

LOCATION:

South Coast Air Quality Management District Office
Auditorium
21865 Copley Drive
Diamond Bar, California 91765-4182

PUBLIC MEETING AGENDA

September 24 & 25, 2009

This facility is accessible by public transit. For transit information, call: (800) 743-3463, <http://www.foothilltransit.org/> (This facility is accessible to persons with disabilities.)

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO: <http://www.arb.ca.gov/lispub/comm/bclist.php>

September 24, 2009

9:00 a.m.

Agenda Item #

09-8-3: Public Meeting to Consider a Report on Staff's Recommended Area Designations for the 2008 Federal Lead Standard

Staff will present its recommended area designations for the 2008 federal lead standard of 0.15 ug/m3. The Air Resources Board (ARB or Board) must submit these recommendations to the United States Environmental Protection Agency by October 15, 2009.

09-8-6: Public Meeting to Consider Appointment of Replacement Member to AB 32 ETAAC

Staff will ask the Board to approve the appointment of a new member to the Economic and Technology Advancement Advisory Committee. A member, representing the California Chamber of Commerce, has resigned from the Committee and staff will recommend filling this seat, effective immediately, by appointing Mr. Marc Burgat, of the California Chamber of Commerce.

09-8-2: Public Meeting to Present to the Board a Draft Report on Planned Air Pollution Research, FY 2009-2010

Staff will present a draft report, "Planned Air Pollution Research for Fiscal Year 2009-2010," to the Board and recommend its approval. The draft report provides a portfolio of research concepts to guide ARB's extramural research program. This research portfolio supports key policy and regulatory drivers: Health Effects and Exposure, Climate Change, and State Implementation Plan Support. If the Board approves the Plan, staff will bring the proposed concepts to future Board meetings for approval as fully designed research proposals.

09-8-9: Public Meeting to Update the Board on ARB's Plan to Hold a Workshop on its Enforcement Program

The Executive Officer will report back to the Board on staff's plan to conduct outreach and hold a workshop on ARB's enforcement program. The workshop is scheduled to be held on October 12, 2009, from 1:00 pm to 5:00 pm, in the Byron Sher Auditorium of the Cal/EPA Headquarters Building.

09-8-4: Public Hearing to Consider Adoption of Proposed Amendments to the California Consumer Products Regulations

Staff will present proposed amendments to the existing Consumer Products Regulation that would establish volatile organic compound limits for three product categories. Minor modifications are also proposed to clarify requirements and/or enhance enforceability.

09-8-7: Public Hearing to Consider Proposed Amendments to New Passenger Motor Vehicle Greenhouse Gas Emission Standards

Staff will present proposed amendments to California's regulations to control greenhouse gas emissions from new light-duty vehicles. The amendments would allow manufacturers to demonstrate compliance based on a combined sales of California-certified vehicles in California and all other states that have adopted California's greenhouse gas regulations. The proposed amendments would also allow manufacturers to demonstrate compliance with the California greenhouse gas requirements by submitting test data from the federal Corporate Average Fuel Economy program.

09-8-8: Public Meeting to Consider Adoption of the Climate Action Reserve Updated Forest Project Protocol for Greenhouse Gas Accounting

Staff will recommend adoption of the updated Climate Action Reserve Forest Project Protocol (version 3.0) for greenhouse gas accounting for emission reduction projects. The Protocol is the result of almost two years of work with considerable stakeholder involvement to update the previously-adopted forest protocols in order to encourage greater participation in forest projects.

September 25, 2009

8:30 a.m.

Agenda Item #

09-6-5: CONTINUED FROM THE JUNE 25, 2009 BOARD MEETING: Public Hearing to Consider Adoption of a Proposed AB 32 Cost of Implementation Fee Regulation and Proposed Amendment to the Existing Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

The Board will conduct a continuation of a public hearing to consider adopting a regulation to assess fees on sources of greenhouse gas emissions and an amendment to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions. The revenue from these fees would be used for the purpose of carrying out the California Global Warming Solutions Act of 2006 (AB 32, Stats. 2006; Ch. 488; Health and Safety Code sections 38500 et seq.).

09-8-5: Public Meeting to Consider Staff Recommendations to Provide Further Locomotive and Railyard Emissions Reductions

Staff will present specific recommendations to provide further locomotive and railyard emissions and risks reductions beyond those expected from existing United States Environmental Protection Agency and ARB regulations and agreements.

CLOSED SESSION – LITIGATION

The Board will hold a closed session, as authorized by Government Code section 11126(e), to confer with, and receive advice from, its legal counsel regarding the following pending litigation:

Central Valley Chrysler-Jeep, Inc. et al. v. Goldstene, U.S. Court of Appeals, Ninth Circuit, No. 08-17378 on appeal from U.S. District Court (E.D. Cal. - Fresno).

Fresno Dodge, Inc. et al. v. California Air Resources Board et al., Superior Court of California (Fresno County), Case No. 04CE CG03498.

General Motors Corp. et al. v. California Air Resources Board et al., Superior Court of California (Fresno County), Case No. 05CE CG02787.

Green Mountain Chrysler-Plymouth-Dodge-Jeep, et al. v. Crombie, 508 F.Supp.2d 295, U.S. District Court Vermont (2007), appeal to U.S. Court of Appeals, Second Circuit, Nos. 07-4342-cv(L) and 07-4360-cv(CON).

California Business Properties Association, et al. v. California Air Resources Board, et al., Superior Court of California (Sacramento), Case No. 34-2009-80000232.

Pacific Merchant Shipping Association v. Goldstene, U.S. District Court, EDCA, Case No. 2:09-CV-01151-MCE-EFB.

American Trucking Association, et al. v. U.S. Environmental Protection Agency, et al., U.S. Court of Appeals, District of Columbia Circuit, Case No. 09-1090.

Yamaha Motor Corporation, USA v. James Goldstene, et al., Superior Court of California (San Diego County), Case No. 37-2009-00094919-CU-MC-CTL.

OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST

Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING. BOARD ITEMS NOTED ABOVE WHICH ARE NOT COMPLETED ON SEPTEMBER 24, WILL BE HEARD ON SEPTEMBER 25 BEGINNING AT 8:30 A.M.

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:

<http://www.arb.ca.gov/lispub/comm/bclist.php>

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CLERK OF THE BOARD:

OFFICE: (916) 322-5594

1001 I Street, Floor 23, Sacramento, California 95814

ARB Homepage: www.arb.ca.gov

To request special accommodation or language needs, please contact the following:

If you require a special accommodation or need this document in an alternate format or language, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

PUBLIC MEETING AGENDA

LOCATION:

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Auditorium
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CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC MEETING TO CONSIDER A REPORT ON STAFF'S RECOMMENDED AREA DESIGNATIONS FOR THE 2008 FEDERAL LEAD STANDARD

The Air Resources Board (ARB or Board) will present recommended area designations for the revised federal lead standard of 0.15 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). ARB will submit these recommendations to the United States Environmental Protection Agency (U.S. EPA) by October 15, 2009.

DATE: September 24, 2009

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 Copley Drive
Diamond Bar, California 91765

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 24, and may continue at 8:30 a.m., September 25, 2009. This item is expected to be considered on September 24, 2009. Please consult the agenda for the meeting, which will be available at least 10 days before September 24, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD Speech to Speech users may dial 711 for the California Relay Service.

BACKGROUND

The federal Clean Air Act requires U.S. EPA to set health-based National Ambient Air Quality Standards. On October 15, 2008, U.S. EPA lowered the lead standard from $1.5 \mu\text{g}/\text{m}^3$ to $0.15 \mu\text{g}/\text{m}^3$. Compliance with the new standard is based on a rolling three-month average concentration measured as lead in total suspended particulate, or TSP. Under the Clean Air Act, ARB is required to submit recommendations for area designations and appropriate boundaries to U.S. EPA by October 15, 2009. The purpose of this report is to summarize the staff's area designation recommendations, based on currently available monitoring data. Staff will also discuss the implementation of new lead monitoring requirements.

U.S. EPA has one year to review the recommendations, promulgating final area designations by October 15, 2010. State implementation plans are due 18 months after U.S. EPA makes the final designations. An area must attain the standard within five years of the nonattainment designation.

Although states are required to make area designation recommendations by October 2009, U.S. EPA recognizes that the current lead sampling network is not adequate in most areas, including California. As a result, U.S. EPA may take an additional two years to designate areas with insufficient data. During this time, new lead samplers will be deployed to collect the data needed to identify designations for many areas with no or limited monitoring data.

PROPOSED ACTION

All areas of California were in compliance of the previous ambient lead standard of $1.5 \mu\text{g}/\text{m}^3$. Because concentrations have been well below that standard for more than a decade, the sampling network was reduced and the number of sampling sites currently operating is very limited.

Based on ARB staff's technical analysis and current ambient lead data for 2006 through 2008, ARB staff recommendations for lead designations are:

- The Los Angeles County portion of the South Coast Air Basin as nonattainment;
- Imperial County as attainment;
- All other areas of California as unclassified because they do not have sufficient data.

AVAILABILITY OF DOCUMENTS

ARB staff will prepare a written staff report prior to the meeting. Copies of the staff report may be obtained from the Board's Public Information Office, 1001 I Street, First Floor, Environmental Services Center, Sacramento, California 95814, (916) 322-2990. This notice and the staff report are also accessible on ARB's website at: www.arb.ca.gov/desig/desig.htm.

SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the meeting and may also be submitted by postal mail or electronic submittal before the meeting. To be considered by the Board, written comments not physically submitted at the meeting must be received no later than 12:00 noon, September 23, 2009, and addressed to the following:

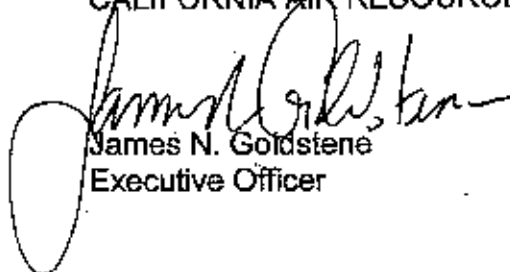
Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require, that 20 copies of any written statement be submitted and that written and e-mail statements be filed prior to the meeting so that ARB staff and Board members have time to fully consider each comment. Further inquiries regarding this matter should be directed to Ms. Gayle Sweigert, Manager of the Air Quality Analysis Section, at (916) 322-6923, or Marcella Nystrom, Staff Air Pollution Specialist, at (916) 323-8543.

CALIFORNIA AIR RESOURCES BOARD

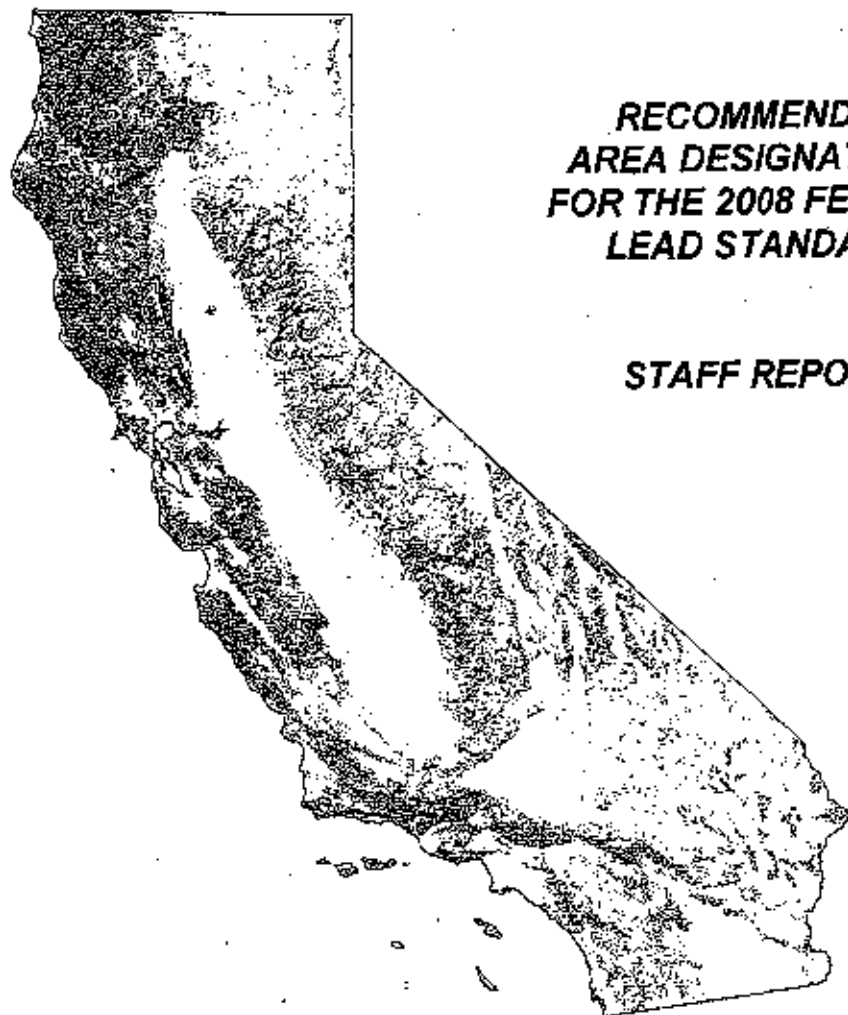


James N. Goldstone
Executive Officer

Date: September 8, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our website at www.arb.ca.gov

State of California
AIR RESOURCES BOARD



**RECOMMENDED
AREA DESIGNATIONS
FOR THE 2008 FEDERAL
LEAD STANDARD**

STAFF REPORT

Release Date: August 26, 2009

Hearing Date: September 24, 2009

California Environmental Protection Agency



Air Resources Board

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BACKGROUND

The purpose of this report is to summarize the staff's area designation recommendations for the revised federal lead standard. This report also discusses the new federal lead monitoring requirements.

On October 15, 2008, U.S. EPA revised the federal ambient air quality standard for lead, lowering it from 1.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to 0.15 $\mu\text{g}/\text{m}^3$ for both the primary and the secondary standard. U.S. EPA determined that numerous health studies are now available that demonstrate health effects at much lower levels of lead than previously thought. U.S. EPA subsequently published the final rule in the Federal Register on November 12, 2008 (<http://www.epa.gov/fedrgstr/EPA-AIR/2008/November/Day-12/a25654.pdf>). This is the first time that the federal lead standard has been revised since it was first issued in 1978.

In addition to revising the level of the standard, U.S. EPA changed the averaging time from a quarterly average to a rolling three-month average. The level of the standard is "not to be exceeded" and is evaluated over a three-year period. Lead levels are measured as lead in total suspended particulate, or TSP. The revised lead standard also includes new monitoring requirements.

Under the Clean Air Act, all states are required to develop recommendations for area designations and appropriate boundaries. These initial recommendations for lead must be submitted to U.S. EPA by October 15, 2009. U.S. EPA has one year to review the recommendations, promulgating final area designations by October 15, 2010. State implementation plans are due 18 months after U.S. EPA makes the final designations. An area must attain the lead standard within five years of the nonattainment designation.

Although states are required to make area designation recommendations, U.S. EPA recognizes that the current lead sampling network is not adequate in all areas, including California. As a result, U.S. EPA may take an additional two years to designate areas with insufficient data. During this time, new lead samplers will be deployed to collect the data needed to resolve unclassifiable designations.

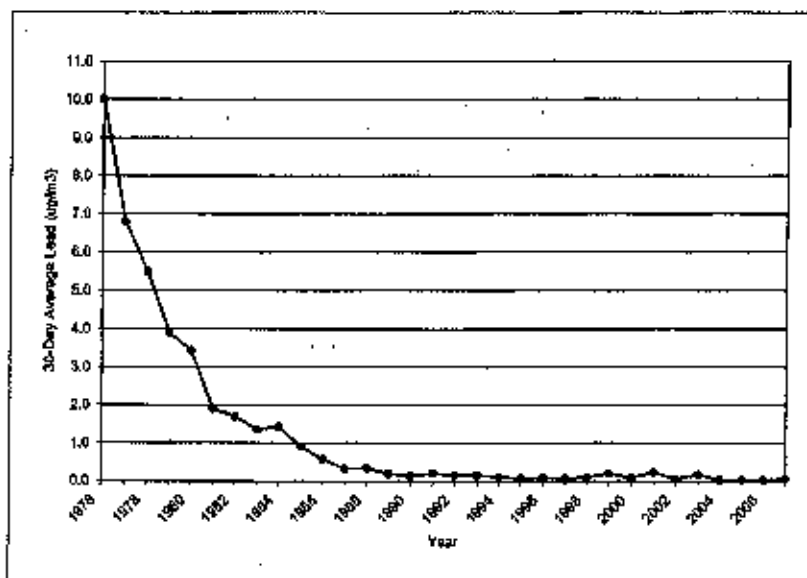
LEAD AIR QUALITY TRENDS

When U.S. EPA adopted the lead standard in 1978, it was estimated that over 90 percent of ambient lead concentrations were attributable to the use of lead in gasoline. The U.S. EPA required a monitoring network be established to include at least two permanent monitors in all urban areas with a population of 500,000 or more. By requiring monitors in urban areas, the regulation was designed to provide information on the major source of lead (gasoline fuel), as well as to

provide information on population exposure to ambient lead concentrations. California's lead monitoring program predated federal requirements by many years. California began monitoring in the late 1960s, and continued to expand the monitoring network in the 1970s and into the early 1980s.

The phase-out of lead in gasoline began during the 1970s, and subsequent ARB regulations virtually eliminated lead from the gasoline sold in California (except for very limited use in general aviation applications). Figure 1 shows the dramatic drop in lead concentrations since 1975 in California's urban areas. Although lead from gasoline no longer poses an air quality problem, lead emissions from remaining industrial sources (not reflected in Figure 1) can still pose "hot spot" problems in a few locations.

FIGURE 1
Maximum 30-Day Average Lead Concentrations in California



Note that the graphed data reflect the maximum 30-day average lead concentration, which is not directly comparable with the rolling 3-month average specified in the federal standard. Generally, the maximum 30-day average is higher than the maximum rolling 3-month average.

As lead concentrations dropped dramatically and all areas of California attained the previous standard, most lead monitors were shut down by the early 1990s and resources deployed to other pollutants. As a result, there is insufficient monitoring data to determine designations, and most areas of the State will be unclassifiable for the revised standard. This will change over the next several years, as a new sampling network is phased-in.

RECOMMENDED AREA DESIGNATIONS

ARB staff evaluated the available ambient lead data to determine appropriate area designations throughout the State. The analysis was conducted for each monitoring site in the State for which data are available. Determining an area's designation is based on comparing measured lead concentrations, averaged for each three-month period, to the level of the standard. If the concentration (known as the design value or the highest rolling three-month average) is higher than $0.15 \mu\text{g}/\text{m}^3$, it violates the federal standard and the area is nonattainment. The recommendations in this report reflect design values based on 2006 through 2008 ambient lead data.

Under the revised federal lead standard, there are three options for area designations:

- An area is nonattainment if the design value is greater than the standard;
- An area is attainment if the design value is equal to or less than the standard, and the data meet U.S. EPA completeness requirements;
- An area is unclassifiable if there are no monitoring data or if the monitoring data indicate attainment but do not meet EPA's completeness requirements.

U.S. EPA's final lead rule states that the presumptive boundary for a lead nonattainment area is the perimeter of the county associated with the sampler(s) violating the standard. The nonattainment area must include the area violating the standard, as well as the area with emissions sources contributing to the violations. In some cases, the nonattainment area may be larger or smaller than a county if analyses of sources and conditions show a different area is justified.

Based on ARB staff's technical analysis and ambient lead data for 2006 through 2008, ARB staff recommendations for lead designations are:

- The Los Angeles County portion of the South Coast Air Basin as nonattainment;
- Imperial County as attainment;
- All other areas of California as unclassifiable because they do not have sufficient data.

These recommendations are shown in Figure 2 and Table 1 and discussed in greater detail in the following pages.

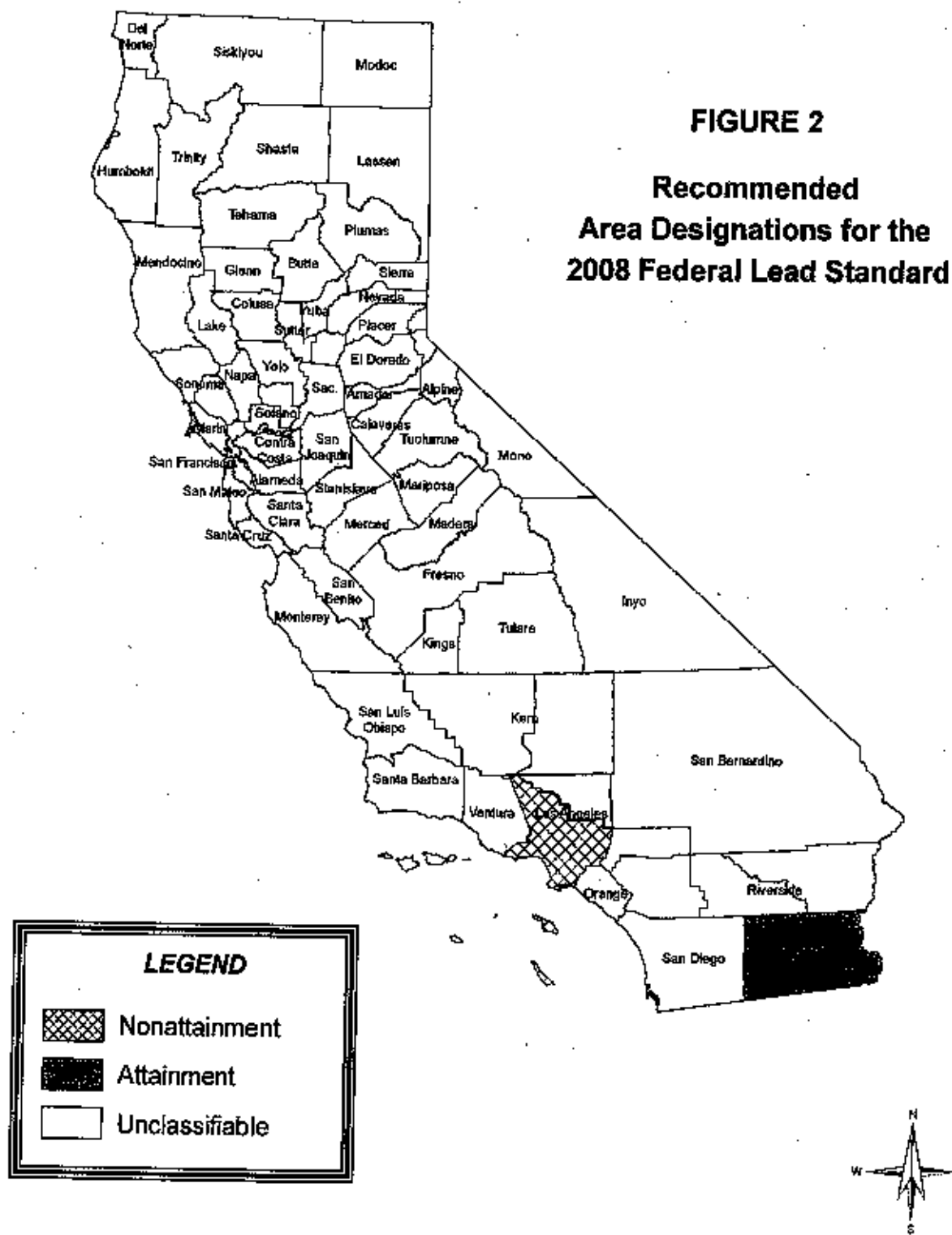


TABLE 1
Recommended California Area Designations for the
Federal Lead Standard Based on 2006-2008 Air Quality Data

| | <i>Designated Area</i> | <i>Design Value ($\mu\text{g}/\text{m}^3$)</i> | <i>Area Included</i> |
|-----------------------|-----------------------------------|---|---|
| Nonattainment | South Coast-Los Angeles County | 2.49 | Air Basin portion of Los Angeles County |
| Attainment | Imperial County | 0.03 | Imperial County |
| Unclassifiable | Great Basin Valleys Air Basin | no data | Alpine, Inyo, and Mono counties |
| | Lake County Air Basin | no data | Lake County |
| | Lake Tahoe Air Basin | no data | Air Basin portions of Placer and El Dorado counties |
| | Mojave Desert Air Basin | no data | Air Basin portions of Kern, Los Angeles, Riverside, and San Bernardino counties |
| | Mountain Counties Air Basin | no data | Amador, Calaveras, Mariposa, Nevada, Sierra, Tuolumne, and Plumas counties and Air Basin portions of El Dorado and Placer counties |
| | North Central Coast Air Basin | no data | Monterey, San Benito, and Santa Cruz counties |
| | North Coast Air Basin | no data | Del Norte, Humboldt, Mendocino, and Trinity counties and Air Basin portion of Sonoma County |
| | Northeast Plateau Air Basin | no data | Lassen, Modoc, and Siskiyou counties |
| | Sacramento Valley Air Basin | no data | Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, and Yuba counties and Air Basin portions of Placer, Solano, and Yolo counties |
| | Salton Sea Air Basin (Remainder) | no data | Air Basin portion of Riverside County |
| | San Diego Air Basin | no data | San Diego County |
| | San Francisco Bay Area Air Basin | no data | Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties and Air Basin portions of Solano and Sonoma counties |
| | San Joaquin Valley Air Basin | no data | Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties and Air Basin portion of Kern County |
| | South Central Coast Air Basin | no data | San Luis Obispo, Santa Barbara, and Ventura counties |
| | South Coast Air Basin (Remainder) | incomplete data | Orange County and Air Basin portions of Riverside and San Bernardino counties |

¹The design value is the highest rolling three-month average lead concentration for any site in the area based on data collected during 2006 through 2008. The area is nonattainment if the design value is greater than $0.15 \mu\text{g}/\text{m}^3$.

Nonattainment Area

South Coast - Los Angeles County

The South Coast Air Quality Management District (District) has collected lead data at several sites in Los Angeles County for a number of years. Several of these sampling sites are located near lead-related facilities and were established as part of the District's Rule 1420 (Emissions Standard for Lead) that was adopted in September 1992. The purpose of Rule 1420 is to reduce lead emissions from non-vehicular sources. It applies to all facilities that use or process materials containing lead, including primary or secondary lead smelters, foundries, lead-acid battery manufacturers or recyclers, as well as facilities that produce lead-oxide, brass, and bronze. The samplers are located at or beyond the property line of the facility and comply with U.S. EPA siting and operating criteria. Lead samples are generally collected on a 1-in-6 day schedule, although samples are collected more frequently at sites with the highest concentrations.

Based on lead data collected during 2008 (when sampling began at the District's Exide Rehrig Pacific site), the maximum rolling three-month average for Los Angeles County is $2.49 \mu\text{g}/\text{m}^3$. This value reflects the January through March 2008 three-month period and exceeds the $0.15 \mu\text{g}/\text{m}^3$ federal lead standard. Because lead concentrations at the Rule 1420 samplers are associated with specific facilities, and lead concentrations drop off fairly rapidly with distance from the source, ARB staff recommends the nonattainment area be limited to the portion of Los Angeles County that is located in the South Coast Air Basin.

Attainment Area

Imperial County

Imperial County is located in the Salton Sea Air Basin. Lead sampling data are available for the Calexico-Ethel Street site which is located near the border between the United States and Mexico. Although ambient lead concentrations in the Calexico area may be impacted by lead emissions from cross-border mobile sources, at the time this report was written, it does not appear there are any significant non-vehicular sources located in the County. The Calexico lead data are complete for November 2005 through December 2008, and they show a design value of $0.03 \mu\text{g}/\text{m}^3$ for the May through July 2007 three-month period. Because the data are complete for the three-year period and the design value is lower than the revised standard, ARB staff recommends Imperial County be designated as attainment for the federal lead standard.

Unclassifiable Areas

In addition to Imperial County and the Los Angeles County portion of the South Coast Air Basin, Table 2 includes a list of all remaining areas in California. ARB recommends these remaining areas be designated as unclassifiable for the revised federal lead standard. While nearly all these areas have no ambient lead data, some sampling data are available for sites in Riverside and San Bernardino counties in the South Coast Air Basin. Although the rolling three-month averages for these sites are lower than the federal standard, the data are not complete for the three-year period. As new samplers are deployed over the next two years, ARB will begin to build the database necessary for resolving these unclassifiable designations.

MONITORING REQUIREMENTS

As described earlier, the phase-out of lead in gasoline (except for limited aviation applications) and long-term attainment of the federal lead standard has been one of California's most dramatic success stories. Consequently, over time, the number of lead monitors has been significantly reduced in California and throughout the nation.

With the success of removing lead from gasoline, remaining lead emissions come from sources such as battery recycling, lead smelters, cement and glass manufacturing, metal mining and the use of non-lead fuel in certain general aviation applications (but not in commercial passenger aircraft). Additionally, lead is a persistent pollutant that can end up in soil and dust, and re-enter the air, often many years after it was originally emitted.

To address this issue, U.S. EPA is requiring samplers near industrial sources emitting at least one ton per year of lead, and these samplers must be deployed by January 1, 2010 (Note: Although the current regulation specifies a one ton per year threshold, U.S. EPA is considering reducing the threshold to a lower level). ARB staff evaluated all of the available emission inventory databases, and worked with air districts to identify the industrial sources that would be subject to this monitoring requirement. At the time of the release of this Staff Report, the only region in California with sources subject to this requirement is the Los Angeles County portion of the South Coast Air Basin.

In conjunction with monitoring near industrial sources, the U.S. EPA is also requiring monitoring to track population exposure to ambient lead concentrations. Population-oriented samplers will be required by January 1, 2011, in each Core Based Statistical Area (CBSA) with a population of at least 500,000. CBSAs are defined by the U.S. Office of Management and Budget (OMB) for use by federal

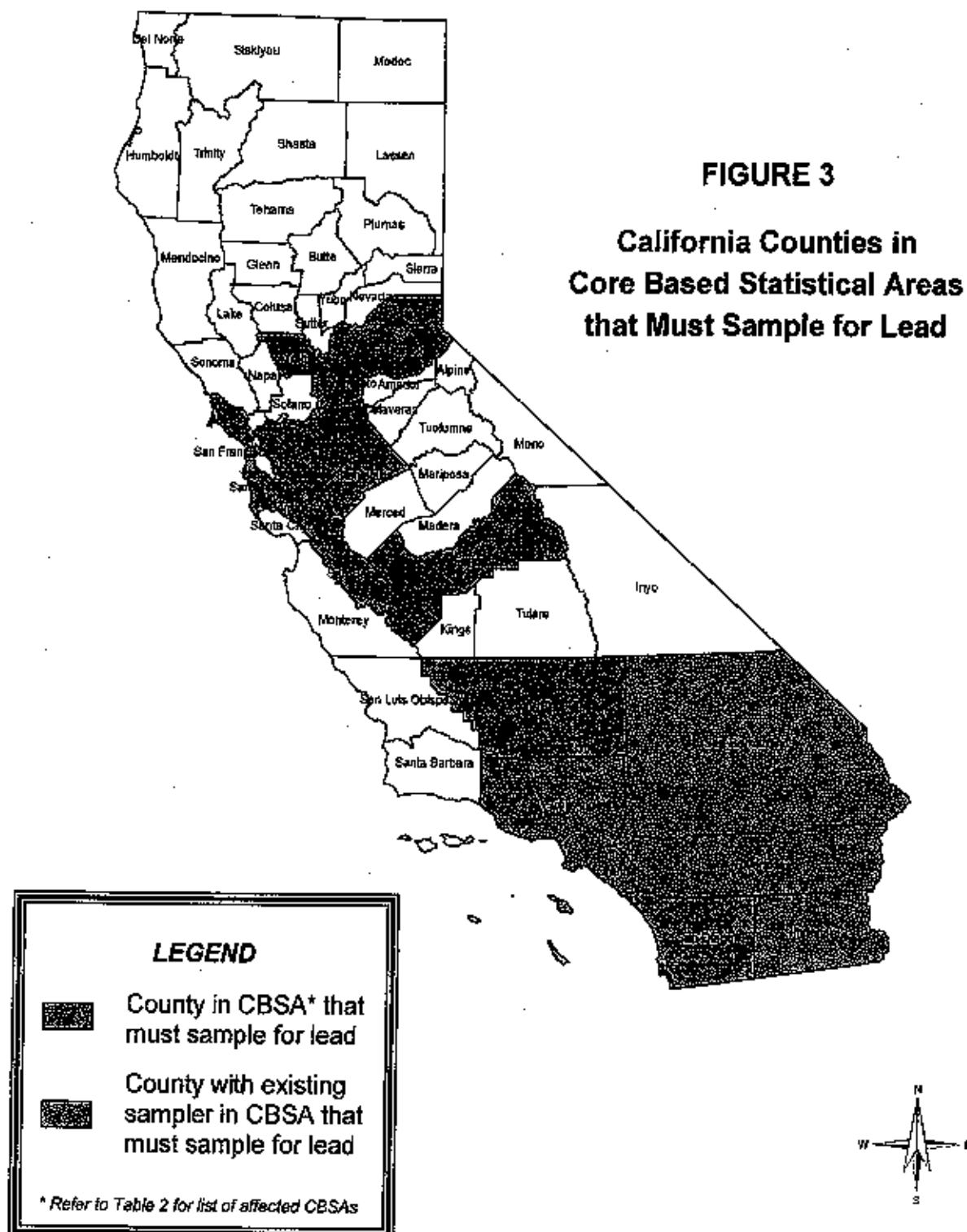
agencies and are intended to provide nationally consistent definitions. A CBSA typically includes at least one urban area, as well as adjacent communities tied to each other through economic, employment, and commuting patterns.

There are 11 CBSAs in California that meet this population threshold, as shown in Table 2. Figure 3 shows which counties within these CBSAs currently have lead samplers and which additional counties might require sampling. ARB and the local districts, using U.S. EPA's monitoring criteria, will complete a more thorough evaluation to determine the best places to site these samplers before the 2011 deployment deadline. When data from these new samplers become available, they will be used to resolve some of the recommended unclassifiable designations.

TABLE 2
Core Based Statistical Areas in California
with a Population of 500,000 or More

| Core Based Statistical Area | Counties Included | Population (millions) |
|-----------------------------------|--|-----------------------|
| Los Angeles-Long Beach-Santa Ana | Los Angeles and Orange | 9.879 |
| Riverside-San Bernardino-Ontario | Riverside and San Bernardino | 4.081 |
| San Diego-Carlsbad-San Marcos | San Diego | 2.975 |
| San Francisco-Oakland-Fremont | Alameda, Contra Costa, Marin, San Francisco, and San Mateo | 2.484 |
| Sacramento-Arden Arcade-Roseville | El Dorado, Placer, Sacramento, and Yolo | 2.091 |
| San Jose-Sunnyvale-Santa Clara | San Benito and Santa Clara | 1.804 |
| Fresno | Fresno | 0.899 |
| Oxnard-Thousand Oaks-Ventura | Ventura | 0.798 |
| Bakersfield | Kern County | 0.791 |
| Stockton | San Joaquin County | 0.671 |
| Modesto | Stanislaus County | 0.511 |

* July 1, 2007 data provided by U.S. EPA.



SUMMARY

This report summarizes ARB staff's recommendations regarding area designations for the revised federal lead standard. It also discusses new lead monitoring requirements. ARB staff recommends the U.S. EPA designate the Los Angeles County portion of the South Coast Air Basin as nonattainment and designate Imperial County as attainment for the $0.15 \mu\text{g}/\text{m}^3$ federal lead standard. Staff recommends that all other parts of the State be designated as unclassifiable because data are either incomplete or not available. These unclassifiable designations will be resolved over the coming years, as the lead sampling network is expanded.

CALIFORNIA AIR RESOURCES BOARD**NOTICE OF PUBLIC MEETING TO CONSIDER THE APPROVAL OF A DRAFT
REPORT: *PLANNED AIR POLLUTION RESEARCH, FISCAL YEAR 2009-2010***

The Air Resources Board (ARB or Board) will conduct a public meeting at the time and place noted below to consider a draft report, titled "*Planned Air Pollution Research, Fiscal Year 2009-2010.*"

DATE: September 24, 2009

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 East Copley Drive
Diamond Bar, California 91765

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 24, 2009, and may continue at 8:30 a.m., on September 25, 2009. This item may not be considered until September 25, 2009. Please consult the agenda for the meeting, which will be available at least 10 days before September 24, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

California Health and Safety Code (HSC) sections 39700 and 39703 establish ARB's research program. It directs the Board to coordinate and administer all air pollution research that is funded, to any extent, with State funds. To facilitate this process, HSC Section 39705 directs the Board to appoint a Research Screening Committee (RSC) to give advice and recommendations on all air pollution research projects proposed for funding.

The draft report is comprised of research ideas for the current fiscal year. The ideas were submitted by the general public, business and academic communities, and ARB staff. More than 300 research ideas were submitted and provided to the RSC for review and comment. The RSC met on August 20, 2009, approved the final list of projects.

Consistent with long-established policy, the Board meets annually with the RSC to review and discuss ongoing projects and research proposed for the next fiscal year. At the September 24, 2009 meeting, ARB staff will present its draft report, *Planned Air Pollution Research, Fiscal Year 2009-2010*, to the Board for approval. The report

describes projected funding allocations and proposed research projects, some recommended for funding and others recommended if funding becomes available. Copies of the report may be obtained from ARB's Public Information Office, 1001 I Street, First Floor, Environmental Services Center, Sacramento, California, 95814, (916) 322-2990, September 14, 2009. The report may also be obtained from ARB's website at <http://www.arb.ca.gov/research/apr/apr.htm>.

Interested members of the public may also present comments orally or in writing at the meeting and may be submitted by postal mail or by electronic submittal before the meeting. To be considered by the Board, written comments submissions not physically submitted at the meeting must be received **no later than 12:00 noon, September 23, 2009**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require 20 copies of any written submission. Also, ARB requests that written and e-mail statements be filed at least 10 days prior to the meeting so that ARB staff and Board members have time to fully consider each comment. Further inquiries regarding this matter should be directed to Susan Fischer, Air Resources Engineer, (916) 324-0627, Air Resource Board, 1001 I Street, Sacramento, California, 95814.

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstene
Executive Officer

Date: September 14, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov

California Environmental Protection Agency



Air Resources Board

PLANNED AIR POLLUTION RESEARCH

Fiscal Year 2009-2010

September 2009

The statements and conclusions in this paper are not necessarily those of the California Air Resources Board. The mention of commercial products, their source, or their use in connection with material reported is not to be construed as either actual or implied endorsement of such products. To obtain this document in an alternative format, please contact the Air Resources Board Disability Coordinator at (916) 323-4916 or 7-1-1 for the California Relay Service. This report is available for viewing or downloading from the Air Resources Board's Internet site at <http://www.arb.ca.gov/research/apr/apr.htm>.

Acknowledgments

This report was prepared with the assistance and support of managers and staff from the Research Division, Mobile Source Control Division, Monitoring and Laboratory Division, Planning and Technical Support Division, Office of Climate Change, and Stationary Source Division of the Air Resources Board. We would also like to acknowledge the members of the academic community, government agencies, private businesses, and the public who submitted research ideas.

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Reviewed By:

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Bay Area Air Quality Management District

California Department of Transportation

California Energy Commission

California Integrated Waste Management Board

California Public Utilities Commission

Coordinating Research Council

Health Effects Institute

National Oceanic and Atmospheric Administration

New York State Energy Research and Development Authority

Office of Environmental Health Hazard Assessment

South Coast Air Quality Management District

United States Environmental Protection Agency

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SUMMARY

This report presents the Air Resources Board's planned air pollution research for the fiscal year 2009-2010. Twenty-one projects that support the ARB's programs are recommended for funding. An additional fifteen projects are offered for consideration, should additional resources become available. This research portfolio is organized by key policy and regulatory drivers: Health Effects and Exposure, State Implementation Plan Support, and Climate Change. Issues related to agriculture and environmental justice are integrated into several of these primary categories.

This annual plan proposes research in the areas listed above, with a significant effort to further inform health impacts of air pollution, develop technologies and behavioral change strategies to reduce emissions of greenhouse gases, improve emission inventories, characterize and assess the behavior of pollutants in the atmosphere, and reduce emissions of conventional air pollutants and their precursors. The total budget for projects recommended for funding is approximately \$5,310,500.

INTRODUCTION

The Air Resources Board (ARB) sponsors a comprehensive program of research addressing the causes, effects, and possible solutions to air pollution problems in California. This research program also provides support for establishing ambient air quality standards. The Board's research program was established by the Legislature in 1971 (Health and Safety Code Sections 39700 et seq.) to develop a better understanding of air pollution in California, including air pollution's effects on health and the environment, atmospheric chemistry and transport of pollutants, and inventory and control of emissions. Several legislative mandates have expanded and further defined the scope of the program in recent years. For example, ARB's growing research interest in climate change issues is reflected by Assembly Bill 2991 (Nuñez, 2008), which expanded membership of ARB's Research Screening Committee to include two experts on climate change.

The ARB's mission to protect California's public health, welfare, and ecological resources is supported by a Strategic Plan for Research covering the years 2001-2010. Based on current and anticipated regulatory priorities, the Strategic Plan provides direction for the ARB's research program. The Plan can be downloaded from: <http://www.arb.ca.gov/research/apr/apr.htm>.

This research plan is organized according to key policy and regulatory drivers that it supports: Health Effects and Exposure, State Implementation Plan (SIP) Support, and Climate Change, with issues related to agriculture and environmental justice integrated into several of these primary categories. Each key policy driver is accompanied by an overview that indicates links between the research area and ARB's mission, ongoing research efforts in the area, research and knowledge gaps that need to be addressed, and recommended research concepts. These contextual overviews are followed by the twenty-one projects recommended for funding and the fifteen projects recommended if additional funds become available.

ARB's research portfolio comprises intense, collaborative studies, some of which are long-term and build on unique data sets, others that address specific implementation or knowledge gaps as single modules. ARB funds niche projects that provide crucial input to California's air quality regulatory programs and may be unlikely to receive support from other funding agencies. In many cases, ARB technical staff play an active role in the research that extends far beyond contract management.

The proposed research projects are not intended to be exhaustive or exclusive. Unanticipated opportunities, unique or innovative study approaches, or urgency may lead to consideration of other projects.

Objective of the Research Program. The goal of the research program is to provide timely scientific and technical information that will allow the Board and local districts to make sound policy decisions and effectively implement air pollution control programs in California. Specifically, this plan supports ARB's missions to protect public health based

on the sound scientific understanding of health effects and exposures; develop and implement strategies to reduce greenhouse gas emissions in accord with the near-term (2020) goals of the California Global Warming Solutions Act (AB 32) as well as longer-term (2050) goals; develop effective strategies to safeguard health and welfare against adverse impacts of ambient air pollution; and develop technologies that address multiple priorities related to environmental quality, from energy conservation and emissions reduction to waste management.

Process for Developing this Research Plan. The Board sends out a public solicitation inviting and encouraging the public to contribute ideas for project consideration. Members of the public, the academic community, and ARB staff submit research ideas. To aid in the evaluation, the Board's Executive Officer established interagency committees, led by ARB staff, to review research ideas. These interagency review teams comprised, in addition to ARB staff, experts from state agencies with related research priorities and responsibilities as well as experts from other state, air district, federal, and non-profit institutions with scientific research or regulatory authority in areas of policy relevance to ARB. In response to this year's solicitation, approximately 300 research ideas were submitted. Proposed projects were examined for relevance to regulatory questions facing the Board, scientific and technical merit, and opportunities to leverage State resources through co-funding. Proposals were modified as necessary. Reviewers then prioritized candidate projects in order of urgency and importance. The Board's scientific external review committee, the Research Screening Committee (RSC), which was established by Health and Safety Code Section 39705, reviewed these candidate projects. A list of projects recommended for funding, as well as projects to consider pending availability of resources, was compiled based on discussions between interagency review committees, feedback from ARB's divisions, and comments from the RSC as well as an agricultural stakeholder outreach working group. This list of recommended projects was submitted to the Executive Research Review Committee, whose members are the Executive Officer, his three deputies, and the Chief of the Research Division. The Executive Research Review Committee reviewed all of the proposed projects and modified the draft list of projects recommended for funding based on ARB's most pressing policy and regulatory needs. The RSC reviewed the selected projects and recommended the Plan to the Board.

Implementation of the Plan. The next step for projects approved in the plan will be their development into full research projects. The submission and selection of an idea does not guarantee a resulting contract for the submitter. Rather, the ARB is required to consider public California universities for expertise to execute these projects. If the universities do not possess the expertise, then a public solicitation is issued or a sole source contract is awarded. A list serve distributes updates on research activities. To subscribe to the list serve, visit <http://www.arb.ca.gov/listserv/research.htm>.

Research Budget. The twenty-one recommended projects total approximately \$5.3 million. An additional fifteen projects totaling approximately \$4.1 million are recommended if resources become available. Allocations for the twenty-one projects

recommended for funding are organized according to key policy or regulatory drivers as follows:

| RESEARCH CATEGORY | BUDGET |
|---|-------------|
| Health Effects and Exposure | \$1,630,000 |
| State Implementation Plan (SIP) Support | \$2,388,500 |
| Climate Change | \$1,292,000 |
| TOTAL | \$5,310,500 |

Project Co-sponsorships. The Research Division is continually looking for co-funding opportunities and other ways to leverage the State's research dollars. This effort allows the ARB to be part of projects and studies that may otherwise lie beyond the state's fiscal reach. ARB has successfully worked with other research organizations and has participated in multimillion-dollar collaborations.

Summaries of Past Research. Projects completed since the beginning of 1989 are summarized in the Research Division's publication, Air Pollution Research, at www.arb.ca.gov/research/apr/past/past.htm. Research Division's final reports are available at the same web site.

OVERVIEWS OF RESEARCH AREAS

Health Effects and Exposure

Policy Drivers:

- The Children's Environmental Health Protection Act (SB 25, Escutia, 1999)
- Defining and Reviewing Ambient Air Quality Standards (Title 17 of the California Health & Safety Code, Section 39606)
- Diesel Risk Reduction Plan
- Exposure Assessment of Toxic Air Contaminants (California Health & Safety Code, Section 39660.5)
- Regulation of Ozone Emissions from Indoor Air Cleaning Devices (California Health & Safety Code, Sections 41985 *et seq.*)

Ongoing Efforts: The U.S. Environmental Protection Agency (U.S. EPA), as well as the National Institutes of Health (NIH) and the Health Effects Institute (HEI) are involved in extensive research efforts that inform health effects and air quality standards. Specifically, the U.S. EPA, as part of its Science to Achieve Results (STAR) program, will be funding national Clean Air Research Centers to support research on the health effects of exposure to particulate matter, ozone, and other air pollutants, both singly and in multipollutant atmospheres. Priority research areas include: explaining regional and temporal differences in air pollution risk; determining the origins and transformations of multipollutant atmospheres and their constituents; defining exposure/concentration-response relationships; assessing susceptibility; understanding PM effects in a multipollutant context; and developing greater understanding of PM and ozone health effects.

U.S. EPA's Clean Air Research Program also probes multipollutant exposures and has developed a research strategy to address multipollutant issues including:

- Laboratory studies to evaluate controlled source emissions and health effects.
- Laboratory studies of artificial mixtures that test hypothetical interactions that may be driving more generalized atmospheric exposure mixtures.
- Real-world studies in cities where emission, exposure, and health data can be collected or integrated on multipollutant exposures that may impact human health.

Areas of scientific investigation include: understanding the relationships between sources of air pollutants and atmospheric transformation to air pollutant products; understanding the health risks posed by mixtures of air pollutants; advancing atmospheric and exposure modeling of multipollutants; developing methods and controls for sources or air pollutants that impact health relevant emissions or products; and determining a hierarchy of sources and related emission components regarding relative health risks. As part of this effort, initial emphasis is directed to near-road exposures since mobile sources emit a complex mix of gases, vapors, and particles.

Ongoing research projects funded by HEI emphasize mixtures of air pollution with a focus on particulate matter and gaseous pollutants, diesel exhaust, and air toxics. HEI

funds theoretical, in vitro, animal, controlled human exposure, and epidemiologic studies. For example HEI is supporting, among other topics, research on the toxicity of particles from new diesel engines and research on accountability (effectiveness of regulation for the improvement of air quality).

ARB has funded and conducted ongoing community exposure projects for a wide range of toxic air contaminants (TAC), as well as PM, CO, NO₂ and other pollutants in California, in various parts of the State, including southern coastal cities near ports. Previously ARB has funded several large personal and neighborhood exposure studies, as well as a study of exposures to diesel exhaust inside vehicles as they are driven on the roadway. U.S. EPA and HEI have previous or ongoing traffic and diesel exposure research projects and a pilot level port worker exposure project.

ARB has also funded and conducted ongoing indoor air quality and personal exposure projects for a wide range of toxic air contaminants, as well as PM, CO, NO₂ and other pollutants in California. Staff have previously conducted in-house research to measure ozone from portable air cleaners that emit ozone. U.S. EPA and the South Coast Air Quality Management District (SCAQMD) have a few ongoing indoor air quality research projects, including a pilot level project funded by SCAQMD to study the effectiveness of indoor air cleaning devices in removing outdoor-generated particles and VOCs in a small sample of classrooms.

Research/Knowledge Gaps: To support its mission to protect public health, the ARB must address a number of knowledge gaps regarding the harmful effects of air pollutants.

- While many epidemiologic studies report statistical associations between air pollutant exposure and a range of adverse health effects, research to date has not fully described biological mechanisms that could explain these associations.
- Differential toxicity of PM from various sources needs to be resolved. This information could lead to control measures targeted at sources that have the greatest impact on health. Of particular concern is the relative toxicity of ultrafine PM, which has been proposed to be highly toxic, but little published information is available to support this hypothesis.
- Air quality measurements at ambient monitoring stations routinely show consistent associations with important health endpoints. However, actual human exposures sometimes differ substantially in temporal and spatial distribution from those observed at monitoring stations. More focused monitoring and exposure assessment efforts are needed to better understand the impacts of diesel exhaust at the community level and those associated with port activities, so that control measures can be better targeted to reduce exposure.
- Exposure to diesel exhaust is estimated to be the largest contributor to Californians' cancer risk from ambient air pollution, as well as a notable contributor to the risk for the worsening of asthma and other harmful health effects. As regulations and policies are implemented to meet Board-approved diesel exhaust risk reduction goals for 2010 and 2020, near-source and personal exposure information is needed to determine time trends of actual health risks.
- For some pollutants, individuals' activities near key sources contribute to indoor and personal exposures that differ substantially from, and are often elevated relative to,

air quality measurements at ambient monitoring stations. More focused monitoring and exposure assessment efforts are needed to better understand individuals' exposures and impacts to TACs and criteria pollutants.

- Few measurements have been made of ozone emissions from In-duct air cleaning devices (air cleaners installed inside ventilation system ductwork), but some such devices appear to emit substantial amounts of ozone.
- There is growing interest in the use of air cleaning devices to help reduce asthma symptoms, but the data available to date do not document their effectiveness.
- Exposures to and health impacts of secondary pollutants from reactions of ozone with indoor air warrant investigation.
- Climate change regulations will affect fuel compositions, vehicle emissions, land use patterns, and other technological and behavioral factors with health implications. Tools need to be developed to delineate the benefits as well as potential adverse effects of climate change regulations on human health.
- Health effects of mixtures of pollutants require research to determine whether—and if so, how—some pollutants in ambient air interact with or modify the effects of particulate matter or other pollutants.
- Studies are needed to identify, quantify, and illuminate mechanisms of biological and genetic factors contributing to sensitivity to air pollution.
- As technologies evolve, an emerging concern is the impact of nanoparticles in products and materials on personal and indoor exposures, including exposure both to nanoparticles and to their toxic components (e.g., metals).
- In-vehicle exposures to VOC and semi-volatile organic chemical concentrations, as well as occupants' exposures from passenger cabin materials and products, need to be characterized because Californians spend a significant amount of time in vehicles, which constitute potentially high-exposure settings.

Recommended for Funding

Health Effects of Central Valley PM

PM_{2.5} has been associated with adverse human health outcomes; however, the specific biological mechanisms involved in causing these outcomes are poorly understood. The objective of this project is to elucidate the mechanisms linking inhalation of PM to pulmonary and cardiovascular responses using mice as an animal model. The results will facilitate assessment of PM-mediated health impacts, strengthen the scientific basis for the PM standards, and help provide evidence for the adequacy of the PM standards to protect the public. This project's cost-effectiveness is enhanced by its use of substantial resources available through the US EPA-funded PM Center at UC Davis. (p. 6)

Proposed funding level: \$450,000

Genetic Control of PM-Induced Inflammation and Oxidative Stress in Subjects with Coronary Artery Disease This study will add new, useful information on how particles may induce or otherwise cause inflammation that may impact the progression of cardiovascular disease. It will examine the genetic component of air pollutant-related adverse health effects. The study will evaluate genetic expression in relation to the PM source, size and composition. In addition to addressing the biological mechanisms leading to adverse health outcomes in human populations, the results from this research may also help the Board evaluate the need to regulate PM on a particle basis

for the protection of public health. The proposed research is leveraged through data already collected in the parent research project funded by NIH. (p. 8)

Proposed funding level: \$275,000

Using a Mobile Monitoring Platform to Investigate Spatial, Diurnal and Seasonal Pollution Gradients Near Freeways and Air Quality Improvements from New Regulations in the Port Area

Individual exposures to air pollutants depend strongly on place as well as time spent in microenvironments, and are not accurately resolved by regionally-averaged air pollution levels. This study will improve our understanding of how pollutants, particularly ultrafine particles, vary with location and time of day near freeways and arterial roads. This understanding is essential for improving health effects studies that depend on exposure assessment. Results of this research will also enable more accurate evaluation of the rate of improvement in air quality near the ports. (p. 11)

Proposed funding level: \$280,000

On-Road Measurement of Emissions from Heavy-Duty Diesel Trucks: Impacts of Fleet Turnover and ARB's Truck and Bus Rule

As California proceeds with implementation of new emission controls on heavy-duty trucks, especially the truck and bus rule, over the next few years, major changes in fleet-average emissions, emission distributions, and relationships among various pollutant emissions are expected. This study will provide on-road confirmation of the emission impacts of the truck & bus rule, and will provide complementary information to a multi-year on-road assessment sponsored by the National Renewable Energy Laboratory that started in 2008 in southern California. (p. 14)

Proposed funding level: \$300,000

In-duct Air Cleaning Devices: Ozone Emissions and Test Methodology

The objective of this project is to develop a robust and easy to use test method to measure ozone from "in-duct" air cleaning devices, and to measure emissions of ozone and ozone reaction by-products from a sample of in-duct air cleaners. ARB's current air cleaner regulation exempts in-duct air cleaners because there is little data on their emissions and there is no accepted test methodology for them, yet some of these devices intentionally emit ozone, and others have been shown to emit potentially harmful levels of ozone. This project would provide critically needed emissions information to determine whether regulation should be pursued, and a test method that could be adopted if regulation is warranted. (p. 16)

Proposed funding level: \$325,000

Recommended if Additional Funding Available

Community Exposures to Traffic-Generated Pollutants

This research will refine what is known regarding concentrations of traffic-related air pollutants in community air and exposure levels experienced by people at elevated risk of adverse health impacts. Results will aid identification of sources as well as factors that mitigate exposures. This information will facilitate improved risk assessments and design of pollution control programs that are most likely to reduce these risks. (p. 18)

Proposed funding level: \$800,000

Mitigation of Air Pollution Exposures from Land Use and Transportation Measures to Reduce Greenhouse Gases

This effort will provide a preliminary assessment of land use and building design measures that can mitigate potential increased exposures to air pollution associated with alternative land use and transportation approaches undertaken to reduce greenhouse gases. It will also provide study designs sufficient to develop accurate cost estimates for the research that is needed. Ultimately, research resulting from this and follow-on projects will provide a definitive assessment of mitigation effectiveness of the measures and a solid scientific basis for the selection of statewide exposure reduction measures. (p. 20)

Proposed funding level: \$300,000

Port Workers' Exposure to Air Pollution

This project will characterize the exposure of port workers to selected air pollutants, including particulate matter. Analysis will also evaluate changes in human exposures with the implementation of the San Pedro Bay Ports Clean Air Action Plan. This study would provide exposure and microenvironmental concentration data at the ports and in the community and would enhance ARB's goods movement program. (p. 23)

Proposed funding level: \$150,000

Evaluation of Secondary Pollutant Emissions from Portable "Air Cleaners"

Investigators propose to examine the creation of secondary reaction products (e.g., aldehydes, VOCs) indoors, which are produced by the operation of portable air cleaners that use new technologies. Since the adoption of ARB's air cleaner regulation, new alternate technologies have been developed, which may have unintended effects. There is concern that health risks from secondary indoor pollutants may exceed that of ozone associated with some portable "air cleaners" and could harm the health of those who use these air cleaners regularly. (p. 25)

Proposed funding level: \$400,000

Comparative Effectiveness of Different Air Cleaning Technologies for Asthma Triggers in Homes and Offices

The objective of this concept is to measure the effectiveness of different types of portable air cleaning devices and ventilation system filters in removing particles and ozone from indoor air in a sample of homes and offices over a twelve-month period, and to provide a cost-benefit analysis which will provide guidance to asthma sufferers. This project would measure real-world effectiveness in typical California buildings and assess the effectiveness of the devices at removing both indoor-generated and outdoor-generated PM and ozone. Interest in, and the need for, filtration is increasing, especially for those with asthma and other respiratory disease. This project will provide information responsive to the public's interest, and subsequent outreach could supplement ARB's program in indoor air quality. (p. 28)

Proposed funding level: \$200,000

Concepts Recommended for Funding

TITLE: Health Effects of Central Valley PM

PROBLEM: Numerous epidemiological studies demonstrate a correlation between ambient particulate matter (PM) concentrations and morbidity and mortality with lags of 1 to 3 days, yet the mechanistic and causal links between health effects and PM concentrations remain unclear. We previously found associations between health effects in mice exposed to concentrated ambient particles (CAPs) in Fresno, but there are no investigations into the time course for development of and recovery from particle-induced health effects. We propose to investigate the time course of pulmonary and systemic biological responses in mice exposed to Fresno PM using lag times after exposure that could help explain epidemiological results.

PREVIOUS WORK: Researchers at UC Davis have exposed animals to ambient PM in urban Fresno and the surrounding rural areas in both summer and winter. Results to date show significant changes in chemokine and cytokine levels, increased total inflammatory cell number, increased number and proportion of neutrophils, and evidence for systemic platelet activation in animals exposed to concentrated ambient particles. Measurements assessing adverse effects by us and others have typically been performed either immediately after exposure ends, or on the next day, although the optimal time for post-exposure measurements is unknown. It is possible that important indications of adverse changes are being missed due to lack of knowledge about the time courses of different endpoints (i.e., pulmonary, cardiovascular, inflammatory, platelet activation). Data from ozone-exposed human subjects indicates that different biomarkers of inflammation are elevated in the lungs at different times post-exposure. This reflects the time course of the inflammatory cascade mechanism, as well as the injury-repair cycle. There is no similar information in the literature for any category of endpoint for PM exposure.

OBJECTIVES: The proposed work will assess the toxicity of urban and background PM from the San Joaquin Valley on pulmonary and cardiovascular systems in a mouse model observed at different times post-exposure. Results will facilitate improved assessment and source attribution of PM-mediated health impacts and may illuminate mechanisms by which PM affects pulmonary and cardiovascular systems in humans.

DESCRIPTION: In the research proposed here, we will expand our research program by investigating the different pulmonary and cardiovascular indicators that are elicited at different times post-exposure. These experiments are motivated by epidemiologic studies that have shown health effects lagging by 1, 2 or 3 days post-exposure. It is likely that some health effects are elicited promptly while others take some time to be observed. Both pulmonary and cardiovascular endpoints will be assessed, and the composition of the PM will be analyzed chemically for source apportionment.

We propose to:

1. Expose mice to concentrated ambient particles in Fresno during winter and summer.
2. Employ a staggered set of post-exposure times to explore the temporal nature of different responses to concentrated ambient particles.
3. Assess markers of cardiovascular health effects induced by this PM.
4. Assess markers of pulmonary health effects induced by this PM.
5. Source apportion the PM to correlate health effects with sources.

Animals will be exposed to CAPs at the East Shaw Avenue Monitoring Site in Fresno, California where we have performed exposures previously and observed health effects using the University of Southern California (USC) Versatile Aerosol Concentrator Exposure System (VACES) at the same time of year and for the same length of exposure proposed here. UC Davis is also developing an improved version of VACES under contract with ARB that can also be deployed for these studies. We will use HiVol samplers to collect coarse PM and PM_{2.5} for in vitro and in vivo laboratory exposures. Assuming that funding is established before the end of 2009, we will perform the exposures in the summer of 2010 and winter of 2011. June of 2010 is optimum for exposures because the CalNex and CARES field campaigns will be taking place so a greater range of ambient measurements will be available for our study. Due to the limited funding, chemical analysis and source apportionment will only be performed on PM_{2.5}. If SAHERC funding is renewed, U.S. EPA funds will be used for chemical analysis and source apportionment of size-resolved PM samples as with previous SAHERC field studies.

There will be two experiments; one during summer 2010 and the other during winter 2011. In both experiments, mice will be exposed to CAPs for 10 days, 6 hours per day. There will be a group of 8 mice exposed to filtered air, and four groups of 8 mice that will be exposed simultaneously to CAPs. Two filtered air exposed animals and one group of 8 CAPs exposed mice will be sacrificed at each of the following post-exposure time points: 1, 2, 4 and 6 days post-exposure. All 40 animals will be acclimated to the Fresno site one week prior to exposure. At 16, 14, 12 and 11 days pre-necropsy, each group will begin exposure to the 10-day, 6-hr/day regimen. After the 16 day exposure protocol, the animals will be sacrificed and analyzed for a wide range of pulmonary and cardiovascular endpoints, as noted below.

BENEFITS: PM is the most serious air pollution problem in California. Air quality standards for PM are based on epidemiological studies that can not demonstrate causality, and current understanding of the biological basis for epidemiological associations is incomplete. This study is designed to clarify biological mechanisms and links linking inhalation of PM to pulmonary and cardiovascular responses, which will strengthen the scientific basis for the PM standards, and enable ARB to be more confident that the standards adequately protect the public.

COST: \$450,000

COFUNDING OPPORTUNITIES: Pending renewal of the San Joaquin Valley Health Effects Research Center (SAHERC) funding, an \$8M co-funding effort will be proposed to the U.S. EPA.

TITLE: Genetic Control of PM-Induced Inflammation and Oxidative Stress in Subjects with Coronary Artery Disease

PROBLEM: Findings in cohort and time series studies suggest that environmental exposure to particulate matter (PM) air pollution is associated with increases in cardiovascular hospitalization and mortality (1). Pathophysiological mechanisms underlying epidemiological findings as well as information regarding PM sources and chemical components responsible for these associations are beginning to emerge. There is evidence to support the hypothesis that ultrafine particles (UFP) and their organic components are capable of inducing the greatest amount of oxidative stress and inflammation per unit of PM mass (2-4). However, accurate exposure assessment methods (5) have generally been lacking in epidemiologic studies to date. Furthermore, there is little data on whether increased exposure to air pollution is associated with changes in mRNA expression reflecting biological processes linked to oxidative stress and inflammation. Most relevant gene expression data has come from *in vitro* studies or animal models. It is unclear whether these findings can be extrapolated to humans. The proposed study will address gaps in understanding mechanisms of PM-induced cardiovascular health effects in human populations.

PREVIOUS WORK: Associations of circulating biomarkers of inflammation as well as antioxidant enzymes with outdoor PM among people with coronary artery disease (CAD) have been demonstrated, in particular associations involving markers of primary combustion aerosols and quasi-UFP particles $<0.25 \mu\text{m}$ (3,4). However, there is limited understanding of complex biological pathways by which PM exposure might trigger such systemic responses (6). An epidemiologic approach is to evaluate whether increased exposure to air pollution is associated with changes in mRNA expression reflecting key biological processes. *In vitro* data has shown that air pollutants can induce gene expression representing antioxidant response, inflammation, coagulation, endothelial function, and apoptosis in endothelial cells, epithelial cells, monocytes, and macrophages. There is some data showing gene expression changes in animals such as hypercholesterolemic mice exposed to urban UFP (7-8), but human data are limited to one small study of 15 welders (9) and another small cross-sectional study of 47 children in the Czech Republic (10). There are no data on whether gene expression in relevant biological pathways is associated with urban PM exposure in humans at increased cardiac risk from advanced age or CAD.

OBJECTIVE: *To assess whether key genes of inflammatory and oxidative stress responses are differentially expressed in peripheral blood of subjects with CAD in relation to air pollutant exposures measured at indoor and outdoor home sites. We hypothesize that the expression level of genes involved in biological pathways relevant to cardiovascular acute responses and disease progression will be altered following higher PM exposures. We will evaluate within-subject differences in repeated gene expression in relation to particle size, PM composition and sources of exposure that have a major contribution to personal and indoor PM concentrations.*

DESCRIPTION: This research to determine the expression levels of candidate gene transcripts in subjects from an ongoing funded panel study, and investigators will merge this data with available intensive exposure and health outcome assessments nearing

completion for an NIH, NIEHS-funded panel study (grant no. ES-012243; with supplemental funding through ARB contract no. 03-329 and US EPA grant no. RD83241301). Principal investigators collected repeated measures to evaluate acute cardiovascular health effects of exposure to PM, with a focus on ultrafine particles. Enrolled subjects with complete home exposure and health outcome data include 60 elderly nonsmokers living in retirement communities in areas of the Los Angeles air basin with high air pollution levels. Each subject has been followed over a 7-month period with up to 12 blood draws for whole blood total RNA at the same time blood samples were taken and already analyzed for biomarkers of inflammation and oxidative stress. The parent study scope of work did not include gene expression research. Subjects were followed weekly on site by research technicians. Diaries were used to monitor medication use, time-activity patterns, and exposure conditions. Extensive baseline and prospective cardiovascular clinical data are available.

BENEFITS: This project will contribute substantial new data to improve understanding of the air pollutant characteristics and sources that affect gene expression among elderly Californians at greatest risk of cardiovascular morbidity and mortality. Because subjects living in the LA Basin's most pollutant areas were followed at home for 12 weeks, results will provide clues to mechanisms not otherwise discoverable using experimental approaches. The greatest strength of this proposal is the use of a potentially powerful new tool in population studies to measure biological response to environmental stressors in what will be the largest study of its kind to date. Results of this study will establish a foundation for additional clinical research involving repeated measurements to yield information about exposure time-dependent gene expression.

COST: \$275,000

COFUNDING/COLLABORATION OPPORTUNITIES: This project will leverage substantial resources in the form of data collected in the parent research project funded by NIH, NIEHS. It Collaboration with an ARB-funded, additional major exposure assessment effort for the NIEHS project will enable principal investigators to evaluate effects from a broad range of particulate air pollutant sources and components. Ongoing EPA-funded research (Southern California Particle Center) is assessing oxidative stress biomarkers in the same subjects. Collaboration will make it possible to explore links between gene expression, protein expression, and oxidative stress.

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TITLE: Using a Mobile Monitoring Platform to Investigate Spatial, Diurnal and Seasonal Pollution Gradients Near Freeways and the Air Quality Improvements from New Regulations in the Port Area

PROBLEM: An understanding of the variability and extent of the steep pollution gradients in close proximity to combustion sources is emerging, but significant gaps remain, particularly concerning the diurnal variability and pollutant levels during calm conditions at night and in the early morning. Broad areas of highly elevated pollutant levels in the early morning likely play a disproportionate role in individual exposures to air pollution [1]. For the population of many urban areas, the most important, locally-variable source of pollution exposures are motor vehicles on freeways and major arterials. In earlier mobile platform (MP) studies we have shown this is particularly true for the port area of Los Angeles and Long Beach which have exceptionally high densities of mobile sources of pollution sources, especially heavy duty diesel trucks (HDDT). Since HDDT's are a target of regulations to protect human health by reducing diesel emissions it is critical to monitor the effectiveness of these regulations.

PREVIOUS WORK: The ARB-developed mobile platform (MP) continues to demonstrate the great versatility and power of using an instrumented electric vehicle to rapidly collect pollutant concentration data, with excellent spatial and temporal resolution, over a wide range of microenvironments [1-8]. Using the MP in 2008 in West Los Angeles, researchers showed that in the hours immediately preceding sunrise, average ultrafine particle concentrations exceed daytime downwind values by factors of 2 to 4 in the first 1000 meters downwind of the freeway, even though traffic flows are lower during the pre-sunrise period than daytime [1]. Further, concentrations of ultrafine particles and other traffic-related pollutants during stable conditions did not return to the background level until about 2500 meters downwind, thus affecting many times more people than during daytime, when pollutant levels return to background within about 300 m [9, 10]. It is suspected these extended high concentration gradients occur in all seasons, and can be generalized to other major roadways, but this needs to be confirmed with additional measurements.

Also of concern are the communities downwind of high densities of diesel truck and rail emissions in the port areas of Los Angeles, the target of many new and existing regulations aimed at reducing such emissions. Data are available from 2006 and 2007 characterizing areas around the 710 freeway as well as in Wilmington, Carson, and San Pedro. These data can be used to create a baseline for a long-term trend analysis of the effectiveness of the new regulations in reducing exposures to residents near the ports.

OBJECTIVE: Objectives are threefold: 1. Generalize the wide impact area of freeways under stable atmospheric conditions, particularly during the night and early morning, and better characterize the impact area phenomenon and its relationship with the time of day. 2. Investigate the diurnal variation of freeway and arterial road impacts due to heavy truck traffic in the port area, and 3. Provide on-going monitoring to track improvements in the air quality in the port area as new regulations aimed at reducing emissions come into force.

DESCRIPTION: This project seeks to continue to exploit the ability of the mobile platform (MP) to efficiently produce spatially- and temporally-resolved measurements. The MP is a self-pollution free electric RAV4 vehicle instrumented with fast instruments to monitor ultrafine particle number and size distribution, PM 2.5, black carbon and particle-bound PAH mass, CO, CO₂ and NO_x, wind speed, direction, temperature and relative humidity and records of traffic activity on video. To make a detailed assessment of pollutant buffers surrounding freeways, investigators will develop a sampling plan that will seek to monitor a range of atmospheric stability conditions, to characterize air pollution gradients under the range of diurnally variable mixed layer conditions typically found in California. Atmospheric stability data will be obtained from the network of vertical profilers managed by the South Coast Air Quality Management District, supplemented in the lowest few hundred meters above ground level with additional instrumentation if possible.

BENEFITS: Individual exposures to air pollutants depend strongly on place as well as times spent in microenvironments rather than on regional averaged air pollution levels. This study seeks to greatly improve our understanding of how pollutants, particularly ultrafine particles, vary with location and time of day, near freeways and arterial roads. These results are essential for more accurate exposure assessment. Results will also enable improved evaluation of the rate of improvement in air quality near the ports.

COST: \$280,000

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TITLE: On-Road Measurement of Emissions from Heavy-Duty Diesel Trucks: Impacts of Fleet Turnover and ARB's Truck & Bus Rule

PROBLEM: New on-road heavy-duty (HD) diesel exhaust PM emission standards are effective for 2007 and newer model engines nation-wide. Furthermore, ARB recently adopted the Truck & Bus rule in December 2008; this rule will accelerate the deployment of control equipment such as diesel particle filters on older engines that are already in use. Some engines will be retired instead of undergoing retrofits. In either case, ARB's truck and bus rule will greatly accelerate penetration of the 2007 heavy-duty engine PM emission standards to the in-use truck fleet, completing a clean-up effort by ~2014 that would otherwise take another decade or longer to achieve. On-road emissions data will help to document and support the emission and air quality benefits of ARB's emission control program in this area.

PREVIOUS WORK: HD diesel truck exhaust PM emissions have been measured on-road at the Caldecott tunnel during summers 1997 and 2006 (Kirchstetter et al., *Atmos. Environ.* 1999; Ban-Weiss et al., *Atmos. Environ.* 2008; Ban-Weiss et al., *Environ. Sci. Technol.* 2009). The most recent study in 2006 for the first time provided data on particulate emission factors from over 200 individual diesel trucks (previous studies reported only fleet-average emissions data). The 2006 measurements described variability and inter-relationships affecting particulate matter emissions (specifically BC = black carbon, and PN = particle number) from individual heavy-duty trucks. There was minimal overlap between high BC and high PN emitters: when BC emissions were high, new PN formation via nucleation was inhibited due to condensation onto existing BC particle surfaces. Changes in emission factor distributions are expected as fleet-average emissions decrease over time: distributions are likely to become more skewed.

OBJECTIVE: Measure emission factor trends and distributions for heavy-duty diesel trucks driving through the Caldecott tunnel in 2010 and 2012.

DESCRIPTION: Pollutant concentrations will be measured in a mixed traffic bore of the Caldecott tunnel, in a ventilation duct above the traffic. Large diesel trucks with vertical exhaust pipes inject their exhaust emissions near the top of the tunnel where air sampling equipment inlets will be located. Measurements will be made for uphill traffic on a 4% grade (the uphill grade poses a significant load on truck engines). Previous work indicates that during midday hours on weekdays, diesel trucks pass by at a rate of about 1 per minute, and that pollutant concentrations (BC, PN, NO_x, and CO₂) increase well above tunnel background levels. Specific pollutants to be measured at 1 Hz:

- * CO₂ (LICOR-820 already purchased & available)
- * BC (Magee Scientific aethalometer – already purchased & available)
- * PN (water and butanol CPCs – already purchased & available)
- * Dustrak PM mass (TSI – available through LBNL)
- * size distribution (FMPS to be borrowed from ARB – electrometer-based particle counting)
- * Total NO_x (ECO Physics CLD 64, on order for delivery in summer 2009)

Investigators will measure at least 500 individual heavy-duty truck exhaust plumes in two separate field campaigns to take place in summer 2010 and 2012. Investigators will

calculate emission factors for all of the above pollutants via carbon balance methods (i.e., normalize pollutant of interest to total carbon – mainly CO₂ – concentration inside the tunnel). Investigators will analyze emission trends over time by comparing fleet-average emission factors and distributions measured at the same site with similar driving conditions.

BENEFITS: As California proceeds with implementation of new emission controls on heavy-duty trucks, especially the truck & bus rule, over the next few years, major changes in fleet-average emissions, emission distributions, and relationships among various pollutant emissions are expected. This study will provide on-road confirmation of the emission impacts of the truck & bus rule, and will provide complementary information to a multi-year on-road assessment sponsored by NREL that started in 2008 in southern California, and will continue for the next 4 years. The NREL study relies on remote sensing to measure HD vehicle emissions.

Information on the distribution of emission factors across a large on-road sample of heavy-duty trucks will complement chassis dynamometer testing programs that support the state's emission inventory and planning needs. Specifically, the emission factor distributions to be developed here will provide data on the prevalence and emission levels of high-emitting vehicles. Although their numbers can be relatively small, these high-emitting vehicles are very important in terms of the overall emissions budget from HD trucks. However, these high-emitting vehicles are difficult to account for in dynamometer-based test programs that are limited in terms of sample size due to budget constraints.

COST: \$300,000

TITLE: In-duct Air Cleaning Devices: Ozone Emissions and Test Methodology

PROBLEM: In 2007, the ARB adopted a regulation that limits ozone emissions from indoor air cleaning devices. Air cleaners physically integrated within a central ventilation system, called "in-duct" air cleaners, were exempted from the requirements of ARB's regulation because no suitable test method was available for measuring ozone emissions from such devices, and few data were available on their ozone emissions to support regulation. However, there are a number of in-duct intentional ozone generators as well as in-duct electrostatic, ionizer, and ultraviolet air cleaners known to emit ozone that are marketed in California. There is reason to believe that some of these may generate significant amounts of ozone and/or ozone reaction byproducts such as formaldehyde. The presence of ozone in the indoor environment has known, serious health consequences, in addition to detrimental effects on building and household materials.

The current California regulation relies on the test method described in Section 37 of Underwriters Laboratory Standard 867 (UL 867) to certify compliance of portable indoor air cleaning devices with the 0.050 ppm emission concentration limit. However, while UL uses UL 867 to test in-duct air cleaners for their electrical safety, UL 867 does not include a suitable test method for measuring ozone emissions from in-duct devices.

PREVIOUS WORK: Measurements of ozone emissions from in-duct, intentional ozone generators are not generally available. However, Viner *et al.* (1992) measured air ozone emissions for three HVAC electrostatic air cleaners. Their findings suggest that some electrostatic air cleaners on the market generate more than 20 mg/hr of ozone, an amount considerably greater than most ion generators (1- 5 mg/hr, Mullen *et al.*, 2005; Britigan *et al.*, 2006; Waring *et al.*, 2008) and less than most portable dedicated ozone generators (31 - 220 mg/hr, Mullen *et al.*, 2005; Britigan *et al.*, 2006). There have been changes in electrostatic air cleaner design since Viner *et al.* conducted their study (i.e., the use of pin ionizers rather than coronas in some models) as well as newer information on the impact of dirty coronas, ozone reaction byproducts, and other factors than point to increased ozone emissions. In addition to the ozone emitted from the air cleaners, heterogeneous reactions of ozone with materials in a ducted system may produce unwanted aldehydes and other irritants. Research by Morrison *et al.* (1998, JAWMA) indicates that exposure of ducted materials to ozone increased the emission rates of aldehydes from a duct liner, duct sealing caulk, and neoprene gasket. Their results also indicated that, contrary to some claims, air ducts in ventilation systems are not likely to be a major sink for ozone, but this needs to be verified.

OBJECTIVE: The objectives of this project would be to: 1) develop a robust and easily applied method to measure ozone emissions from central system, in-duct air cleaners; 2) apply this method to test modern in-duct air cleaner designs in the laboratory; 3) measure ozone and byproduct emissions from in-duct air cleaners in homes and offices during actual use; 4) estimate the impact of these emissions on Californians' exposures to ozone and reaction byproducts; and 5) compare the ozone impacts to those from portable intentional and unintentional ozone-generating air cleaners. This study would develop a test method for in-duct air cleaners that could be adopted by UL and ARB; establish the relationship between tested ozone levels for in-duct ozone-generating air

cleaning devices and incremental increases in ozone and byproduct concentrations in buildings; and help identify the potential need for regulation of in-duct devices.

DESCRIPTION: The work would entail laboratory tests, field research, and modeling of potential ozone and reaction product concentrations within home and office environments. First, investigators would develop an ozone emission rate test methodology appropriate for in-duct air cleaners. The methodology would take into account the large airflows in typical HVAC systems, and variations in ozone emission rate due to factors such as temperature, relative humidity, upstream particle concentration, dust loading, flow rate, and voltage fluctuations. All of these factors are likely to vary significantly and have been shown to impact ozone emissions. They also would assess the potential for reaction of ozone on the air cleaner itself as well as on ducts and downstream HVAC components. These reactions can artificially reduce the measured ozone emission rates, and produce a variety of compounds that are odorous, irritating, and of serious health concern, such as formaldehyde.

Next, investigators would validate the test methodology in different test ducts at other facilities to assess repeatability and reliability as well as ease of use. These results would be used to improve the test method. Then, the ozone emission rates of 6 -10 in-duct air cleaning devices commercially available in California would be determined, using the methodology developed. Next, testing would be conducted in four homes and two office buildings to verify the relationship between laboratory-measured emissions and installed performance. Finally, using test data and modeling, investigators would estimate: 1) the incremental increase in ozone concentrations in residential buildings as a function of the measured emission rates from these units, 2) the anticipated total indoor ozone concentrations as a function of emission rates and a statistical analysis of California building characteristics and other relevant regional information, 3) the ozone and reaction product exposures for typical Californians in buildings with these devices, and 4) compare the measured impacts to those from portable intentional and unintentional ozone-generating air cleaners.

BENEFITS: This study would provide a test method and necessary data to support inclusion of in-duct air cleaners in ARB's air cleaner regulation, if warranted. Regulation of all significant contributors of ozone in an indoor setting is appropriate and should be further explored. If warranted, the resulting regulation would reduce Californians' exposures to ozone and the associated harmful effects of ozone and its byproducts.

COST: \$325,000

Concepts Recommended if Funding Available

TITLE: Community Exposures to Traffic-Generated Pollutants

PROBLEM: Pollutants emitted by or formed from the emissions of motor vehicles have long been known to be harmful. Epidemiological studies have found that people living near roadways are more likely to suffer adverse health effects that include exacerbation of existing asthma, heart problems, low birth weights, and even excess mortality. Controlled animal, human and toxicological studies have reinforced these findings. Components that have been found to be related to health impacts include: particle-phase carbon, oxides of nitrogen, CO, organic vapors, PM_{2.5}, ultrafine PM, PAHs, quinones, reactive oxygen species, and diesel exhaust particles. However uncertainties exist regarding which pollutant are causing these effects and what levels are encountered by people in the community. This is partially because epidemiological and biostatistical studies often use pollutant data that are quite limited, typically from routine air monitoring stations. These stations are intentionally sited to minimize the impacts of local sources, such as traffic and monitor a short list of pollutants. An added problem is that many of the pollutants are emitted by the same source. Thus, some reported associations with measured pollutants may act as surrogates, or stand-ins, for the actual harmful agent or agents.

The uncertainties regarding the specific potencies and level of exposure to the components of traffic-related air pollutants make it difficult to assess risk with confidence and to develop programs that efficiently control these risks. A key uncertainty remains to be resolved: what harmful pollutants are present in near traffic community air, including near roadways, in cars, in homes, schools, and workplaces?

PREVIOUS WORK: Studies have used differing approaches to assess the health impacts of traffic-related pollutants. Near roadway studies have shown that ultrafine PM and other primary pollutants diminish as they move from the roadway, but may be found at elevated levels for hundreds of meters. On-road exposure studies find that in-vehicle exposure is a major contributor to UFP exposures for commuters. Statistical studies which have used available data on health status or outcomes have found that estimated PM_{2.5}, NO₂, CO or ozone exposures are associated with increased rates of asthma, low birth weights, mortality, heart problems and other outcomes. Other studies have found that distance from roadways, or to heavy duty truck traffic is linked to health impacts that include mortality rates and childhood respiratory illnesses. When more refined pollutant exposure data are available for individuals in a community, health outcomes such as reduced lung function development in children are seen to be associated with NO₂, PM_{2.5} and carbon. Cardiac function and blood markers of injury and inflammation have been related to personal and indoor exposures to outdoor traffic sources. Various approaches are employed to refine exposure/effects estimates for use in statistical studies of health outcomes. These include consideration of lifestyle and socioeconomic status determined from census data as well as limited air monitoring to refine local ambient air quality data. Land use has also been used to model community and population exposures. However, these methodologies and their reliance on the available, limited monitoring data may misrepresent the nature and risks of pollutant

exposures. One example is for NO_2 that has been found to be associated with a range of health outcomes by epidemiological and statistical studies. However, studies performed in controlled human and animal exposure studies have not shown NO_2 capable of causing such effects. A more probable explanation of the epidemiological results is that NO_2 is a stand-in for harmful pollutants emitted by vehicles, such as NO , UFP, or organics.

OBJECTIVE: The objective is to determine the nature of community and individual exposures to harmful traffic generated-pollutants.

DESCRIPTION: The study would incorporate intensive, time and spatially resolved air monitoring for pollutants of concern regarding the health impacts of traffic. Based on the findings of recent health studies these pollutants would include, as a minimum: ultrafine PM, $\text{PM}_{2.5}$ mass, carbon (black, organic, and elemental), primary and secondary organic aerosols, CO , and, NO_x . In-vehicle, near roadway, community, and indoor air monitoring would be included to both provide spatially refined concentrations and to evaluate how the physical and chemical nature of these pollutants varies as they move from source to receptor.

The optimal deployment of this study would be to coordinate it with a health study (or studies) in order to improve the exposure data available for that study, as well as to document the nature of the pollutant across a community and indoors. UCI has two studies focused on traffic-related pollutants that are anticipated to begin in the fall or winter of 2009-2010 that would be candidates. The first would follow from successful observations of elderly people with health problems. In that NIESH/ARB/SCAQMD sponsored study performed by UCI, pollutants from outdoor origin, especially organic aerosols from traffic sources, were found to be associated with a range of health outcome measures. The second study is of asthmatic children whose respiratory health would be evaluated for changes due to community and indoor air pollution exposures. Extended air monitoring would provide both studies with an improved ability to evaluate how specific traffic related pollutants impact health.

BENEFITS: This research will refine what is known regarding concentrations of traffic-related air pollutants in community air and exposure levels experienced by people at elevated risk of adverse health impacts. Results will aid identification of sources as well as factors that mitigate exposures. This information will facilitate improved risk assessments and the design of pollution control programs that are most likely to reduce these risks.

COST: \$800,000

TITLE: Mitigation of Air Pollution Exposures from Land Use and Transportation Measures to Reduce Greenhouse Gases

PROBLEM: As stated in SB 375 (Steinberg, 2008), additional measures beyond vehicle emission reductions, such as alternative land use patterns and transportation systems that will help reduce energy use, are needed in order to meet the greenhouse gas (GHG) emission reduction goals of AB 32 (Nunez, 2006). Measures such as increased housing density, closer proximity of buildings to public transit and roadways, and more walkable and bikable communities have been identified as additional means to achieve AB 32 goals. However, such broad measures can have unintended consequences, in addition to the expected environmental and social benefits. For example, greater proximity to busy freeways and arterial roadways can result in increased exposure of the community to air pollutant emissions from vehicles and traffic noise (Zhu et al., 2002, 2006; Baldauf et al., 2008; Hu et al., 2009). Also, increased building density and walkable/bikable community designs put commercial buildings in closer proximity to residential buildings, increasing exposures of residents to emissions and noise from establishments such as print shops, restaurants, and auto body shops. Measures to reduce such exposures are available, but have not been sufficiently studied to support their use on a statewide basis. Mitigation measures that have been used recently or are planned for use include set-back of buildings at a greater distance from major roadways; construction freeways and arterials below grade; the use of sound walls, raised landscape berms and dense foliage as pollutant interceptors or diverters and for noise attenuation; design of buildings with air intakes on the downwind side of the building away from major pollutant sources; the use of mechanical ventilation and high efficiency air filtration in homes; advanced building technologies to regulate outdoor air intake under high pollution conditions; and the use of reduced leakage and other "whole building" measures to achieve zero energy buildings. However, only very limited research has been conducted to date on most of these measures to confirm and quantify their actual effectiveness in mitigating exposures to air pollutants in the real world. The data are generally insufficient to support them as statewide mitigation measures or to allow quantification of the extent to which they would reduce the local population's exposures to pollution from alternative land use patterns.

PREVIOUS WORK: Very little information is available on the effect of mitigation measures to reduce pollutant transport from roadways into homes. Sound walls can elevate the air pollutant plume from roadways and reduce downwind concentrations to 0-80% of roadway concentrations, while vegetation and buildings may reduce pollutant transport by increasing air turbulence and pollutant deposition (Bowker et al., 2007 and papers cited). However, local air flow patterns (e.g., during inversions) may also concentrate the polluted airstream flowing over the walls, resulting in increased exposures nearby. Hu et al. (2009) recently found that elevated pollutant levels occur at distances farther from busy roadways than previously measured, especially at night; thus, the current State policy of a 500 foot set-back of buildings from roadways may not be sufficiently protective, and warrants further research.

Homes with very tight building shells, mechanical ventilation and high efficiency air filtration can greatly (though not completely) reduce uncontrolled air leakage and pollutant infiltration from the outdoors. Such measures accompanied by no- or low-VOC

building materials and other measures comprise a "whole house" approach that is being used increasingly in Europe, and recently in the U.S., to reduce energy use and GHG emissions. However, the reduction of pollutant infiltration has not been assessed in such homes, nor have measures used in Europe been successfully demonstrated in California climates using local construction styles.

OBJECTIVE: The objectives of this project are to: 1) conduct a literature review of the land use and building design mitigation measures discussed above and other such mitigation measures to identify the type and extent of further research needed for each to be considered as a statewide mitigation measure; 2) for measures that are promising but require further research, develop study plans that would provide sufficient data to confirm and quantify their effectiveness in reducing exposures; 3) conduct pilot studies (or full studies if funds are available) for two of the most promising measures requiring further study; and 4) seek co-funding for the full field studies and the additional research needed.

DESCRIPTION: Within six months, investigators would conduct a comprehensive literature review of all relevant exposure reduction measures and prepare and deliver a draft report of their findings for review by ARB staff and others as determined by ARB. In consultation with ARB and appropriate scientists and stakeholders, measures warranting further study would be selected for development of study plans. Preliminary study plans would be delivered, and two measures would then be selected in consultation with ARB for immediate study. Pilot studies (or full field studies if sufficient funds are available) would be conducted for those two measures upon approval of a detailed study plan for each. Co-funding would be sought for the main studies of the first two measures and for the full studies for the remaining measures.

BENEFITS: This initial effort would provide a preliminary assessment of land use and building design measures that can mitigate the increased exposures to air pollution expected to occur from alternative land use and transportation approaches undertaken to reduce greenhouse gases. It also would provide study designs sufficient to develop accurate cost estimates for the research that is needed. This initial phase of work avoids allocating funds for full research and instead would pursue co-funding from other sources to help cover costs of the research. The ultimate research resulting from this project would provide a definitive assessment of mitigation effectiveness of the measures and a solid scientific basis for the selection of statewide exposure reduction measures.

COST: \$300,000

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TITLE: Port Workers' Exposure to Air Pollution

PROBLEM: The Ports of Los Angeles and Long Beach (Ports) and their terminal operators provide employment to thousands of workers in on-dock and transportation jobs. Current ARB and SCAQMD efforts to characterize air pollution levels in the surrounding communities do not address on-job air pollution exposure. As many of the workers live in the surrounding communities, assessing overall pollutant exposure of this sub-population requires knowledge of occupational exposure as well.

PREVIOUS WORK: A previous study funded by NIOSH and conducted by Cal-EPA measured the on-job pollution exposure of several occupation classes at the Ports. The study was limited and did not address many pollutants of concern such as diesel particulate matter. Other studies have assessed diesel exposure in other occupational settings.

OBJECTIVE: The objective is to characterize the exposure of Port terminal and transportation workers to air pollutants.

DESCRIPTION: In order to characterize exposure of Port workers, a combination of personal monitoring and area sampling will be conducted. A set of occupation types and settings will be selected after an initial scoping task to determine the jobs and areas where potential for high exposures exists. This will be accomplished via site visits and include input from occupational hygienists, the Ports, terminal operators, and the local dock workers union (ILWU #13). The exact number of samples, subjects, areas, and sampling durations will be determined based on the scoping exercise and available resources. Once the jobs and areas for sampling are identified, volunteers for personal monitoring and appropriate IRB approval will be sought.

Area sampling will include established methods for air monitoring of selected pollutants and air toxics. PM_{2.5} and PM₁₀ filter samples will be collected and analyzed for mass, air toxic species, and elemental carbon as an indicator of diesel exhaust. Methods for measuring continuous PM mass will also be considered as resources allow. Ultrafine particle counters will also be considered. Eight-hour duration silanated canisters will collect organic gas air toxics for subsequent analysis.

Personal sampling may include some more recently developed active and passive methods. Many traditional occupational exposure monitors do not have the sensitivity to measure pollutants at ambient levels. Since the objective of the personal monitoring is to measure exposures that may be well below established occupational limits or guidelines and provide comparisons to fixed site monitors, the methods deployed for epidemiological exposure assessment are more appropriate. Methods that will be considered include personal, active PM samplers or impactors, passive and active gas samplers, and particle counters for ultrafine particles. Sampling analysis techniques will be as similar as possible to those used for the area sampling and the other ongoing monitoring studies in the surrounding areas.

Data analysis will include direct comparisons between on-job exposures, area concentrations, and community concentrations as measured by ongoing SCAQMD and

ARB monitoring studies. The specific source of the exposures will be assessed based on the chemical analysis of PM filters, gases, and estimated source profiles.

BENEFITS: Assessing the impact of goods movement includes the health effects costs associated with exposure to air pollution from goods movement activities. Given the large number of jobs associated with Port activities, and the proximity of these jobs to pollution sources, an impact assessment should include the potentially elevated exposures of this sub-population of residents. This study will help to identify these exposures and impacts and provide important information for decision-makers regarding Port operations and pollution mitigation measures.

COST: \$150,000

COFUNDING/COLLABORATION OPPORTUNITIES: Potential cost matching by SCAQMD in the amount of \$150,000.

TITLE: Evaluation of Secondary Pollutant Emissions from Portable "Air Cleaners"

PROBLEM: In a recent survey, 14% of California households reported ownership or use of portable air cleaner during the past five years (1). A majority of portable air cleaners are electrostatic precipitators (ESPs), ionizers and ozone generators (OGs), all of which may negatively impact indoor air quality (IAQ) through emissions of O_3 (2,3).

Hence, nearly one million Californians may be exposed to potentially harmful pollutants emitted by poorly engineered air cleaning devices. Increasing public awareness of the deleterious effects of indoor ozone is likely driving consumers to seek alternative products available in a dynamic multi-million dollar market. Several new products combine new technology such as TiO_2 photocatalytic oxidation with established technologies in an integrated device. While ozone emissions remain a concern, formaldehyde and other partially oxidized VOCs may be generated as undesired byproducts of chemical processes taking place inside the air cleaner unit. These new integrated devices are capturing a growing market share, but research is needed to evaluate potential IAQ and public health impacts of these new generation devices.

PREVIOUS WORK: Characterization of ozone emissions by OGs, ESPs and ionizers has been carried out by ARB staff and other investigators (2-4). Several other studies on portable air cleaners evaluated their effectiveness at removing aerosol particles (5-8), microbes (9) and VOCs (10,11). However, little attention has been paid to the generation of secondary organic pollutants formed during the operation of portable air cleaning devices. In recent work, we have investigated the performance of a prototype in-duct whole-building photocatalytic oxidation (PCO) air cleaner. We observed and quantified the formation of volatile aldehydes and carboxylic acids as partial oxidation byproducts upon challenging the device with realistic indoor VOC mixtures (12,13). Our results suggest that PCO air cleaners, when operated under certain conditions and in the absence of secondary treatment, may constitute a significant source of harmful byproducts such as formaldehyde. Similar results have also been described by other authors (14,15), further illustrating that the yield of secondary pollutants is highly dependent on experimental conditions, including the composition of the VOC mixture and the concentration of key constituents. In recent CARB-funded projects, our group has characterized secondary pollutants from ozone-initiated indoor chemistry (16,17) and emissions from office electronic equipment under idle and active cycles (18), gaining valuable insight on the key physical-chemical phenomena involved and the experimental and analytical tools required to perform the proposed study.

OBJECTIVE: The objective is to evaluate the emission of indoor pollutants by devices commercialized as portable air cleaners in California, with emphasis on a new generation of equipment integrating several technologies that include photocatalytic oxidation (PCO). Emissions will be determined in realistic indoor conditions, to assess the risks associated with exposure to those secondary pollutants.

DESCRIPTION: Given the large number and the diverse nature of available portable air cleaners, *Task 1* of the project will involve performing a survey of equipment and technologies available in California through chain-store retailers with substantial market presence, as well as through online vendors. Additional information on leading

brand/models available in the US can be obtained through independent sources such as The Consumers Report magazine and from the results of ARB's ozone air cleaner survey performed by the U.C. Berkeley Survey Research Center (1). This initial screening will allow us to identify devices with a likely significant presence in the State. A representative subset of those will be selected (in consultation with ARB staff) to perform the proposed experimental work. **Task 2** will involve the development of a test protocol for portable air cleaners. Devices will be operated inside the LBNL stainless steel 20-m³ chamber operated at air exchange rates typical of buildings (in the range 0.2 – 1.5 h⁻¹), under a controlled atmosphere generated by continuous infusion of a challenge VOC mixture. Key parameters to be optimized include the composition of the chamber atmosphere and concentration of VOCs introduced in the chamber (with particular attention given to formaldehyde precursors such as alcohols and terpenes). Also, the study should be applicable to test equipment of different dimensions and different airflow throughput under comparable experimental conditions. **Task 3** will comprise the characterization of emissions of secondary pollutants by each of the air cleaners selected during Task 1, following the protocol developed under Task 2 for several air exchange conditions. This third task will be carried out with brand-new, out-of-the-box units, following manufacturers' operation procedures. At the completion of Task 3 tests, the air cleaners will be removed from the chamber and operated continuously in real indoor environments to age the test units. Subsequently, **Task 4** will involve a repetition of the tests performed under Task 3 using the aged equipment, to evaluate possible changes of emissions of secondary pollutants in used equipment. Finally, in **Task 5** the results determined under Tasks 3 and 4 will be used to estimate the expected IAQ impact of each of the studied devices using a mass balance model.

BENEFITS: Ineffective portable air cleaners may lead to poor IAQ and associated health effects for a significant number of Californians. The proposed research will help the State assist the public in making informed decisions when purchasing and using these devices. Information generated in this work would contribute to the broader effort that the ARB has been carrying out in this field over the past years.

COST: \$400,000

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TITLE: Comparative Effectiveness of Different Air Cleaning Technologies for Asthma Triggers in Homes and Offices

PROBLEM: The research will investigate the comparative effectiveness of different air cleaning solutions to reducing the airborne concentrations of fine particulates and ozone in California homes and offices. It will address the lack of comparative data to assess the air quality impact of different filter designs and technologies on actual residential and office indoor environments.

PREVIOUS WORK: The applicant has completed an AQMD funded a pilot study at three elementary schools located near refineries, other industrial facilities and freeways in the Carson-Long Beach area. The project tested the effectiveness of various air filtration devices and filters at removing pollutants from indoor air. Preliminary results showed that the low cost high-efficiency HVAC filters are effective at removing particles from indoor air in classrooms.

OBJECTIVE: The specific aim of the research is to determine the effectiveness of different air cleaning solutions under typical and representative home and office conditions in California and to provide a cost-benefit analysis which will provide guidance to asthma sufferers.

DESCRIPTION: The proposed research will monitor the indoor and outdoor environments of 10 homes and 10 offices for the period of approx. 12 months for fine particulates and ozone. In this period, the effectiveness of six different filter designs and technologies on the reduction of fine particulates and ozone will be investigated. The study will include a wide selection of commercially available stand-alone room air purifiers and heating ventilation and air conditioning (HVAC) filters with a wide range of technologies and costs. The study will focus on home styles and office designs including HVAC designs common in California. The study will also yield a better understanding of how outdoor particle and ozone levels affect indoor air quality in residential and office buildings with different air cleaning technologies.

BENEFITS: The successful completion of this project will benefit Californians with asthma, their families and employers in providing much needed objective guidance as to which air cleaning devices provide the most effective reduction of the two most common asthma triggers: fine particulates and ozone.

COST: \$ 395,000

State Implementation Plan (SIP) Support

Policy Drivers:

- Development and implementation of State Implementation Plans for ozone;
- Development and implementation of State Implementation Plans for PM.

Ongoing Efforts

Background: The federal Clean Air Act (CAA) establishes planning requirements for those areas where ozone levels routinely exceed the National Ambient Air Quality Standards (NAAQS). The CAA requires these "non-attainment" areas to adopt and implement SIPs that demonstrate how each area will attain the standards by specified dates. The challenge of properly managing California's atmospheric resources is complex, because management strategies must simultaneously deal with two interrelated environmental concerns: air quality and climate change. Although separate programs are in place to research and manage air quality and climate change, these concerns are not separate and in fact are intimately connected. These connections arise because many of the atmospheric species of concern are the same, and in many cases the sources of the agents are the same or intimately connected. For example, surface ozone is both an air pollutant and a greenhouse gas. Aerosols, known in the air quality community as particulate matter (PM), not only have significant and complex climate impacts, but also are an important air pollutant that has significant human health impacts, degrades visibility and contributes to acidic deposition. In many cases, efforts to address one of these issues can be beneficial in addressing the other, but in other cases policies addressing one issue can have unintended detrimental impacts on the other.

ARB's research program for SIPs closely complements scientific work being conducted by other agencies. For example, the National Center for Atmospheric Research is involved in efforts to improve biogenics emission estimates, and ARB scientists are closely monitoring their work for its applicability to California. The U.S. EPA continues to fund and participate in the development of air quality modeling tools for use in SIP preparation, as well as providing guidance on the use and implementation of those tools. ARB scientists are heavily involved in the development, testing, and application of these tools and algorithms. The SCAQMD continues to fund important research into inventory improvements for their ozone and PM planning activities, and for improvements to meteorological fields used for SIP modeling. And ARB is a key player along with the National Oceanic and Atmospheric Administration (NOAA), the California Energy Commission (CEC), and others in planning and funding the 2010 CalNex study, which will collect valuable three-dimensional data to support the next round of SIPs and climate change planning activities.

Air quality modeling: Model depiction of atmospheric processes and precursor pollutant species, such as NO_x and speciated ROG, that participate in the formation of ozone and PM_{2.5} is critical to SIP support, as is field validation of models. A new version of the SAPRC chemical mechanism (SAPRC07) has recently been completed through ARB funded work at UC Riverside. ARB staff are currently working on implementing this mechanism into the CMAQ air quality model (a primary model used in SIP modeling efforts). U.S. EPA is also working on their own more condensed implementation of the

mechanism in parallel with ARB's efforts. A complete evaluation of the mechanism is a critical component of ARB's work.

Biogenic emission estimates: From a statewide perspective, field validation measurements of biogenic emissions have historically focused on relatively small geographic regions. While biogenic emissions measurements have been made at many locations around the globe, these emissions are a function of plant species and are strongly correlated to atmospheric conditions. Thus, measurements made outside of California do not offer a sound basis for evaluating the state's biogenic emissions inventory. During CalNex, NOAA will make airborne measurements of isoprene, which may provide some useful information about regional biogenic isoprene emissions. However, these measurements will not suffice to illuminate California's biogenic emissions inventory at the requisite resolution for improving the State Implementation Plans.

CalNex 2010: The goal of the CalNex 2010 program is to study critical issues at the nexus of the air quality and climate change problems, and to provide scientific information regarding the trade-offs faced by decision makers when addressing these two inter-related issues. Since ARB's earliest years, major field studies have expanded the science behind ARB's effort to improve air quality. This tradition continues as next year ARB will benefit from a \$15 million effort on the part of NOAA focused on air quality and climate science issues. CalNex 2010 will benefit from an unprecedented level of support from NOAA, including multiple platforms and many scientists. The air quality and meteorological data collected during CalNex will improve ARB's emission inventories of greenhouse gases, traditional air pollutants and precursors. In addition the study will improve ARB's air quality models used in SIP development, our understanding of the atmospheric formation of ozone and PM, and the role of aerosols in radiative forcing over the State. NOAA's plan to deploy two aircraft in the state for four to six weeks will generate a dataset of unprecedented chemical completeness, spatial extent and temporal resolution. The presence of a research vessel off the coast will provide data about the emissions and impacts of shipping off California's coast. California has taken advantage of this opportunity to have questions of specific interest to ARB included in planning efforts and to leverage our research funds by coordinating work with NOAA.

Fertilizer air emissions: Measurements of NO emissions from cropland soils have been conducted in other states and countries, but the sensitivity of these emissions to crop type, fertilizer application, and environmental conditions preclude use of these measurements to characterize California. While extensive measurements of NO will be taken during CalNex, those measurements will not be crop-specific.

Research/Knowledge Gaps: Among the key knowledge gaps to be addressed to support the Board's decision-making are:

- Statewide validation of the biogenic emissions inventory is crucial, especially isoprene emission estimates, for California to augment field validation measurements that have been limited to smaller geographic scales;
- Characterization of emissions of NO from cropland soils in California to characterize the state's mix of crops, fertilization practices, and climate;

- Spatially resolved measurements of NO_2 to evaluate urban NO emissions inventory;
- Measurements of key species in atmospheric chemistry, such as formaldehyde (HCHO) and glyoxal (CHOCHO), coupled with modeling efforts;
- Clarification of sources and processes that contribute to $\text{PM}_{2.5}$ in California;
- Lifecycle assessment of fuels-related emissions from fuel production, refining, transport, storage, and fueling, as well as vehicle emissions when driving;
- Investigation of discrepancies between current emission inventories and atmospheric measurements in urban areas of California for certain pollutants (e.g., whole gasoline VOCs, combustion nitrogen dioxide, particulate black carbon, mercury, manganese and other trace metals);
- Development of robust techniques for routine monitoring of ambient levels and trends of diesel PM;
- Improved understanding of the formation of secondary organic aerosols from gas to particle and from source to receptor, as well as improved simulation of the chemical-physical transformation and transport of primary carbonaceous PM and improved measurement methods for carbonaceous species in $\text{PM}_{2.5}$ (e.g., organic fraction of aerosols);
- Monitoring, modeling, or data analysis research to quantify the current impacts of global-scale transport of pollutants on air quality in California and trends in global "backgrounds" for major criteria and GHG emissions, with particular interest in identifying sources of PM transported into California as well as effects of long-range transport on developing State Implementation Plans (SIPs) for ozone attainment.

Recommended for Funding

Improved Characterization of Primary and Secondary Carbonaceous Particles

Both sources and composition of carbonaceous PM are poorly understood, in part due to the contribution of atmospheric processes and transport to formation of secondary organic aerosol (SOA). This study will use spectroscopic techniques to delineate the various contributions to carbonaceous aerosols, which account for 20-90 percent of $\text{PM}_{2.5}$ in urban and agricultural areas. Results will aid control strategies and help rectify discrepancies between emissions inventories and atmospheric measurements. (p. 34)

Proposed funding level: \$255,000

Characterization of Emissions and Atmospheric Chemistry from Motor Vehicles

This project seeks to support recently suggested amendments to the widely used conceptual approach for treatment of organic aerosols in photochemical modeling. The amendments include a new accounting for gas-particle partitioning of POA and explicit representation of gas-phase oxidation of low volatility species in the SOA mechanism. Improvements to the proposed concept will come from the proposed measurement of gasoline and diesel vehicle emissions; with specific quantification of SOA production; followed by an update of emission inventories and SOA mechanisms used by chemical transport models. (p. 36)

Proposed funding level: \$500,000

Determining Nitric Oxide Emissions from Soil in California Cropping Systems to Improve Ozone Modeling

Estimates of biogenic NO_x emissions and of NO_x from fertilizer applications have not yet been incorporated into the Emission Inventory Development and Reporting System

used for San Joaquin Valley, although NO_x plays a critical role in determining ozone concentrations that exceed state standards more than 120 days per year in the Valley. This research will determine baseline NO emissions from a range of cropping systems in California as well as characterize NO flux as a function of amount of nitrogen fertilizer and air temperature. (p. 38)

Proposed funding level: \$83,500

Validation of ARB's statewide Biogenic Emissions Inventory

The accuracy of the biogenic emissions inventory is essential for realistically representing how anthropogenic emissions reductions will influence future PM and ozone levels throughout California. However, despite increasing importance of biogenic sources in the statewide hydrocarbon budget, a statewide comprehensive validation of the biogenic emissions inventory for California has not yet been conducted. This work will expand the spatial and temporal domain of the database used to evaluate ARB's biogenic emissions inventory on scales relevant to regional modeling tasks. (p. 41)

Proposed funding level: \$400,000

AMAX-DOAS Column Observations from Research Aircraft Over California

The proposed research will use the recently developed Airborne Multi Axis DOAS (AMAX-DOAS) technique to measure various chemical species (i.e., NO_2 , HCHO, CHOCHO) as well as aerosol optical depth over a large and vertically resolved spatial area, at a resolution consistent with ARB's regional models. (p. 43)

Proposed funding level: \$550,000

Hourly In-situ Quantitation of Organic Aerosol Marker Compounds

Using a recently developed instrument that enables hourly, in situ measurements of organic marker compounds, this study will identify the relative contributions of diesel, spark ignition, biomass burning, and secondary aerosols to total $\text{PM}_{2.5}$ aerosol over California's San Joaquin Valley. This work will complement a parallel data set for Los Angeles and allow for comparative understanding of the $\text{PM}_{2.5}$ regulatory challenges in these two regions. (p. 45)

Proposed funding level: \$400,000

Source Apportionment as a Function of Altitude of Atmospheric Aerosols in California

Because aerosols exert both health and climate impacts, $\text{PM}_{2.5}$ control strategies can reduce the climate impacts of short-lived pollutants as well as protect public health. This study will help ARB design the most effective control strategies by clarifying California's primary sources of carbonaceous, sulfate-rich, and nitrate-rich aerosols, as well as spatial and temporal evolution of chemical and optical properties. (p. 47)

Proposed funding level: \$350,000

Recommended if Additional Funding Available

Improved Estimates of VOC Emissions from Latex Paints in the South Coast Air Basin

Architectural coatings are one of the largest sources of VOC emissions in California and the South Coast Air Basin. Latex paints make up a large fraction of total architectural coating applications, and are an important source of volatile organic compound (VOC)

emissions in the South Coast Air Basin. This study will fill important knowledge gaps by measuring VOC emissions from latex paint in the field, ascertaining emission dynamics under various field conditions, and assessing whether the common assumption of complete mass emissions from paint is valid across all painted substrates. (p. 49)

Proposed funding level: \$220,000

Concepts Recommended for Funding

TITLE: Improved Characterization of Primary and Secondary Carbonaceous Particles

PROBLEM: Carbonaceous compounds can constitute the largest fraction of particulate matter (PM) in many regions, but their composition is usually the least understood. Better understanding and characterization of carbonaceous aerosols through improved measurements are needed in order to identify their emission sources and their impacts on health and visibility. Because the organic fraction of carbonaceous aerosol has contributions from multiple sources, there is a need for improving the linkages between sources and this fraction of ambient PM concentrations. Since volatile organic carbon (VOC) emissions can produce organic PM by forming secondary organic aerosol (SOA), simultaneous measurements of VOCs and organic PM are needed to investigate the discrepancies between emission inventories and atmospheric measurements.

PREVIOUS WORK: Organic source apportionment of organic carbon (OC) and mass (OM) has been carried out using organic molecular markers to identify sources. An example is Minguillon et al. (2008), who used chemical mass balance (CMB) modeling to estimate 70-83% contributions to OC from vehicle traffic in Long Beach. At Riverside on the other end of the Los Angeles Basin, 45-90% of the OM was identified as SOA but was not attributed to specific sources. These recent findings illustrate the need to improve the chemical characterization of SOA in California so that its sources can be identified (as was done for Houston by Russell et al., 2009).

OBJECTIVE: The objective of this proposed study is to quantify the mass fraction of OM functional groups (including those formed as SOA) to emissions of combustion and other processes using trace metal and organic molecular signatures from VOCs. The organic aerosol sampling will be carried out as part of CARB-designated sampling locations, possibly in coordination with CalNex 2010 measurements in Los Angeles or the San Joaquin Valley.

DESCRIPTION: The proposed research to improve the characterization and quantification of organic particles will include measurements and factor analysis of OM by Aerosol Mass Spectroscopy (AMS) and Fourier Transform Infrared spectroscopy (FTIR) at designated ARB sites. Proposed Techniques: FTIR measurements (Russell et al., 2009; Gilardoni et al., 2007; Maria et al., 2003) collect ambient submicron particles on Teflon filters after an impactor, typically for sampling times of 4 to 12 hr. Filters are frozen, shipped back to our UCSD laboratory, and scanned with an infrared spectrometer in a humidity- and temperature-regulated clean room. Spectra (wavenumber range 4000-1500 cm^{-1}) are baselined with a recently automated algorithm (Russell et al., 2009). The absorption spectra are integrated for calibrated absorption peaks of major organic functional groups of organic molecules. Quantified functional groups include alkanes, alcohols, amines, carbonyls, carboxylic acid, and organosulfates (alkenes and aromatics are also quantified if present above 1-3% OM). Ratios of oxygen to carbon (O/C) and OM-to-OC can be calculated from FTIR analysis,

revealing trends in oxidation and phase partitioning. In addition, the organic functional group composition can be broken down by factor analysis and correlated to trace metal analysis (by X-ray fluorescence) to identify particle source contributions (Russell et al., 2009). One surprising result of those measurements in the Houston and Mexico City metropolitan areas is that a significant fraction of OM and of oxygenated organic compounds is strongly correlated to trace metals associated with power plants and other fossil fuel combustion rather than biogenic or non-specific secondary particle sources (Russell et al., 2009; Liu et al., 2009), indicating that the SOA may be rapidly formed after emission. Simultaneous AMS measurements will provide complementary information with rapid in-situ quantification of aerosol mass fragments (Gilardoni et al., 2007; Russell et al., 2009). After size-resolved particles are collected, focused and ionized, the device uses electrical forces to separate ions according to their mass to charge ratios (m/z). The high time resolution of the AMS produces detailed time series of organic compound fragments, which can be associated with plumes and other short events that are not resolved by FTIR filter sampling for organic functional groups. AMS measurements simultaneously quantify size and corresponding composition, providing more detailed information about particle lifetimes, health effects, and chemical reactions.

Potential Tasks: As part of a CARB-designated sampling site, investigators propose to (1) collect and analyze AMS, FTIR, and XRF measurements, (2) use factor analysis to attribute the measured mass of OC functional groups to sources based on trace metal signatures, (3) compare these results to gas-phase organic tracers and oxidants, and (4) collect and analyze an additional set of FTIR and XRF measurements at an additional CARB-designated site. AMS measurements will be continuous during the study; FTIR and XRF will be coordinated with local meteorology and collocated sampling to collect 4-12 hr samples. Analysis will include broad dissemination of results as part of ARB reporting requirements and peer-reviewed publications.

(Note: Cited references are available at <http://aerosol.ucsd.edu/publications.html>.)

BENEFITS: Identifying the contributions of different types of combustion sources to SOA and other types of OC, will enable ARB to delineate which sources could be regulated in order to improve air quality efficiently. The better characterization of OC (which constitutes 20-90% of PM_{2.5} in urban and agricultural areas) will also improve our ability to identify potentially harmful organic functional groups in particles that reduce air quality and harm health.

COST: \$255,000

TITLE: Characterization of Emissions and Atmospheric Chemistry from Motor Vehicles

PROBLEM: Many Californians live in nonattainment areas for fine particulate matter (PM). In all of these areas, organic material contributes a large fraction of the fine PM; however, the sources of these organics are not well understood. For example, chemical transport models systematically underpredict organic aerosol levels, especially during photochemically active periods. These problems hamper the development of effective State Implementation Plans (SIPs) for the State of California.

PREVIOUS WORK: Organic aerosols comprise primary organic aerosol (POA - particle mass directly emitted from sources such as motor vehicles) and secondary organic aerosol (SOA - particle mass formed in the atmosphere from oxidation of gas-phase precursors). Recent field measurements indicate SOA dominance, even in heavily urbanized areas; for example, the recent Study of Organic Aerosols at Riverside (SOAR-1) campaign estimated that around 75% of the organic PM in Riverside is SOA. However, state-of-the-art chemical transport models predict POA dominance.

Different researchers are using a variety of models to predict SOA formation including, empirical two-product (Odum), product specific, and volatility basis set (VBS) (Chen et al, Atmospheric Chemistry and Physics, 2009).

The VBS framework is a method that comprehensively treats all low volatility organics. The VBS lumps organics into a set of "volatility bins" that span a basis set of logarithmically spaced effective saturation concentrations. If this volatility distribution is known, one can calculate the organic aerosol mass from partitioning theory. A volatility operator is used to treat SOA production; this operator represents how the volatility distribution evolves with photochemical aging.

The VBS method is relatively new, and offers the ability to study relatively complex mixtures of aerosols and gases such as gasoline and diesel motor vehicle exhaust. Studies to date have generally involved relatively simple combustion sources such as small laboratory engines, but in-use vehicles have not been systematically tested.

OBJECTIVE: This research has three primary objectives:

1. Measure emissions of low volatility organics from in-use gasoline and diesel vehicles;
2. Quantify SOA production from in-use gasoline and diesel vehicle emissions; and
3. Update emission inventories and SOA mechanisms used by chemical transport models.

DESCRIPTION: The proposed research will develop techniques and knowledge required to measure and to simulate both gas-particle partitioning of primary emissions from motor vehicles and SOA production from these emissions. The focus is on low volatility organics, which we define as those less volatile than a C-12 n-alkane (vapor pressure of about 0.2 Torr). The gas-particle partitioning of this material changes as an emission plume dilutes; low-volatility vapors are important, but largely unrecognized, SOA precursors. Some of these emissions are currently in inventories and models,

albeit misclassified as non-volatile POA. However, there are unaccounted for or missing emissions, namely intermediate volatility compounds.

The research will characterize emissions from different classes of motor vehicle emissions (gasoline, diesel, smoker, low-emitter, etc). The vehicle testing will be performed at the ARB's Haagen-Smit and Heavy-Duty Vehicle Laboratories. The measurements will be made in collaboration with a research group to be determined.

Task 1. Source characterization. This task will measure mass emission factors and volatility distributions of low volatility organic emissions from different classes of gasoline and diesel powered vehicles. Specific objectives will be to quantify missing emissions and to appropriately classify POA emissions by volatility. The data will also be used to investigate how to efficiently update existing emission inventories and modeling. Dilution samplers and thermodenuders will be used to systematically investigate the gas-particle partitioning of the POA from near tail pipe to background conditions. Filter and sorbent based gas chromatography mass spectrometry will be used to characterize the low volatility vapor emissions. Instead of quantifying individual species, the chromatographic analysis will classify the total organic mass by elution time to provide an estimate of volatility.

Task 2. SOA production from mobile source emissions. The goal of this task will be to measure the SOA production from photo-oxidation of mobile source emissions. Briefly, combustion products (gases and particles) will be drawn into a smog chamber for aging. Photochemistry will be initiated using either sunlight or artificial UV lights. SOA production will be quantified and attributed to both traditional (e.g. light aromatics) and non-traditional (e.g. low volatility organics) precursors. Key research questions are quantifying relative contributions of different classes of vehicles (e.g. gasoline versus diesel or smoker versus non-smoker) to POA versus SOA and developing the next generation of SOA chemistry mechanisms. To aid the development of the SOA mechanism, aging experiments will also be conducted using smog chambers to quantify SOA production from photo-oxidation of emission surrogates such as mixtures of lubricating oil with either diesel fuel or gasoline.

BENEFITS: This project will provide important new knowledge and data to support emissions inventory development, air quality modeling, SIP development, and exposure and health effect assessments.

COST: \$500,000

COFUNDING/COLLABORATION OPPORTUNITIES: Potential collaborators and co-funders include the Coordinating Research Council (CRC).

TITLE: Determining Nitric Oxide Emissions from Soil in California Cropping Systems to Improve Ozone Modeling

PROBLEM: Oxides of nitrogen (NO_x , which comprises nitric oxide [NO] and nitrogen dioxide [NO_2]) and volatile organic compounds (VOCs) are the two important precursors of ozone (O_3), a pollutant with negative implications on human health and crop productivity that routinely exceeds the State's standards. For example, the San Joaquin Valley exceeds State ozone standards on more than 120 days per year (California Emission Inventory Development and Reporting System, CEIDARS, 2004-2007). Either NO_x or VOCs can limit O_3 formation, and the influence of these precursors on O_3 production varies temporally and spatially across the landscape, depending on the ratio of NO_x to VOCs and the relative concentration (i.e. mixing ratio) of each precursor (Blanchard and Fairley, 2001). Therefore, quantifying all major NO_x sources is essential to predict the dynamics of O_3 levels and devise cost-effective control strategies. Agricultural soils are known to be sources of NO , which is rapidly oxidized to NO_2 , but there are few definitive studies on NO emissions from soils especially in California, and this dearth of information restricts CARB's ability to develop accurate O_3 modeling. Estimates of biogenic (non-anthropogenic) NO_x emissions and of NO_x from fertilizer applications are conspicuously absent in CEIDARS.

PREVIOUS WORK: Of the world's annual 190 million tons of NO_x emissions, 80 million ton are biogenic, and 39% of the latter originate from microbial production in soils (Olivier et al., 1998). The range of NO flux from cultivated land reported in the literature is 0.1 to 23 kg $\text{NO-N ha}^{-1} \text{ yr}^{-1}$, and on average, NO loss was higher in the tropics than in temperate zones (Davidson and Kinglerlee, 1997). Assuming an average emission rate of 3.6 kg $\text{NO-N ha}^{-1} \text{ yr}^{-1}$ from agricultural land based on a meta-analysis of the scientific literature (Davidson and Kinglerlee, 1997), emissions of NO from all the land devoted to agriculture in California would amount to about 360 tons $\text{NO}_x \text{ d}^{-1}$, a quantity roughly equivalent to all stationary sources of NO_x in the State (CEIDARS 2006). Almost no data of NO flux in California's cropping systems exist. Mean NO fluxes during 50 days following N fertilizer (anhydrous ammonia) application in a tomato cropping system in western Sacramento county were 0.54 kg $\text{NO-N ha}^{-1} \text{ d}^{-1}$ (Venterea and Rolston, 2000a), comparable to NO emissions measured in intensively fertilized wheat fields in Mexico (Matson et al., 1998).

OBJECTIVE: The objectives of the proposed research are to determine baseline NO emissions in a range of cropping systems and to characterize NO flux in response to various amounts of N fertilizer and under several air temperature conditions.

DESCRIPTION: The NO flux will be measured in five cropping systems (tomato, alfalfa, corn, wheat and almond) in the Sacramento and San Joaquin Valley primarily in the summer when O_3 production is particularly problematic. The NO emissions will be measured in one season during several periods relating to fertilization and changing soil moisture status in each of the systems.

In soils, NO is produced by the microbial processes of nitrification and denitrification and via abiotic reactions (Firestone and Davidson, 1989). Soil nitrogen availability is positively correlated with NO emissions. Nitric oxide emissions are particularly

correlated with nitrite (NO_2^-) concentrations in soil, especially when the soil pH is <5 (Davidson, 1991; Venterea and Rolston, 2000b), which can occur even in well buffered soils over the short term as a result of nitrification, for example after application of NH_3 -based fertilizers (Frederick and Broadbent, 1965). To assess the effects of N fertilizer rates on NO_x flux, microplots will be set up in some of the systems in a randomized complete block design (at least 3 blocks, each with 5 microplots) and N fertilizer will be applied to microplots at several rates ranging from zero to a value that exceeds the highest rate reported for a particular crop. For example, tomato plots will be fertilized at 0, 75, 150, 225, and 300 kg N ha⁻¹. Crop residue incorporation is another management event that will be followed with NO flux measurements. We will also conduct diurnal measurements of NO flux at each site as soil temperature is positively correlated with NO emissions (Matson et al., 1996) and because ambient air temperature is an important factor in O_3 modeling (Stohl et al., 1996).

The NO flux will be measured in the field by using dynamic chamber methods. Thin-wall stainless steel chambers (approx. 50 x 30 x 10cm), equipped with inlet and outlet ports that will be connected to a Thermo Scientific Trace Level NO- NO_2 - NO_x analyzer (Model 42C, Thermo Fisher Scientific Inc.), will be attached onto pre-installed bases during the measurement periods. A pump in the NO- NO_2 - NO_x analyzer will continuously circulate chamber air that is scrubbed of NO_x before it reenters the chamber. The NO is converted to NO_2 as the analyzer detects NO_2 . Ozone models use total NO_x as NO inputs (James Sweet, San Joaquin Valley Air Pollution Control District, personal communication), so the data that will be generated do not have to be converted to other N oxide species. Soil variables that will be analyzed regularly will be inorganic N, soil moisture, and pH in the top 15 cm of soil.

The deliverables of the project will be estimates of NO_x emissions from soil, including diurnal and daily variations of these emissions, in typical Central Valley cropping systems.

BENEFITS: This research will benefit state agencies ARB and the San Joaquin Valley Air Pollution Control District by providing baseline NO_x emissions estimates in typical Central Valley cropping systems. The NO_x emission data generated will improve the capability to predict O_3 production, which will allow the above agencies to better understand and regulate O_3 precursor sources.

COST: \$ 83,500

COFUNDING/COLLABORATION OPPORTUNITIES: Most of the proposed research will be incorporated into existing studies that monitor nitrous oxide (N_2O) emissions and a complementary N_2O monitoring project, for which funding is currently requested to leverage the effort. Briefly, site selection will occur after on-site characterization of soil parameters; the management at the selected sites will reflect the "typical" practices for a given crop; some of the costs will be offset because we can take advantage of the already set up fertilizer trial plots of the N_2O projects, some of the travel to the monitoring sites and other logistics.

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TITLE: Validation of ARB's Statewide Biogenic Emissions Inventory

PROBLEM: State Implementation Plans require air quality modeling to be conducted as a means of demonstrating the effectiveness of control strategies to reach the ambient concentration levels prescribed by National Air Quality Standards. Estimates of anthropogenic and biogenic emissions are key inputs to air quality modeling and biogenic emissions play a key role in the production of both PM and ozone. It is estimated that the statewide tonnage of biogenic hydrocarbon emissions will surpass anthropogenic hydrocarbons by 2010 (ARB Almanac, 2008). The relative abundance of hydrocarbons emitted from biogenic sources over anthropogenic sources is expected to grow beyond 2010 as anthropogenic emissions are reduced and biogenic emissions grow in response to climate change. Despite the increasing importance of biogenic sources in the statewide hydrocarbon budget, a statewide comprehensive validation of the biogenic emissions inventory for California has not yet been conducted.

The accuracy of the biogenic inventory is essential for realistically representing how anthropogenic emissions reductions will influence future PM and ozone levels throughout California. Ideally, validating the biogenic emissions inventory would involve validation of the spatial distribution, as well as both short term (diurnal) and long term (seasonal) variability.

PREVIOUS WORK: Previous work supported by ARB, the SJVAPSA and the South Coast AQMD resulted in the essential databases and tools used in ARB's biogenic emissions model (BEIGIS). Previous ARB funded research conducted by UC-Bakersfield researchers used a ground-truth approach to validate the Leaf Mass, Leaf Area Index, and GAP land cover databases at six geographically diverse sites throughout Central California, while researchers from UC-Berkeley measured emission fluxes of biogenic hydrocarbons above a forest canopy at the Blodgett Forest Site. Using controlled laboratory experiments and tower-based flux measurements in the field, ARB funded researchers from UC-Berkeley are measuring emissions of a suite of biogenic hydrocarbons from major California crops (to be completed November 2009, but may be extended). Although previous and ongoing research related to biogenic hydrocarbon emissions in California have been useful in validating the databases used in BEIGIS and in expanding our understanding of emissions from specific plant species, the research is too specific in regards to location and corresponding ecosystem to be sufficient for validating the magnitude and spatial variability of ARB's statewide biogenic emissions inventory on scales relevant to regional air quality modeling.

OBJECTIVE: The objective of this proposal is to expand the spatial and temporal representation of the existing validation database that is used to evaluate ARB's biogenic emissions inventory on scales relevant to regional modeling applications. To date, the sole means of validating the inventory has been through comparison with emission flux measurements collected at a single site in the Blodgett Forest (Goldstein et al. 2001; ARB Award No. 98-328).

DESCRIPTION: Developing a more comprehensive database for evaluating California's biogenic emissions inventory requires emission flux measurements of biogenic hydrocarbons within a number of California's ecosystems. These

measurements could be accomplished in one of two ways. The first option involves deploying Relaxed Eddy Accumulation (REA) systems at roughly 10 existing flux towers for one year. There are currently 10 AmeriFlux towers operating in shrub lands and oak and conifer forests throughout California, which could be used for the REA measurements. It may also be necessary to set up additional low cost towers in select areas/ecosystems not currently accounted for in the AmeriFlux network. This option would result in a better understanding of the magnitude and seasonal variation of biogenic hydrocarbon emissions for representative ecosystems.

A second approach would be to conduct a one month airborne flux campaign, using PTRMS eddy covariance methods, covering key grasslands, croplands, shrublands, and forests throughout California. The airborne measurements would give a good characterization of a wide range of biogenic hydrocarbon emissions for many representative locations and many of the major California ecosystems and croplands on scales appropriate for regional air quality modeling (10-15 km). Alternatively, a combination of airborne flux and REA measurements, at two or three sites, could also be used.

BENEFITS: Successful completion of this project would allow staff to better validate the biogenic emissions inventory used in ARB's modeling studies and point to areas which need improvement. Since results from modeling studies are routinely used in policy decisions, an improved biogenic inventory will lead to better supporting science and ultimately more confidence in those decisions.

COST: \$400,000

TITLE: AMAX-DOAS Column Observations from Research Aircraft Over California

PROBLEM: Past field campaigns in California provided little information about pollutant concentrations outside the boundary layer, and the vertical column integral over the boundary layer height. Further, while satellites, like SCIAMACHY or OMI, are now capable of providing column data useful for testing emission inventories of NO_x and to constrain the rate of hydrocarbon oxidation in photochemical hotspots of ozone and secondary organic aerosol (SOA) formation, satellites have significant limitations and such data must be carefully evaluated prior to using it in combination with atmospheric models for the management of air resources. For example, the sensitivity of the measurement varies over the height of the column, and depends significantly on ambient conditions, i.e., surface albedo, aerosol loading and optical properties.

PREVIOUS WORK: Airborne Multi Axis DOAS (AMAX-DOAS), a recent development of the well established MAX-DOAS technique, has successfully been used to validate solar straylight satellite retrievals of nitrogen dioxide NO_2 , but never over California, where atmospheric models disagree as to the NO_2 abundance measured over urban areas. Recent work by the PI demonstrated that SCIAMACHY significantly underestimates the NO_2 column observed by ground based MAX-DOAS in Mexico City, in part due to organic aerosols that absorb light much stronger than previously believed; similar effects likely also play a role over California urban areas. Glyoxal (CHOCHO) presents a novel indicator molecule to constrain the rate of hydrocarbon oxidation; it is also a relevant building block for SOA formation. The PI accomplished the first direct measurements of CHOCHO in the atmosphere and predicted the capability to measure it from space (regularly observed over Los Angeles from satellite); more recently he built a prototype AMAX-DOAS instrument and demonstrated first CHOCHO measurements (along with NO_2 and oxygen dimers, O_4 , an aerosol indicator) from aboard NOAA's Twin Otter research aircraft (summer 2008). The PI has published numerous papers on urban Air Pollution, and conducted field work that integrates satellites with models in Mexico, China, Chile, and the Pacific Ocean. The CU AMAX-DOAS is a unique instrument in the US; capabilities to measure O_4 (aerosol optical depth) at 360, 477, 570 and 630nm, formaldehyde (HCHO) were recently added, and are unique in the world; further flights are planned in 2009.

OBJECTIVE: Deploy the CU AMAX-DOAS instrument on a research aircraft in California to measure pollutant concentrations outside the boundary layer, probe directly the horizontal and vertical distribution of NO_2 , HCHO , CHOCHO and O_4 (aerosol optical depth) boundary layer columns, and use these measurements to test atmospheric models, validate satellites, and make improved models and validated satellite data available for the management of air resources.

DESCRIPTION: The CU AMAX-DOAS measures the same observables as SCIAMACHY and OMI with better spatial resolution and precision, and in addition places constraints on radiative transfer calculations that are not available to satellites. Specific tasks include (i) integration into the aircraft and science flights over point sources, urban areas, and photochemical hotspots, (ii) data analysis to extract vertical column densities (VCDs) of NO_2 , HCHO , CHOCHO , surface albedo, and aerosol optical depth (AOD) by coupling with a radiative transfer model, (iii) assess vertical gradients

and concentrations outside the boundary layer, (iv) investigate synergies with SCIAMACHY to study NO_2 over point sources and urban areas (and OMI, where possible), (v) compare with UCD-CIT model predictions, (vi) assess the temporal and spatial variability in the rate of hydrocarbon oxidation over photochemical hotspots of ozone and SOA formation, and (vii) assess the potential and study limitations of the synergistic use of AMAX-DOAS, SCIAMACHY, and the UCD-CIT model to learn about the sources for ozone, and SOA. AMAX-DOAS, as these satellites, provide a column averaged measurement of trace gases. However, AMAX-DOAS is maximally sensitive to tropospheric absorbers, and has a greatly enhanced sensitivity at/near the instrument altitude. Vertical profiles can be obtained with few 100m vertical resolution by varying flight altitude. The horizontal resolution of AMAX-DOAS exceeds that of satellites and models (AMAX-DOAS: few 100m-1km; UCD-CIT model: 4x4km grid cell size; OMI: 14x14km, SCIAMACHY: 40x80km ground pixel size), which enables to visualize and track plumes, and to average data to closely resemble the resolution of models and satellites. The CU AMAX-DOAS measures four O4 bands and the ring effect at different wavelengths (300-620nm) simultaneously; independent sensors measure surface albedo. This enables to test assumptions in radiative transfer calculations that underlie satellite retrievals. AMAX column data enable novel means to test and improve the UCD-CIT model.

BENEFITS: AMAX-DOAS provides data about pollutant concentrations outside the boundary layer, and measures vertical column integrals of pollutant concentrations inside the boundary layer. These data place constraints on model emission inputs, enable to test and improve model predictions of pollution transport and photochemical transformations, and provide direct means to validate satellites. Good Air Quality is relevant for public health, and improving Air Quality models makes more reliable tools available for the management of air resources.

COST: \$550,000.

TITLE: Hourly In-situ Quantitation of Organic Aerosol Marker Compounds During CalNex 2010

PROBLEM: Regulatory efforts to conform to PM_{2.5} standards require improvements in our knowledge of the factors controlling the concentration, size and chemical composition of PM_{2.5}. While many advances have been made in measuring and modeling the inorganic ionic species that are found in PM_{2.5}, much less is known about the organic fraction. Yet organic matter is a major constituent of airborne particles, comprising 20-50% of the PM_{2.5} mass in many regions. Quantitative, time-resolved knowledge of the composition of PM_{2.5} organic matter is key to tracing its sources, to understanding its formation and transformation processes, and to evaluating its role in global climate change.

PREVIOUS WORK: Our group has developed an instrument to provide hourly, in-situ measurements of organic marker compounds. Called a Thermal Desorption Aerosol Gas Chromatograph (TAG), our instrument uses an impactor collector, followed by thermal desorption onto a GC column, with subsequent GC/MS analysis to provide measurement of airborne particulate organics at the molecular level. The measurement system is automated, yielding around the clock speciation with hourly time resolution. While the identified compounds comprise only a fraction of the total organic mass, those that are quantified serve as valuable tracers for sources, and have been used to determine the relative contribution of various source types to primary ambient organic matter. This instrument has been used in several field campaigns, including a remote site in Nova Scotia, and at an urban location. Under previous ARB sponsorship it was deployed in two separate field campaigns in Riverside, California. As with traditional filter-based methods for organic compound, TAG provides identification of organic matter at the molecular level. However, the hourly time resolution afforded by our measurement provides a robust data set for receptor analysis, and valuable insight and guidance in our understanding of processes affecting airborne particulate organic matter.

OBJECTIVE: The objective is to identify the origins of organic matter in PM_{2.5} aerosol in California in support of the proposed 2010 field study to be conducted in the San Joaquin Valley of California. As in our prior work, we expect to identify and allocate the sources of primary constituents, and to improve our understanding of the formation pathways important to secondary components. Utilizing hourly, in-situ measurements of organic marker compounds provided by our Thermal Desorption Aerosol Gas Chromatograph, we will identify the relative contributions of diesel, spark-ignition, biomass burning and secondary aerosols to the total PM_{2.5} organic aerosol. We propose to use this instrument in conjunction with an organized field study to identify the origins of PM_{2.5} organic matter within a region in California that is currently out of compliance with PM_{2.5} air quality standards, and to investigate the implications of these aerosols related to aerosol radiative forcing. Similar measurements are planned for the Los Angeles CalNex 2010 ground site, so this proposal would provide equivalent measurements at the San Joaquin Valley site and allow for comparative understanding of the PM_{2.5} regulatory challenges in these two regions.

DESCRIPTION: In coordination with the proposed CalNex 2010 study, we will conduct measurements to determine PM2.5 organic composition at hourly intervals, building a database that be used for source receptor modeling. Measurements will be conducted at the San Joaquin Valley ground site, in a location determined in consultation with ARB. We expect to identify over 100 organic compounds at hourly intervals over the study period. These data will provide a rich and comprehensive basis for identification of primary sources through factor analysis. Through coordinated measurements of VOCs with similar time resolution, we expect to identify links between some of the secondary aerosol constituents and their likely primary precursors. These analyses will provide source attribution for primary organic compounds, and will elucidate transformation mechanisms for certain secondary species.

BENEFITS: This work addresses the critical need for on-line, time-resolved, quantitative measurement of atmospheric PM2.5 organics at the molecular level. Marker compounds unique to specific source types provide a means of determining the relative contribution of primary sources. Data at the compound level are also needed for understanding the chemical formation and transformation mechanisms leading to secondary organic aerosol formation. This research will provide useful new data of immediate value for air quality attainment strategies in California and the development of the State Implementation Plan, and for understanding the pathways leading to secondary organic aerosols that may be of importance in climate change.

COST: \$250,000

COFUNDING/COLLABORATION OPPORTUNITIES: This project builds on our currently funded research through the DOE SBIR program for the refinement of our instrument package, thus making the ARB sponsored project possible at a highly subsidized cost. This project would be part of the planned CalNex 2010 study in collaboration with NOAA and other participating entities.

TITLE: Source Apportionment as a Function of Altitude of Atmospheric Aerosols in California

PROBLEM: Air pollution represents a growing environmental concern within California. As our climate warms, air pollution levels are increasing even higher. Aerosols represent a major component of air pollution and contribute to negative health and climate impacts. Our understanding of the sources and chemistry of aerosols is relatively poor. Given that aerosols have relatively short lifetimes with both warming and cooling effects on climate, it has been proposed by some scientists that certain control strategies involving aerosols could provide more rapid relief for California climate. However, in parallel to controlling greenhouse gases such as CO₂, we must establish a stronger understanding of short-lived aerosol sources, chemistry, and other properties such as cloud formation potential before enacting any major control strategies.

PREVIOUS WORK: Our group has performed extensive ground based studies focusing on determining the major sources of aerosols in California using a unique single particle mass spectrometer, aerosol time-of-flight mass spectrometry (ATOFMS), developed in our lab. Over the past decade, we have developed an extensive source library that can now be used to perform real-time source apportionment of aerosols in California. We have performed studies in Los Angeles, Riverside, Long Beach, Fullerton, Pasadena, Mt. Wilson, and San Diego. The major sources that have been characterized and apportioned in California include ships, diesel trucks, gasoline powered cars, biomass burning (i.e. wood smoke), and dust transported from Asia and other regions. Most recently, we constructed a smaller aircraft version of the instrument, an A-ATOFMS (Pratt, 2008). This instrument opens new doors for studying the spatial variability of the sources and chemistry of aerosols over the state of California.

OBJECTIVE: The major goal of the proposed research project involves using our A-ATOFMS to characterize atmospheric aerosols on the Twin Otter aircraft in collaboration with Prof. John Seinfeld (Caltech). The proposed study will address a number of questions including (1) What are the major sources of carbonaceous (OC and soot) aerosols in California? (2) How do the chemistry and optical properties of California aerosols evolve spatially and temporally? (3) How does aerosol mixing state influence hygroscopicity, CCN activity, and optical properties? (4) What are the major sources and levels of black carbon or soot in California aerosols? (5) How does the chemistry and associated optical properties of soot and other carbonaceous aerosols change with age and altitude? (6) What are the major sources contributing to high levels of sulfate and nitrate in atmospheric aerosols?

DESCRIPTION: This proposed project will involve performing flights on the CIRPAS Twin Otter aircraft with Prof. John Seinfeld from Caltech. We will fly our newly developed single particle mass spectrometer (Pratt, 2008) along with other aerosol and gas phase measurements on board the aircraft over an 8 week period. This project will focus on making on-line single particle size, chemistry, and optical property measurements. We will study the evolution of the size and chemistry of aerosols as they travel from source regions to more inland urban sites. In addition to our single particle measurements, Prof. Seinfeld will have other complementary measurements on board including an aerosol mass spectrometer (AMS) and a PILS for measuring water-soluble

organic species. A major goal of the airborne measurements will be to acquire complementary data that can be used to obtain more accurate estimates of the impact of soot on climate in California. In addition to the ATOFMS single particle soot mixing state measurements, the Twin Otter payload will include a wide range of soot measurements including a Single-Particle Soot Photometer (SP2), three-wavelength Photoacoustic Aerosol Spectrometer (PASS-3), and a three-wavelength Particle Soot Absorption Photometer (PSAP). Aerosol properties measured during these flights will be used as inputs for a General Circulation Model (GCM) to assess the radiative forcing of aerosols over California.

BENEFITS: Knowledge of aerosol sources and how they vary as a function of altitude and time is critical to understanding the overall impact of aerosols on climate. A key facet of the proposed study involves developing a better understanding of how the chemistry and sources of soot and other aerosols vary with altitude. The overall climate-relevant properties of aerosols depend on their mixing state which can only be determined with single particle measurements such as the A-ATOFMS. The proposed combination of measurements will allow us to reduce the uncertainties associated with the role of aerosols on climate. Also, we will focus on better understanding the key sources contributing to the aerosols at different altitudes, addressing the important question of how much aerosol is globally transported into California from other regions of the world (Asia, Mexico) and other states.

Aerosols represent short-lived climate change pollutants and it is clear that they are affecting climate in California in a major yet poorly understood way. Aerosol-cloud interactions are hypothesized to affect regional weather patterns and lead to drought which ultimately means they could be impacting California's water supply. Developing a better understanding of the properties of aerosols and how they vary spatially, over time, and from different sources will allow one to eliminate the aerosols leading to the most deleterious climate and health effects.

COST: \$350,000

COFUNDING/COLLABORATION OPPORTUNITIES: The cost of the aircraft will be covered by other sources. Since these flights will be conducted as part of CalNex, many opportunities will exist for collaborations with other researchers and sampling platforms (ship, ground, other aircraft) doing aerosol and gas phase measurements as part of Calnex in 2010.

Concepts Recommended if Funding Available

TITLE: Improved Estimates of VOC Emissions from Latex Paints in the South Coast Air Basin

PROBLEM: Architectural coatings are one of the largest sources of VOC emissions in California and the South Coast Air Basin.¹ Latex paints make up a large fraction of total architectural coating applications, and are an important source of volatile organic compound (VOC) emissions in the South Coast Air Basin. As such, this source may contribute significantly to the formation of ozone and secondary particulate matter in the basin. However, there have been no studies to actually measure VOC emissions from latex paint in the field, to ascertain emission dynamics under various field conditions, or to assess whether the common assumption of complete mass emissions from paint is valid across all painted substrates.

PREVIOUS WORK: The major VOCs found in latex paint are 2,2,4-trimethyl-1,3-pentanediol monoisobutyrate (TMPD-MIB or Texanol®) and ethylene glycol (EG). Laboratory studies at the University of Texas at Austin (UT) have shed light on the effects of different substrates on TMPD-MIB emission profiles, and also suggest that TMPD-MIB in painted gypsum board may be sequestered for months to years.² Ongoing studies at UT for which samples of well-characterized painted substrates, e.g., gypsum board removed from the USEPA test house in North Carolina, indicate that as much as 20 to 40% of TMPD-MIB mass remains sequestered in gypsum board after 15 to 20 years. Thus, an assumption of complete mass emissions of TMPD-MIB may be highly conservative over the useful lifetime of some substrates, e.g., if a substrate is removed to a landfill where the VOC in question may be effectively biodegraded.

OBJECTIVES: The objectives of this study will be to measure emissions of TMPD-MIB and EG from painted surfaces of actual buildings in the South Coast Air Basin, and to couple these findings with analysis of residual TMPD-MIB and EG in well characterized painted substrates removed from the basin. Emissions will be characterized per unit area of substrate for a wide range of previous paint applications and age, building materials, and environmental conditions, and will be useful for improved emission inventories. Emissions and chemical residuals will be used to estimate continued emissions from, and lifetime on/in, various substrates.

DESCRIPTION: The proposed study would include three major tasks. Task 1 would involve actual field measurements of TMPD-MIB and EG emissions from painted surfaces in the South Coast Air Basin. Task 2 would involve collection of previously painted substrates in the South Coast Air Basin for analysis of residual TMPD-MIB and EG from those substrates. Task 3 would involve an analysis of field and laboratory data to determine improved estimates of TMPD-MIB and EG emissions from, and lifetimes on, various painted substrates.

For Task 1, a Field and Laboratory Emission Cell (FLEC) would be used to collect samples from building surfaces in the field (South Coast Air Basin). Mass emissions would be determined for both the interior (e.g., painted gypsum board) and exterior (e.g., stucco) surfaces of buildings for which key information is available, such

as dates of last painting(s), types of paint and primer used (which would allow estimates of TMPD-MIB and EG content), etc. This would be possible by working with government agencies, e.g., SCAQMD, and local universities, as they should have records of painting dates and paint purchase requisitions for buildings in their facilities. The study design will account for different types and ages of paint, painted substrates, and environmental conditions. During each field event, ambient air and surface temperatures, barometric pressure and relative humidity will be measured and recorded. Samples would be collected on Tenax-TA and analyzed via thermal desorption and gas chromatography with mass spectroscopy (TD/GC/MS). The study design would include multiple field monitoring events over a two-year period with an estimate of over 100 field measurements and replicate analyses for the same materials.

For Task 2, the organizations described in Task 1 will be asked to provide small specimens ("legacy" samples) of the painted surfaces analyzed for Task 1. These would be analyzed by chemical extraction and GC/MS, allowing for estimation of the approximate amount of TMPD-MIB and EG that still remain on the painted materials over specified time periods. More than 20 legacy samples would be collected for this task.

Task 3 will involve analyses of data collected during Tasks 1 and 2. The nature and scope of this study would allow for new insights regarding the effects of various parameters on VOC emissions from latex paint, and potential for improvements in the existing emissions inventory. In addition, the findings of this study combined with previous and on-going research findings at UT would allow for a lifecycle analysis of TMPD-MIB and EG in latex paint.

BENEFITS: This effort would be the first of its kind to actually measure TMPD-MIB and EG emissions from painted materials in the field. The study would provide valuable information related to the extent of such emissions throughout the South Coast Air Basin. Corresponding improvements to the emissions inventory will allow for enhanced planning and policymaking related to air quality in the South Coast Air Basin.

COST: \$220,000

REFERENCES:

1. Berry, N., <http://www.epa.gov/region09/air/cecat-forum/stationary/Naveen-Berry.pdf>
2. Lin, C.-C., and Corsi, R.L., *Atmospheric Environment*, 41(15): 3225-3234 (2007).

Climate Change

Policy Drivers:

- California Climate Change Solutions Act of 2006 (AB 32)
- AB 32 Scoping Plan
- Executive Order S-3-05 establishing greenhouse gas emissions reductions targets
- SB 375

Based on the policy drivers above and ARB's other responsibilities, the major themes for the FY 2009-2010 climate change research portfolio are emissions and mitigation; long-range planning; behavioral change; the climate/air quality nexus; and public health co-benefits of climate change policy.

Ongoing Efforts: State-sponsored and -mandated research complements national and international efforts and has provided a scientific framework for informed climate change policy in California. At the national level, two interagency working groups coordinate climate change research: the Climate Change Science Program (CCSP) and the Climate Change Technology Program (CCTP). The Climate Change Science Program integrates research on climate and global change sponsored by 13 federal agencies. The program coordinates the scientific research of the participating agencies through a set of linked interdisciplinary research elements and cross-cutting activities that encompass a wide range of interconnected issues of climate and global change. Research elements and cross-cutting activities include atmospheric composition, climate variability and change, the global carbon and water cycles, ecosystems, land use and land cover change, decision-support resources, human contributions and response, monitoring of climate systems, international research cooperation, and communication.

The Climate Change Technology Program (CCTP) is a multi-agency research and development program. This program seeks to accelerate the development and deployment of technologies from the portfolios of more than a dozen participating agencies. Reduction, avoidance, and capture of GHG emissions are key priorities. Together, the CCSP and the CCTP represent the primary effort under the President's Climate Change Research Initiative for the United States.

California benefits from federal research funds for climate-related research. In addition to the participating agencies in CCSP and CCTP, there are approximately 40 national research laboratories based in California and programs such as the Integrated Earth Observation System and other networks, West CARB (administered by CEC), CALFED, a regional integrated sciences and assessment (RISA) center at Scripps Institution for Oceanography (UCSD), and other projects supported by NOAA, the U.S. Department of Interior, the U.S. Geological Survey, the National Park Service, the Fish and Wildlife Service, and the U.S. Department of Agriculture (USDA).

California's climate action programs are a collection of nearly 20 separate elements or functions that establish a comprehensive strategy for reducing GHG emissions. These elements include specific regulatory actions, programmatic functions of departments or boards, and statewide promotion of energy efficiency and conservation. The function of

coordination of state efforts on climate change for meeting the AB 32 GHG reduction targets resides with the Climate Action Team (CAT). As detailed in the 2008 CAT Report, many State agencies as well as private and public universities in California conduct, support, or direct research related to climate change, and there is increased coordination among agencies in this research. For example, the California Department of Food and Agriculture (CDFA), CEC, and ARB have joined forces to study N₂O emissions, primarily from agricultural activity in the State.

Research/Knowledge Gaps: To support the Board's decision-making and implementation of climate change policies, several key knowledge gaps must be addressed.

- Development of coherent strategies and tools for economic analysis to support sound and effective investments to reach near- and long-term State climate goals;
- Refinement and verification of emissions inventories and emissions reductions, with particular emphasis on large area sources, CH₄ emissions, and N₂O emissions;
- Further investigation of the climate impact of non-CO₂ GHG emissions not included in the international Kyoto Protocol (e.g., black carbon emissions);
- Investigation of the roles of human behaviors and decision-making in climate change emissions to support implementation, outreach, and social marketing;
- Identification of additional cost-effective climate change mitigation strategies (technology or non-technology based), with particular emphasis on sources of non-CO₂ GHGs;
- Development of methods for lifecycle analysis of proposed mitigation strategies;
- Development and application of GHG emission forecasting methods to project California climate change emission inventories into the future;
- Identification and characterization of emission reduction potential from strategies that provide consumers with information regarding the GHG footprint of personal choices;
- Development of protocols for quantifying and verifying emissions reduction associated with changing behavior (e.g., eco-driving, product labeling, carbon offsetting, etc.);
- Characterization of California-specific impacts of short-lived climate change pollutants (e.g., methane, black carbon, ozone precursors) and sensitivity of projections to such parameters as time horizon and emission levels to facilitate short-lived species' prioritization for mitigation via regulations, market-based approaches, or a combination of strategies;
- Costs and benefits of adaptation strategies suitable for application in California including heat emergency action plans or other responses;
- Characterization of economic and public health impacts of climate change on California.

Recommended for Funding

Determination of the Spatial Distribution of Greenhouse Gas and Ozone Precursor Concentrations and Emissions in the LA Basin

The proposed research would utilize novel instrumentation to measure spatial/temporal variations of greenhouse gas and air pollutant emissions in the South Coast Air Basin. The high time resolution (~1 hour) and large spatial coverage (with < 1 km resolution in

vertical and horizontal scales) proposed in this study would provide unique information on emission sources that is currently not available through other means. (p. 58)

Proposed funding level: \$300,000

Pilot Study of Inverse Modelling to Verify California's Greenhouse Gas Emissions Inventory

To accurately quantify current emissions and verify future emission reductions—as mandated by AB 32—uncertainties in California's inventory estimates of CH₄ and other non-CO₂ GHG need to be reduced. ARB is now investing in instrumentation to measure CH₄ and other GHGs and needs to evaluate the measured data to effectively verify the CH₄ emission inventory. This project will use inverse modeling tools to evaluate and improve CH₄ emission inventory in California based on data that will be collected from ARB's CH₄ measurement network. Results will improve CH₄ emission inventory and verify future CH₄ emission reductions in California. (p. 60)

Proposed funding level: \$275,000

Assessment of Baseline Nitrous Oxide Emissions in California's Dairy Systems

The study addresses N₂O emissions inventory and supports an AB 32 Early Action. The project objective is to measure N₂O emissions from forage croplands that receive liquid manure from dairy operations. The uncertainty regarding N₂O emissions from manure-amended fields has long been recognized and requires field investigation in California. The proposed research would leverage a number of ongoing efforts and would benefit from shared protocols and sampling/analysis equipment. (p. 62)

Proposed funding level: \$82,000

Are There Any Counteracting Effects that Reduce the Global Warming Benefits Attributed to Diesel and Other Black Carbon Controls?

Black carbon, which is a major component of coal, diesel and other combustion-generated PM, may be the most important pollutant contributing to global warming after CO₂ and methane. Its short atmospheric lifetime (1-2 weeks) differentiates it from CO₂ and other globally well-mixed gases, which have lifetimes of decades to centuries. This property makes it attractive as a means to immediately reduce global warming impacts through directed controls of black carbon sources. Uncertainties regarding black carbon's indirect climate impacts associated with modification of cloud properties and abundance need to be clarified to support sound strategies for mitigating climate change through black carbon emissions controls. (p. 64)

Proposed funding level: \$60,000

Quantifying the Effect of Local Government Actions on Vehicle Miles Travelled (VMT)

SB 375 requires California's regions to prepare Sustainable Community Strategies as part of their transportation planning, identifying a set of actions at the regional level that would bring transportation greenhouse gas emissions down to target levels. Given limited resources, it is critical to choose wisely which policies are implemented by local and regional governments to reduce VMT in their jurisdictions. Available policy tools include road and parking pricing, mixed use zoning, investments in alternative modes, and household travel planning programs. To help local/regional governments prioritize

actions, this research will estimate the likely impact of local government actions on VMT as a function of local/regional context variables. (p. 66)

Proposed funding level: \$125,000

Develop Assessment Tool and Verify Emissions Reductions from Green Homes: GreenPoint Rated Climate Calculator Version II

California's Climate Change Scoping Plan states that further research is needed to quantify GHG emission reductions from green buildings. This project will expand the capabilities of a GreenPoint Rated Climate Calculator to include the latest green building methods and information. The climate calculator outputs can influence home buying and renovation decisions by quantifying a home's impact. This data will also help local governments to develop local climate action plans, and in particular, improve their existing housing stock. (p. 68)

Proposed funding level: \$100,000

Evaluation of Models for Economic Analysis: ARB Regulations and Alternative Approaches to Reduce Greenhouse Gas Emissions

Major issues that arise in many of the proposed regulations or alternative approaches are economics based. Economic impacts of GHG reduction policies that materially change the energy markets, transportation alternatives, and land use are significant issues for the policy makers, the public, and the business communities. Economic models come in a variety of structures, sector focus, and completeness, which make the model selection and choice for a specific regulation or policy an important step. This project would assess and evaluate several models applicability to and usefulness for economic impacts analysis of ARB regulations and policies. (p. 70)

Proposed funding level: \$120,000

Identify Factors that Support Low Residential Energy Consumption Observed in Some California Households

A large challenge facing ARB is facilitating behavior changes to achieve the GHG reduction milestones outlined in AB 32 and Executive Order S-3-05. The household profiles generated by this research can yield strategies, insights, and concrete examples of how Californians live with (much) less energy. This information could be used to help design more effective strategies and programs to promote household GHG reductions and achieve ARB's climate policy goals. (p. 72)

Proposed funding level: \$95,000

Behavioral Strategies to Bridge the Gap Between Potential and Actual Energy Savings in Commercial Buildings

This study integrates social science with technical analysis to investigate the roles of building occupant, property manager, and operator behaviors on energy consumption. The study will identify barriers and opportunities to reduced energy use and enhanced occupant comfort. These important findings could dramatically enhance the State's ability to leverage professionals in and occupants of built environments to achieve GHG emissions reductions delineated by the Scoping Plan. (p. 74)

Proposed funding level: \$135,000

Recommended if Additional Funding Available

Emission Reduction and Energy Efficiency Using Solid Oxide Fuel Cells Running on Anaerobic Digester Biogas from a Dairy Farm

This project will demonstrate the capability of solid oxide fuel cells in using biogas from a manure digester as the anode fuel, with an increase of the energy efficiency and a reduction of pollutant emissions. (p. 77)

Proposed funding level: \$328,000

Carbon Life Cycle Impacts from Increased Biofuel Collection and Processing in California

California has a substantial opportunity to reduce carbon emissions by collecting previously unused forest residuals for biofuels, increasing thinnings of overly dense stands at risk of unnatural fires that are prone to release substantial emissions, to increase investments in short rotation wood crops, and to better utilize mixed waste streams for energy. California biofuel opportunities are unlike most other regions requiring site-specific analysis to estimate potential sources and not covered in the nationally supported workplan. This proposal augments the existing workplan to include California biofuel collection and processing. (p. 79)

Proposed funding level: \$275,000

Assessing California's Potential Emissions Reductions from Utilization of Advanced Storage for Ancillary Services and Integration of Renewables at Commercial and Industrial Facilities

Advanced Storage devices can facilitate increased deployment of wind and solar projects by alleviating potential ramping issues, regulate frequency, and serve commercial and industrial facilities as a back-up generation/storage devices to potentially remove the need for diesel generation or as a demand response tool. This study will assess whether significant emission reductions can be obtained from the main uses of advanced, fast-response storage technologies throughout the State of California. (p. 81)

Proposed funding level: \$150,000

Analysis of Changes in Light-Duty Vehicle Holdings by California Households

The proposed research will analyze existing vehicle registration databases to better understand recent changes in the composition of the current vehicle fleet (by type and age), at the household level. These databases can be monitored in the future to understand how changes in fuel prices and policies affect vehicle holdings and new vehicle purchases, and perhaps vehicle miles traveled and fuel consumption, at the household level. (p. 83)

Proposed funding level: \$200,000

Using Social Marketing to Alter Community Behavior and Reduce Greenhouse Gas Emissions: Morgan Hill Case Study

This research will measure the impact of a city-wide intervention, the "Lose 5,000 Pounds of Carbon in 30 Days" program, that involves using social marketing prompts, the diffusion model and small eco-teams. This study will provide an empirical foundation

for program planning and evaluation of local government-initiated social marketing campaigns to addresses climate change. (p. 85)

Proposed funding level: \$250,000

Develop Tools to Assess Public Health Co-Benefits of Climate Change Policy

Implementation of climate-related regulations, such as the Low Carbon Fuel Standard and SB 375, will change emissions profiles and air pollution as well as time-activity patterns of Californians. Integrated assessment of health co-benefits and risks associated with climate policy is critical to ARB's mission. In addition to aggregate health impacts, tools to assess public health co-benefits and risks of climate change policy should illuminate distribution of effects. Analyses with these tools will be used by ARB to develop and implement climate-related regulations that maximize health benefits, and will guide city planners in developing healthy "cool" communities. (p. 87)

Proposed funding level: \$400,000

Social Responses to Climatic Changes and Extremes: Potential for and Constraints on Adaptation in the North Coast Wine Country

This is intended to characterize the vulnerabilities, adaptation options, and constraints of the North Coast winegrowing sector to climate change over the next several decades. Based on a social science/physical science vulnerability framework, the project attempts to assess exposure, sensitivity, coping capacity, and adaptation of the sector. This sector is an important economic element in California. Understanding the impacts of a changing climate is the first step in developing plans for dealing with unavoidable impacts. (p. 89)

Proposed funding level: \$199,885

The Impact of Changes in Economic Growth on California's GHG Emissions

The volume and trend of California's aggregate GHG emissions will vary with its economic growth, increasing the difficulty of estimating the macro-economic effects of achieving a cap in a given year and the effect on certain policies such as the expected price of carbon in a cap and trade program. This California-specific study will analyze data on GHG emissions across the State's major economic sectors in the period during and prior to the current economic contraction to quantify observed relationships between changes in economic growth and related changes in GHG emissions. Results will shed light on the relationship between changes in economic growth and changes in GHG emissions, improve projections regarding aggregate and sector-specific GHG emissions of California's economy, and foster more effective design of market-based GHG emission reduction programs. (p. 91)

Proposed funding level: \$100,000

Scenario Planning for 80% Reduction in 2050

Reducing greenhouse gases by 80 percent will require a complete transformation of the state's energy economy affecting every sector including electricity production, transportation and fuels, rural and urban land use, industry, agriculture and even the way we heat our homes and businesses. This research will help ARB develop a set of plausible and positive scenarios for the future of California that achieves the 2050 targets (80% reduction) for greenhouse gas emissions. Scenarios will include sufficient detail such that they could be used to inform the policy makers who are working to

achieve the goal, including technical, institutional, and political barriers that need to be addressed. (p. 93)

Proposed funding level: \$150,000

Concepts Recommended for Funding

TITLE: Determination of the Spatial Distribution of Ozone Precursor and Greenhouse Gas Concentrations and Emissions in the LA-Basin

PROBLEM: Observation of the spatial distribution of air pollutant and greenhouse gas concentrations and emission fluxes is a crucial aspect of monitoring air quality as well as the current efforts, mandated by AB32, to curb greenhouse gas emissions in California. To date the strategy to monitor atmospheric trace gases and their emissions on a regional scale has relied upon networks of in-situ ground observations and simple comparison with results from urban air-shed models. The limited number of ground sites in these networks often poses challenges due to possible influence of local emissions and large spatial gaps between the stations. Without complementary data from aircraft, balloons, satellites or other exotic platforms, the ground-based network is inadequate to characterize the emissions of pollutants and greenhouse gases. The quantitative analysis of the observations in models also is often difficult and time consuming. Novel observational and modeling methods are therefore needed to address California's challenges in regulating and reducing the emission of pollutants and greenhouse gases.

PREVIOUS WORK: A pilot study using multi-axis Differential Optical Absorption Spectroscopy (MAX-DOAS) to measure NO_2 , HCHO , and aerosol extinction from the new NASA-Jet Propulsion Laboratory (JPL) "California Laboratory for Atmospheric Remote Sensing" (CLARS) has been performed at Mt. Wilson, showing that enough information can be derived to retrieve spatial concentration fields of these compounds in the South Coast air basin. Through a NASA-sponsored project we have built a dedicated near-IR FTIR to measure the spatial distribution of various greenhouse gases. The instrument is based on a long heritage of Fourier transform spectrometers developed at JPL for ground-based, aircraft, balloon and spaceflight applications. The near-IR capability will be fully operational by summer of 2009. At this point in time first results of this setup will become available in spring of 2009. The CMAQ model has been coupled with the WRF model and applied to simulate ozone in the LA Basin. Additionally, an adjoint of the CMAQ model has been developed, which enables the assimilation of observations using a variational approach.

OBJECTIVE: The proposed work offers the first steps towards an air quality monitoring and forecast strategy for pollutants and greenhouse gases by developing and employing a combined observation and modeling system. Optical remote sensing from Mt. Wilson will provide spatial and temporal distributions of the column densities of various pollutants (NO_2 , HCHO , CO , aerosol extinction) and greenhouse gases (CO_2 , CH_4 , N_2O). The observations will be assimilated into the CMAQ model and the adjoint of the model will provide improved emission fluxes and concentrations of NO_x , VOC's, CH_4 , and N_2O in the LA-Basin.

DESCRIPTION: JPL's "California Laboratory for Atmospheric Remote Sensing" (CLARS) is located on a mountain ridge at Mt. Wilson with a near full view of the South Coast air basin. Investigators propose to perform field observations during different seasons in the years 2010 and 2011, measuring the spatial and temporal distribution of

various pollutants (NO_2 , HCHO, CO, aerosol extinction via O_4) and greenhouse gases (CO_2 , CH_4 , N_2O) using a UV-vis MAX-DOAS and a near-IR FTIR spectrometer. Both instruments will use scanning systems to measure the absorptions of these trace gases in different viewing directions. Concentration fields of these compounds with a vertical resolution of 0.2 to 1 km, a horizontal resolution of at least one kilometer, and a temporal resolution of 0.5 - 1 hour, will be retrieved using radiative transfer calculations and inversion techniques.

However, our main emphasis for this project will be to circumvent this inversion by expanding UCLA's CMAQ model with a radiative transfer code to directly simulate and assimilate the trace gas slant column densities observed from CLARS. The assimilated data can then be used in the existing adjoint of the CMAQ model to derive improved emission fluxes of NO_x , VOC's, CH_4 , and N_2O in the LA-Basin. We propose to perform these calculations for different seasons and meteorological conditions in the LA-Basin. The results of this exercise will be compared to existing emission inventories. The improved model will be tested against ground observations to investigate the performance of our novel approach.

BENEFITS: The State of California is currently pursuing an ambitious plan to reduce its greenhouse gas emissions and to improve its air quality over the next decade. The proposed novel observation/modeling strategy will provide a unique tool to support these activities, by allowing the validation and improvement of emission inventories and urban airshed models. While our current proposal adopts a campaign style strategy, the proposed approach can easily be expanded into a year-round system to monitor changes in trace gas concentrations and emissions in the South Coast air basin and other urban areas in California. An assimilated CMAQ system that uses instantaneous observations, such as those from remote sensing instruments, would provide the next generation of air quality analysis and forecast tools.

COST: \$300,000

COFUNDING/COLLABORATION OPPORTUNITIES: This research will be carried out in close collaboration with ARB staff who are already performing greenhouse gas air sampling at Mt. Wilson, as well as with the SCAQMD for the validation of our observations with ground observation. Collaborations with the NASA satellite community are already established and will be further expanded in this project.

TITLE: Pilot Study of Inverse Modeling to Verify California's Greenhouse Gas Emission Inventory

PROBLEM: Inventory estimates of California's greenhouse gas (GHG) emissions are based on international protocols that may not be representative of California sources and conditions for non-CO₂ GHG. Thus, there is a need to independently verify current emissions estimates. In addition, Assembly Bill 32, the Global Warming Solutions Act of 2006, mandates the California Air Resources Board (ARB) to verify future GHG emission reductions resulting from mitigation measures. The academic community has proposed a statewide continuous GHG monitoring network and the use of air quality models to back-calculate current emissions ("inverse modeling") and to follow emission trends. The proposed network would be a multi-million dollar commitment and a workshop jointly conducted by ARB and UC Irvine in January 2008 raised questions about the necessary number of monitors, the desired locations, and current inverse modeling capabilities. In order to provide a database to test the inverse modeling approach, ARB staff are deploying ten relatively low-cost (but high precision and hourly resolution) CO/CO₂/CH₄ monitors in the Central Valley of California. As part of the CalNex field study in May-June 2010, the National Oceanic and Atmospheric Administration (NOAA) will make flights over the monitoring sites and throughout the Central Valley to provide further spatial information. ARB has a highly spatially resolved (4 x 4 km) CO emission inventory of known accuracy that can be used to verify the inverse modeling approach.

PREVIOUS WORK: UC San Diego operates two sites (Scripps Pier and Trinidad Head) that provide hourly resolution for multiple GHG. ARB has provided high resolution CO monitors for these sites so they can be part of the CO/CO₂/CH₄ network. In 2007, two new projects were initiated. First, UC Irvine and ARB conducted 10-day measurement campaigns over four seasons at the Mt. Wilson Observatory, overlooking greater Los Angeles. By correlating GHG with simultaneous CO measurements and using the CO emission inventory for Los Angeles, the study estimated emissions for several GHG (CH₄, CFC-12) that were higher than the emission inventory. Second, a collaborative study by the Lawrence Berkeley National Laboratory, NOAA, and the California Energy Commission, began continuous measurements of multiple GHG at a site near Sacramento (Walnut Grove) and in the San Francisco Bay Area (Sutro Tower). The study demonstrated an inverse modeling approach for a portion of the Central Valley by using the Walnut Grove measurements to estimate CH₄ emissions.

OBJECTIVE: The objective of this project is to demonstrate inverse modeling tools for data collected from ARB and UC San Diego's CO/CO₂/CH₄ measurement network.

DESCRIPTION: The proposed work involves four major tasks: 1) Demonstrate an inverse modeling approach for CO using the ARB/UC San Diego measurement network. Annual, summer and winter inventories at county or sub-county resolution are desired for comparison to the existing ARB CO emission inventory. 2) Calculate annual CO₂ and CH₄ emission inventories using the ARB/UC San Diego measurement network. Compare to county-level emission inventories, to be proved by ARB staff. (ARB staff also have two mobile monitoring platforms available to investigate unexpected hot spots.) 3) Use the NOAA aircraft and other data (e.g., Walnut Grove)

to improve the emission inventory estimates and make recommendations on the optimal number and locations of monitors. 4) Turn over the inverse modeling tool to ARB staff and conduct a training course.

BENEFITS: The project will improve CH₄ emission inventory and verify future CH₄ emission reductions in California as mandated by AB32.

COST: \$150,000

REFERENCES:

Fischer, M.L., C. Zhao, W.J. Riley, and A.C. Andrews (2009). Observation of CH₄ and other Non-CO₂ Green House Gas Emissions from California. California Energy Commission, PIER Energy-Related Environmental Research. CEC-XXX.

TITLE: Assessment of Baseline Nitrous Oxide Emissions in California's Dairy Systems

PROBLEM: In California, nitrous oxide (N_2O) may contribute as much as 50% to the total net agricultural greenhouse gas (GHG) emissions (California Energy Commission, 2005), but there is a great uncertainty associated with this estimate because actual field measurements of N_2O in California are lacking and N_2O emissions vary greatly among agricultural systems. With the passage of the Global Climate Change Solution Act (AB 32), quantifying N_2O emission from California agricultural land is vital to determining GHG emission budgets needed to address the mandated reduction in GHG emissions by 2020 and to develop appropriate mitigation strategies. Three State agencies (CEC, CDFA, ARB) recently funded research to determine baseline N_2O emissions in 9 of California's acreage-wise and economically most important types of cropping systems. However, no research has been commissioned to develop N_2O inventories for irrigated forage cropland that receives liquid manure from anaerobic storage ponds and corral manure. Dairy waste is applied to some 400,000 acres of forage cropland, which has one of the highest annual throughputs of nitrogen (N) of any cropping system in the world and, therefore, the potential of producing substantial N_2O emissions.

PREVIOUS WORK: The main driver for increasing N_2O emissions in North America is management of manure and manure application to soils (IPCC 2007). To date, N_2O emissions have not been measured on California's dairy farms, where water waste is typically applied year-round to forage crops surrounding the dairy facilities. According to our most recent research, the N inputs into these cropping systems (mainly as lagoon water and fertilizer through the flood irrigation systems) range from 500 to 1200 kg N ha⁻¹ yr⁻¹, versus 350 to 600 kg N ha⁻¹ yr⁻¹ removed in the harvested crop. Many studies have shown that high N inputs significantly increased N_2O emissions (Bouwman et al., 2002; Eichner, 1990; Stehfest and Bouwman, 2006), and that N_2O emissions increased sharply in response to N inputs that exceeded crop N requirements (Edis et al., 2008; McSwiney and Robertson, 2005). Manure enhances denitrification; furthermore, manure stored in anaerobic lagoons contains volatile fatty acids, which have a high biochemical oxygen demand and likely provide an additional stimulus to denitrification (Coyne, 2008).

OBJECTIVE: The goal of the proposed research is to determine baseline N_2O emissions in forage production systems receiving dairy lagoon water waste.

PROPOSED WORK: Task 1: At least three farms with differing soil types will be selected for the N_2O monitoring. Sites will be selected with a history of regular manure additions. Task 2: On each farm, measurements of N_2O flux will be made during one summer corn growing season and also during one winter, when winter forage (triticale, oats, wheat etc.) are grown.

Episodes of high N_2O emissions occur when both soil inorganic N concentrations and water-filled pore space (WFPS) are high (Bronson and Mosier, 1993; Burger et al., 2005; Dobbie et al., 1999; Simojoki and Jaakkola, 2000). Therefore, frequent N_2O flux sampling will take place immediately before and after irrigation with dairy lagoon water

with the goal of capturing the extent of elevated N_2O fluxes until the fluxes subside to background levels. When N_2O flux has receded and soils are relatively dry, measurements will be taken less frequently. Frequent sampling will also take place in the winter if the WFPS stays high for extended periods.

Nitrous oxide flux will be measured, using a static chamber technique (Hutchinson and Livingston, 1993). During measurements, vented, insulated, rectangular thin-wall stainless steel chambers (approx. 50 x 30 x 10cm) will be fitted onto previously inserted bases (depth about 8 cm) in beds and furrows. Chamber headspace air will be removed from a sampling port with butyl rubber septa via syringe and needle after 0, 30 and 60 min and stored in evacuated glass vials. The headspace air samples will be analyzed by a Shimadzu gas chromatograph (Model GC-2014) linked to a Shimadzu auto sampler (Model AOC-5000) in Dr. Horwath's laboratory. The system will be calibrated daily using analytical grade N_2O standards from a reputable source. Soil and air temperature, and soil moisture will be recorded during each gas sampling. Task 3: Periodically, inorganic N to a depth of 15 cm will be determined in soil extracts, and pH will be measured in soil slurries. Bulk density in the 0-15 cm layer will be determined seasonally. The ancillary data will be used to characterize the environmental factors that control N_2O emissions. The yearly N inputs into these systems will be estimated from the inflow, determined by flow meters, and the concentration of total N in the irrigation water. Task 4: The yearly N_2O emissions in these dairy systems will be calculated from the N_2O fluxes measured following the irrigation or rainfall events and from estimates based on the background fluxes that are expected when soils are relatively dry. Emission factors will be estimated for these dairy systems from the total yearly N_2O -N emissions divided by the amount of the yearly N inputs. The deliverables of this research will be a baseline estimate of annual N_2O emissions in dairy systems that can be used to estimate the N_2O emissions from the same land use in California. The emission factors (EFs) can be compared with those of other systems, for example corn cropping systems supplied with varied amounts of synthetic fertilizer that are being monitored for N_2O emissions in the Fresno area by our collaborators (PI Dr. Goorahoo).

BENEFITS: Baseline N_2O emission estimate for Central Valley dairy systems will improve the State's N_2O emission estimates. The EFs of dairy systems in comparison with EFs of other California cropping systems will provide guidance in developing best management practices to lower N_2O emissions in California's dairy systems.

COST: \$82,000

COFUNDING/COLLABORATION OPPORTUNITIES: The proposed research will complement N_2O monitoring in other projects funded by State agencies. This project will benefit from shared protocols, flux chamber design, and streamlined analytical procedures established in the other N_2O monitoring projects underway. The data generated in the proposed research can also be used to calibrate and validate N_2O flux modeling, as proposed in some of the other projects funded by State agencies.

TITLE: Are There Any Counteracting Effects That Reduce the Global Warming Benefits Attributed to Diesel and Other Black Carbon Controls?

PROBLEM: The IPCC concluded that black carbon (a major component of coal, diesel and other combustion-generated PM) may be the second most important pollutant contributing to global warming, but chose not to assign a global warming potential (GWP) for two reasons. First, its short atmospheric lifetime (1-2 weeks) is incompatible with the long lifetimes (decades to centuries) of CO₂ and other well globally mixed gases. However, this property makes it attractive as a means to immediately reduce global warming impacts through directed controls of black carbon sources. And to slow loss of Arctic sea ice and glaciers around the world as black carbon deposited on snow and ice accelerates their melting. Second, because of uncertainties regarding how it influences climate in an indirect manner through the modification of the properties and abundance of clouds. While this "indirect aerosol effect" does not appear to offset the benefits of black carbon control, its magnitude needs to be understood.

PREVIOUS WORK: The Desert Research Institute just finished an emission inventory of black carbon sources in California. The ARB is funding Scripps to assess the impact of black carbon on California's climate through a balanced approach involving observations, data analyses, and modeling studies. Results from this research project will address the question of the importance of black carbon (both overseas transport and local sources) on recent observed trends of warming, drying and early melt of the Sierra Nevada snow pack. NOAA is funding Caltech (as part of CalNex) to investigate the impacts of PM (including black carbon) on climate forcing and cloud formation. They will address the origin and nature of California PM by flight plans that seek to track the evolution of the size and composition of the particles as they travel from source-rich to downwind areas. Caltech, NASA and Stanford have developed global climate models of the "indirect aerosol effect". ARB staff have assisted Michael Walsh and the University of Illinois in developing global emission inventories of black carbon and GHG reductions for the on-road transportation sector. These inventories include both BAU and control scenarios that extend California's diesel engine standards and retrofit programs to the U.S., EU and China.

OBJECTIVE: Run a model intercomparison study to isolate the direct effects of black carbon from the indirect, using global scenarios of on-road transportation controls.

DESCRIPTION: An extensive literature review by Caltech concluded that no global climate modeling study exists in which the effect of changing black carbon on aerosol indirect effects has been specifically diagnosed. Several global climate models exist that include the requisite detailed PM size distribution and composition treatment, coupled to an explicit cloud drop number concentration parameterization, to carry out such a calculation. The proposed study would be carried out with Caltech, NASA and Stanford and would involve a series of equilibrium climate simulations in which the effect of reductions in black carbon emissions from the on-road transportation sector on the indirect aerosol effect is diagnosed. In particular, we are interested in determining whether a reduction in black carbon will lead to an increase or decrease in cloud radiative forcing. In short, would mitigating black carbon result in some counteracting warming due to consequent reduction in the indirect effect of aerosols on climate?

BENEFITS: Black carbon emissions from Asia and local sources contribute to global warming and accelerated melting of the Sierra Nevada snow pack. If California's example of strict diesel control is applied to other regions of the U.S. and world, these impacts could be reduced.

Greenhouse gases such as carbon dioxide have atmospheric lifetimes of decades allowing them to mix over a broad geographical area. In contrast, the removal timescales for BC particles are less than a week with greenhouse effects felt much closer to the emissions source. Changes to the emissions of light absorbing carbon particles could result in rapid, regionally specific changes to the radiative forcing. Therefore, reduction of black carbon offers a unique opportunity to mitigate the effects of global warming trends in the short term.

COST: \$60,000

COFUNDING/COLLABORATION OPPORTUNITIES: This proposal builds on work already funded by NASA and NOAA, so the funding needs are modest.

TITLE: Quantifying the effect of local government actions on VMT

PROBLEM: The State of California has laid out ambitious greenhouse gas emissions reduction goals in AB 32 and in Executive Order # S-03-05. The transport sector is responsible for 38% of California's greenhouse gas emissions. Although technological advances in vehicles and fuels can go a long way toward reducing transportation emissions, it is now accepted that part of the strategy to meet these climate goals must be to reduce the overall vehicle miles traveled (VMT).

SB 375 requires California's regions to prepare Sustainable Community Strategies as part of their transportation planning, identifying a set of actions at the region level that would bring transportation greenhouse gas emissions down to target levels. There are plenty of policy ideas out there for local and regional governments to reduce VMT in their jurisdictions. Road and parking pricing, mixed use zoning, investments in alternative modes, and household travel planning programs represent just a small sample of the possibilities. Unfortunately, resources are limited, and they cannot all be implemented.

To responsibly do their part in the state's effort to meet emissions reduction goals, planners and local government officials need to have a clear way of prioritizing actions to reduce greenhouse gas emissions in their communities. In order to properly prioritize options, it is necessary to know—among other things—how much each option will actually reduce the greenhouse gas emissions of the community. However, the emissions effect of actions that reduce emissions through behavior change is highly uncertain; all actions that aim to reduce VMT are in this category.

The challenge is that the particulars of the local and regional context play a large role in determining which actions will be most effective where. For instance, road pricing will generally be most effective in reducing VMT where there are alternative modes of transportation. Incremental investments in transit will be most effective in places where those investments are filling gaps in existing service. It is impossible to create a simple table with actions in one column and greenhouse gas impacts in the next.

The extent to which people will reduce their VMT in response to government actions (their elasticity) is instead a *function* of contextual variables, and it is this function that must be investigated to help local and regional governments prioritize actions.

OBJECTIVE: To estimate the likely impact of local government actions on VMT as a function of local/regional context variables.

DESCRIPTION:

The research should include three subtasks, which will be refined in accord with RTAC dialogue and other SB 375-related developments:

1. Synthesize available evidence on the effects of local and regional government actions on VMT.
2. Use available travel survey, census, and GIS land use data to develop models that estimate elasticity of VMT with respect to a variety of major local/regional

policy variables (e.g. cost of travel, density of land use, transit availability) in a variety of urban and suburban contexts.

3. Create a simple spreadsheet model tool that synthesizes the resulting elasticity functions into usable policy parameters for local government decision making.

BENEFITS: Research results will support ARB's responsibilities under SB 375 and help planners and local government officials prioritize actions to reduce greenhouse gas emissions in their communities by offering a context-dependent tool to estimate greenhouse gas emissions reductions from a variety of VMT control strategies.

COST: \$125,000

TITLE: Develop Assessment Tool and Verify Emissions Reductions from Green Homes: GreenPoint Rated Climate Calculator Version II

PROBLEM: A number of lifestyle-based carbon calculators have been developed to estimate an individual's or household's carbon footprint, but few tools exist to measure the total avoided greenhouse gas emissions from building green homes. Existing calculators typically rely on self-reported data, rather than third-party verification. At the national level, there is no systematic method of quantifying the greenhouse gas reductions from LEED projects; each project/developer uses its own methodology. And while the energy-related emissions savings from the building industry are well understood, research on the non-energy benefits of green buildings is very limited.

PREVIOUS WORK: The first version of the GreenPoint Rated Climate Calculator, developed by a team led by Green Building in Alameda County, quantifies the impacts of a core set of residential green building practices that go beyond energy. Our agency has taken a lead in identifying and quantifying the greenhouse gas reductions possible from recycling construction and demolition waste. Version I includes other non-typical quantification protocols, including indoor and outdoor water efficiency measures, benefits for locating near transit, and planting shade trees as ways to reduce a home's overall carbon footprint. A final report documenting our findings and methodologies is publicly available and is being used by public agencies in developing climate action plans.

OBJECTIVE: Our objective is to expand the number of green building measures that can be quantified in the Climate Calculator by undergoing a second phase of research, called Version 2. We will also revise current methodologies to ensure their compatibility with emerging green building protocols and/or cap and trade systems as appropriate.

DESCRIPTION: The second phase of research will follow similar methods used in Version I:

The measures included in the Calculator are drawn from the Green Building Guidelines published by Build It Green, the residential green building standard that is most commonly promoted by local governments in California. The GreenPoint Rated program offers third-party verification of these measures. The project team encountered some challenges as they sought to develop a Calculator based on accurate, verifiable data and assumptions. To be credible the Calculator had to reference valid standards, research reports, and assumptions. Perhaps most challenging, the Calculator had to work for third-party raters in the field. A calculator that is too onerous to fill out would drive up the cost of ratings, while an overly simplified calculator would lack credibility.

Unlike some calculators, the GreenPoint Rated Climate Calculator isn't a do-it-yourself rating tool that estimates the impacts of individual's behaviors, although it may be complementary to those behavior-based calculators. The GreenPoint Rated score and the Climate Calculator results are independent of the occupants' behavior in most cases because they are based on industry standards. The assumptions used in the Calculator remain valid for that building regardless of ownership or occupancy, unless significant

changes are made to the building's structure or systems. For this reason the Climate Calculator is different from other calculators used for estimating CO₂E attributed to homes.

The GreenPoint Rated Climate Calculator bridges the gap between those calculators that estimate the carbon footprint of individuals; and the large, industry-wide emissions reporting protocols. Other methodologies, such as the World Resources Institute methodology, measure impacts on climate change at a macro level, either by assessing the emissions of a business, an entire industry sector, or a local or regional government's jurisdiction. Home carbon footprinting tools, like those that allow users to offset their air travel or purchasing habits, are specific to the behavior of the occupants. The GreenPoint Rated Climate Calculator, however, provides a way to estimate the benefits of building green as compared to a conventionally built home of the same vintage.

As part of the Version 2 update process, Green Building in Alameda County will contact key stakeholders including experts, state agencies, local governments, builders, GreenPoint raters and climate registries. We will review the latest research to expand the number of green building measures that can be quantified and to update current methodologies. We will undertake pilot projects of different residential building types.

BENEFITS: The climate calculator outputs can influence home buying and renovation decisions by quantifying a home's impact. This data will also help local governments to develop local climate actions plans, and in particular, improve their existing housing stock.

COST: \$100,000

COFUNDING/COLLABORATION OPPORTUNITIES: The Green Building in Alameda County program will be committing \$25,000 in hard costs and in-kind staff time to developing Version II of the Climate Calculator. By funding this project, the state will be leveraging two years of past research on this project. The Green Building in Alameda County program has already invested \$75,000 in hard costs in the development of Version I and has provided data to the ARB's Climate Change research division for the green building portion of the draft Scoping Plan.

TITLE: Evaluation of Models for Economic Analysis: ARB Regulations and Alternative Approaches to Reduce Greenhouse Gas Emissions

PROBLEM: Support for reducing greenhouse gas (GHG) emissions to reduce future climate change has increased substantially over the last decade. The California Legislature has set year 2020 targets for GHG emissions, and the Governor has passionately pursued and emphasized efforts and programs to further GHG reductions. The California Air Resources Board has adopted a Scoping Plan for GHG reductions to meet the targets, and is adopting regulations to implement the plan.

Major issues that arise in many of the proposed regulations or alternative approaches are economics based. Economic impacts of GHG reduction policies that materially change the energy markets, transportation alternatives, and land use are significant issues for the policy makers, the public, and the business communities. Economic models come in a variety of structures, sector focus, and completeness, which make the model selection and choice for a specific regulation or policy an important step.

OBJECTIVE: This project would assess and evaluate several models applicability to and usefulness for economic impacts analysis of ARB regulations and policies.

DESCRIPTION: This project would be in three phases that would involve ARB staff, outside advisors, and panel of experts.

Phase I would be conducted in-house by ARB Economics Studies Section Staff. In this phase, staff would:

- Gather information on several state and national level models that are being used either in California or within the U.S.
- Summarize the models structures, definitions, coverage, usage, and other information useful for model evaluations.
- Develop a set of criteria for model evaluations.
- Consult with other ARB divisions to assess economic modeling needs and the sectors that most likely would need full economic analysis.
- Perform a preliminary evaluation of the models.
- Prepare issue documents on each of the models.

Phase II would involve recruiting and consulting with outside advisors. Experts and professors from the University of California or leading economics institutions will be recruited to advise the ARB. The experts will:

- Review the model information gathered by the staff and advise on the completeness of the coverage.
- Review the staff analysis of the model applicability, and preliminary evaluations.
- Prepare a set of recommendations on all of the models reviewed based on the staff and their own analysis of the pros and cons of each model.
- Recommend the leading models that should go to a conference or panel of experts before the ARB stakeholders.

- Prepare documents and formally submit to the ARB.

Phase III would consist of a one-day conference where the recommended and leading models would be discussed according to specific criteria developed by the staff and the Phase II experts. The ARB stakeholders would be invited to participate in a portion of the panel discussions. The panel would:

- Review the prepared documents and models prior to the conference.
- Discuss the evaluation criteria for the models.
- Express their concurrence or rejection of previous evaluation findings on the models.
- Present their own evaluation of the models.
- Summarize and make recommendations.

BENEFITS: This research will aid ARB in choosing, using, and improving economic models that are used to estimate economic impacts of greenhouse gas reduction strategies. Improved models and better understanding of their results will help resolve issues related to differing estimate of regulatory control of greenhouse gas emissions.

COST: \$120,000

TITLE: Identify Factors that Support Low Residential Energy Consumption Observed in Some California Households

PROBLEM: This research will investigate the circumstances which correspond to (very) low energy consumption levels in a subset of California households. Although inter-household variation in kWh consumption is acknowledged to be much larger than differences in end use technologies or household size could explain, the determinants of low usage have not been studied. The roles played by social factors such as habits, attitudes, and knowledge of energy matters, and demographic factors such as age, race, and social class are not well understood. This research can overcome the present uncertainty about what life lived at ten percent of current average energy consumption entails.

PREVIOUS WORK: According to data supplied by Pacific Gas & Electric (PG&E), inter-household variation in monthly electricity and gas consumption by residents of the City of Berkeley varies by more than a factor of 100. An investigator serving on the Berkeley Energy Commission initiated and coordinated a series of local contests designed to confirm the existence of very low usage and reveal the patterns underlying it. Subsequent research using consumption data acquired through these contests revealed a very low correlation between the energy efficiency of end use technologies and electricity consumption. Another investigator and potential collaborator conducted research on both low usage behaviors as well as variation in energy usage among otherwise similar households beginning in the late 1970s.

OBJECTIVE: This research aims to identify what factors are responsible for the low levels of energy use within an unstudied segment of the California residential sector, and establish a framework within which to assess the contributions of different social, cultural, and behavioral factors toward such low consumption levels. The research aims to generate a set of household profiles corresponding to different combinations of physical and social factors that yield low energy use. Finally, an understanding of low energy usage patterns could supply a template of what California's Global Warming Solutions Act (AB32) might require in five or ten or even twenty years.

DESCRIPTION: Through in-home interviews and a detailed survey this research will explore both the physical, social, and behavioral factors contributing to low energy use as well as attitudes among low use customers about their uses of energy.

1) Acquire a dataset from PG&E consisting of usage histories of approximately 5,000 residential accounts at the bottom end of the usage spectrum for both gas and electricity. This number encompasses all residential accounts up to the 10th percentile usage level. These accounts would include 12 consecutive months of electricity and natural gas consumption and either the account number or a code allowing subsequent matching to the account number. The approximate monthly billing cutoff levels for such data extraction are: 70 kWh and 5 therms. This data set would then be sorted using criteria for culling accounts with no occupants or where significant fuel substitution is responsible for the exceptional usage.

- 2) Screen the data set to remove apparently unoccupied residences as well as customers whose bills reflect fuel substitution, e.g., low gas users with above-average electric consumption.
- 3) Design a study participation consent form. To protect customer confidentiality, personal information in the data set would be redacted. Research staff would have no ability to access personal information or contact customers until customers have consented in writing.
- 4) Mail the form to the screened dataset (expected to be between 2,000 and 3,000 accounts). The form would include a pre-printed account number or other identification code. Those residents willing to participate would respond to research staff directly. The advantage of such an approach is that it ensures anonymity of account holders while affording them the opportunity to participate. The computational requirements for PG&E are also minimized. Other approaches to protecting customer privacy while encouraging participation are possible.
- 5) Develop sampling criteria for identifying a subset of participating households to be interviewed in their homes. Conduct and transcribe interviews with low-use households. Interviews are designed to establish a working understanding of the circumstances and parameters corresponding to low use patterns and to facilitate development of appropriate survey questions.
- 6) Draft, pretest, and mail a detailed survey to all households agreeing to participate.
- 7) Analyze findings from interviews and household surveys. Identify household profiles using physical, social-demographic, and attitudinal categories developed through analyzing the responses.
- 8) Derive applications, focusing on the potential for significant reductions in energy consumption through transferable strategies.

BENEFITS: The household profiles generated by this research can yield strategies, insights, and concrete examples of how Californians live with (much) less energy. These permit and suggest a policy approach grounded in the experience of actual California households. Expert knowledge would be utilized not to prescribe standard bundles of technical solutions to everyone, but to identify combinations of habits, behaviors, technologies, and building characteristics that correspond to low energy consumption patterns commensurate with the long-term mandates of AB32.

COST: \$95,000

TITLE: Behavioral Strategies to Bridge the Gap Between Potential and Actual Energy Savings in Commercial Buildings

PROBLEM: Space conditioning and ventilation represent 28% of the electricity use and 38% of the natural gas consumption in California's commercial sector (1). Efforts to reduce these levels and associated greenhouse gas emissions have typically focused on developing technological solutions and devising prescriptive approaches. Yet buildings rarely work as designed, in large part because they are operated and inhabited by people. This mismatch between building operations in theory and building operations in practice places serious limits on the success that solely technology-oriented solutions can have. The mismatch also points to the untapped social and behavioral potential of building operators and occupants to work *with* the built environment to provide indoor spaces that require less energy and cause less greenhouse gas emissions without causing undue stress on occupants.

PREVIOUS WORK: Work in the U.S. and the U.K. indicates that commercial buildings often perform much differently than theorized. For example, energy consumption in new commercial office buildings is often higher than predicted (2), while occupant satisfaction survey data show that most office buildings, whether old or new, deliver levels of occupant thermal comfort that are much poorer than design values specify, often because of overprovision rather than underprovision of space conditioning (3).¹ There is limited published research, however, on the orchestration of real day-to-day operations of buildings, which encompass the decisions of the building operators, the influence of property management, and the behaviors and reactions of building occupants. Several large occupant satisfaction survey databases, including the Occupant Indoor Environmental Quality Survey developed by the Center for the Built Environment (CBE) at University of California Berkeley, have amassed data that help begin to answer these questions.

OBJECTIVES: The objectives are three-fold: (1) Understand key differences between theory and actual practice of thermal comfort provisioning in commercial buildings, addressing technological and operational elements simultaneously; (2) Identify barriers and opportunities in socio-technical systems of practice toward reduced energy consumption, such as expanding comfort temperature bands while maintaining or increasing the satisfaction of building occupants. Consider how these opportunities can be fulfilled in actual building operation, retrofit, and design; (3) Provide a structure to highlight the above issues so that they can be better recognized and integrated in future research and practice on the commercial built environment.

DESCRIPTION: This research would involve two intertwined streams. The first stream would analyze field observations and interviews with building operators, occupants, and property managers. The second stream would interview academic and practicing building experts, to draw out unpublished and informal knowledge and experience. A third stream could be added, subject to data and resource availability, to combine

¹ Research shows that just 38% of survey respondents said they were satisfied with temperature in their workspaces. Over half of occupants' stated dissatisfaction with temperature *in the summer* is from temperatures that are too cold, rather than too hot, according to the Occupant Indoor Environmental Quality Survey database (<http://www.cbe.berkeley.edu/research/survey.htm>) at U.C. Berkeley.

analysis of observed energy consumption and temperature ranges with "what if" scenarios (e.g., for expanded thermal comfort ranges).

Select California buildings for which occupant satisfaction and building technical characteristics data have already been archived in CBE's Occupant Indoor Environmental Quality Survey database, and obtain necessary permissions from management.² Use existing survey results and consultations with building experts to develop interview and focus group protocols. Employ interviews and focus groups to speak with building operators, building occupants, and property management to better understand current practices and to ascertain barriers and opportunities for lower energy use. The focus would be on the thermal environment, but other aspects of the built environment would be included as they arise. Analyze results to determine themes of how buildings are "really" operated and why, and to identify barriers and opportunities for modifying practices toward reduced building energy use. Themes could include, for example: traditions in setting air conditioning and heating levels and their rationale (e.g., assumptions about how temperature affects sales or productivity), roles of various parties in determining operating choices, what systems do not work, how complaints are managed, window and door opening practices, degree of occupant control, occupant adaptation to discomfort, performance data availability, clashing interests of operators, managers, and occupants, relationships to outdoor environment, etc. Investigate in particular the possibilities for increasing the range of indoor temperature, and whether and how this could be achieved by changes in operating practices, changes in occupant and management expectations, as well as technologies and practices of adaptation.

BENEFITS: Results would offer ways in which building operators, management, and occupants could collectively establish building practices that use less energy, resulting in lower GHG emissions and potentially more satisfying commercial indoor spaces. Results would also inform theory of commercial building operation and design for comfort provision, toward better accounting for actual operations and uncertainties, thus contributing to better design and more realistic theoretical approaches to lower building energy consumption.

COST: \$135,000

COFUNDING/COLLABORATION OPPORTUNITIES: In using CBE's survey database, this research leverages past funding by the California Department of General Services, CEC, GSA, and other agencies, as well as the collective work of 50,000 building occupants. It also links to a research proposal that CBE is developing, at the request of CEC, to study comfort from a broader perspective, integrating outdoor comfort and building user expectations.

REFERENCES:

- (1) California Commercial Energy Use Survey, available online at: <http://capabilities.itron.com/CeusWeb/Chart.aspx>

² There are currently 34 surveyed buildings in California in the CBE survey archives. Additional buildings could be surveyed at relatively low cost. In total, CBE archives surveys from over 400 buildings, primarily in the U.S.

- (2) B. Bordass, R. Cohen, and J. Field, "Energy performance of non-domestic buildings: closing the credibility gap," presented at the 2004 International Conference on Improving Energy Efficiency in Buildings, Frankfurt,
<http://europrosper.energyprojects.net/links/IEECB04BordassCredGap2.pdf>.
- (3) S.A. Fard, *Post-Occupancy Evaluation in U.S. Office Buildings: Do Green Buildings Have More Satisfied Occupants?*, MS. Thesis, U.C. Berkeley, 2006.

Concepts Recommended if Funding Available

TITLE: Emission Reduction and Energy Efficiency using SOFCs running on Anaerobic Digester Biogas from a Dairy Farm

PROBLEM: There are currently 1.8 million cows in 1900 farms that produce 90,000 tons of waste per day in California. With the purpose of generating power, heat, and reducing greenhouse and volatile organic compound emissions, some dairy farms generate biogas by digesting manure in anaerobic digesters. However, current emission standards for IC engines are not being met by generator sets running on biogas.

PREVIOUS WORK: Attempts have been made to add catalytic converters to process the exhaust gases of generator sets to reduce NO_x and CO emissions. Current converters have been designed for operation with NG and not for biogas, so they tend to fail after a short period of operation. Solid Oxide Fuel Cells (SOFCs) have been tested with biogas (mainly CH_4/CO_2 mixtures) and have even shown recovery after exposure to small H_2S concentrations that can be present even when sulfur cleaning is applied before the injection to the SOFC anode.

OBJECTIVE: Demonstrate the capability of SOFCs in using biogas from a manure digester as the anode fuel, with an increase of the energy efficiency and a reduction of pollutant emissions. The biogas will be obtained from a manure digester located at Joseph Gallo Farms, in Atwater CA.

DESCRIPTION: Anaerobic digesters constitute a proven technology for cow-manure management that reduces the emissions of methane to the atmosphere. The biogas obtained from the digester can be used on-site or provided to a nearby local user, it may be cleaned into biomethane and sold to public utilities or be used for distributed power generation purposes, producing electricity for use on-farm, off-farm or sold to utilities. There is an additional positive effect when it is used to help to reduce the load on an already saturated power transmission line.

A typical composition of the biogas obtained from a digester has between 55 and 62% CH_4 , 30 to 35% CO_2 , small fractions of O_2 , N_2 , and 0.2% of H_2S which requires the use of a scrubber. Due to the higher fractions of CO_2 and N_2 , a spark-ignited IC engine running on biogas shows a penalty in performance compared to natural gas or gasoline [Crookes 2006]. An increase in the compression ratio improves performance but increases the levels of NO_x , CO, and HCs. Information obtained from a San Joaquin Valley Air Pollution Control District operating permit (see attached document) for a 575 BHP Caterpillar generator engine indicates maximum emission levels of 0.15 g- NO_x /bhp-hr, 0.1 g-PM10/bhp-hr, and 0.5 g-CO/bhp-hr. Although the PM and CO emissions have been met, so far, measured levels of NO_x emissions are above the regulatory requirement.

Due to their capability of operating with CH_4/CO_2 mixtures obtaining higher efficiencies than ICEs or GTs, and the relative insensitivity to the contaminants present in biogas

(provided a desulfurization step) SOFCs may present a viable alternative to IC engines for power generation and emission reduction (Van herle 2003 and 2004, Shiratori 2008, Santarelli 2008). However their performance running on biogas from a manure digester has not been documented previously. The main concern in the utilization of SOFCs with biogas is the presence of H_2S which is stable at the operating conditions of a SOFC. The poisoning becomes more serious at increased levels of H_2S and decreasing operational temperature (Sasaki 2006). However, experimental results indicate that SOFCs can recover from exposure to low quantities of H_2S (below 1 ppm) (Sasaki 2008). Carbon deposition is also a problem if steam or O_2 is not added (Van herle 2004).

Before a transition from IC-engines to fuel cells can take place, a comprehensive analysis of the performance and emission levels of SOFCs running on biogas needs to be performed. The proposed project intends to run a series of tests to collect data and determine the exhaust emissions levels and power generation performance of a solid oxide single cell **operating** on biogas from a digester. The biogas will be obtained from the manure digester at Joseph Gallo Farms in Atwater, CA. Based on funding availability a 1 kW SOFC stack could also be installed at the Joseph Gallo Farms facilities for performance, reliability, and real-time operation analysis.

The proposed list of tasks includes

1. Obtain a benchmark test data of emissions levels and power generation of a single solid oxide cell operating with CH_4/H_2O mixtures (steam-to-carbon ratio higher than 2).
2. Measure emissions levels and power generation performance of a single solid oxide cell operating with simulated biogas composed of 60% CH_4 and 40% CO_2 .
3. Measure emissions levels and power generation performance of a single solid oxide cell operating with scrubbed and raw biogas from digester.
1. Analysis of carbon deposition on solid oxide single cell.
2. Quantify degradation effect of H_2S .

BENEFITS The use a waste material for aims of power generation at high efficiency and low pollutant emissions. Low exhaust emission levels and high-efficiency distributed power generation will significantly reduce Californians' respiratory illnesses and will lower the load on saturated transmission lines.

COST: \$328,000

TITLE: Carbon Life Cycle Impacts from Increased Biofuel Collection and Processing in California

PROBLEM: Biofuel collection and processing to displace fossil fuels provides an important opportunity for reducing carbon emissions. The US Forest Service (USFS) has provided \$500,000 funding to measure the Life-Cycle Inventories (LCI) for collection and processing of biomass suitable for bioprocessing (forest residuals, thinnings, short rotation crops and mixed waste streams). A national workshop of experts prioritized potential projects and estimated that comprehensive coverage would require a total budget in excess of \$1 million. They established an initial set of priorities singling out regions and biofuel processing models that were already producing useful data to generate the most and highest quality results per unit cost. As a large energy using state, California has a substantial opportunity to reduce carbon emissions by collecting previously unused forest residuals for biofuels, increasing thinnings of overly dense stands at risk of unnatural fires that are prone to release substantial emissions, to increase investments in short rotation wood crops, and to better utilize mixed waste streams for energy. California biofuel opportunities are unlike most other regions requiring more site-specific analysis to estimate potential sources and not covered in the USFS supported workplan. This proposal extends the existing workplan to include California biofuel collection and processing.

PREVIOUS WORK: The Consortium for Research on Renewable Industrial Materials (CORRIM) a non-profit research consortium formed by 15 research institutions, mostly universities, has developed LCI information and carbon equivalent Green House Gas (GHG) assessments for all structural wood products for the major US producing regions including an integration of the impacts from alternative building materials for the construction, use and disposal of residential buildings for cold and warm climates, along with impacts for residential and light commercial structures meeting seismic codes in Los Angeles www.corrim.org. CORRIM is just beginning to develop biofuel collection and processing LCIs based on regional supply analysis and a sample of key biofuel processing alternatives including pyrolysis, gasification and fermentation. This new CORRIM project in conjunction with this proposal can extend the California Biomass to Energy Study for a select region of the state that was recently completed under the supervision of Mark Nechodam of the USFS Pacific Southwest Research Station providing.

OBJECTIVE: Extend the coverage being provided by a USFS grant to CORRIM to develop LCIs for biofuel collection and processing to include California sourced biofuels and carbon mitigation impacts sourced by forest residuals, thinnings, short rotation high yielding crops and mixed wastes, supplying a range of processing technologies. Provide information that will motivate increased biofuel uses such as biofuel processing for liquid fuels.

DESCRIPTION: Provide estimates of life cycle impacts for biofuel collection of residuals and fire reduction thinnings and short rotation woody crops and their bioprocessing alternatives based on processing models that will ultimately lead to LCIs for scale facilities once they are in operation.

Specific Tasks include:

1. Identify best thinning strategies by extending a current USFS funded study to establish best practices for a range of inland-west forest types by including specific California forest types and their related fire risks.
2. Analyze growth, yield and life cycle impacts for fast growing California species such as eucalyptus.
3. Develop life cycle impacts for forest residuals that could be collected if incentives supported by increasing carbon values or fossil fuel prices are realized.
4. Consider mixed feedstock sources and their impact on volumes and LCI measures.
5. To the degree possible leverage use of the data collected in prior USFS and California's Air Research Board (ARB) supported studies and customize collection and processing alternatives appropriate to California infrastructure.
6. Develop estimates of the magnitude of emissions reduction available from increased biofuel collection and processing for California under a range of economic conditions.
7. Assess other environmental burdens that may result from increased use of biofuels.
8. Peer review all findings integrated with the CORRIM LCI biofuel and collection project reviews for increased credibility and enhanced support for implementation.

BENEFITS: California specific LCI information on increased biofuel opportunities that are peer-reviewed integral with the USFS effort will identify new opportunities to reduce green house gas emissions (GHG) in California and provide direction for implementation and the reduction of barriers.

COST: \$275,000

CO-FUNDING COLLABORATIVE OPPORTUNITIES: The USFS funded biofuel LCI collection and processing study (\$500k) will provide research protocols for consistent analysis across many regions in identifying opportunities in California and provide benchmarks for comparisons across collection and processing alternatives. The study will also benefit from a pellet study (\$50k, supported by the State of Wisconsin) in cooperation with CORRIM, ongoing field studies on the accessibility of forest residuals (\$300k, supported by State of Washington), and a wood products study being completed under industry funded grants for assessing the impact of increased biofuels in the manufacture of structural products (\$18K). The study will also build off of a USFS study on fire risk reduction and carbon mitigation opportunities specific to a range of forest types in the west (\$300K). Without the extended coverage provided by this proposal, the opportunities for California's working forests and unique species and site conditions will not be available at least in the foreseeable future. With this proposal data for California will likely be more complete than for most other regions. The participating CORRIM research institutions will also provide matching funds of 20%.

TITLE: Assessing California Emission Benefits from Utilization of Advanced Storage for Ancillary Services and Integration of Renewables at Commercial & Industrial Facilities

PROBLEM: Advanced Storage devices are expected to have an increase in utilization in the state of California. The targeted uses for storage are (1) Assisting with increased implementation of wind and solar projects by alleviating potential ramping issues, (2) Offering ancillary Services such as frequency regulation, and (3) Serving commercial and industrial facilities as a back-up generation/storage devices to ease demand for diesel generation or foster demand response.

Each of these uses has the potential to provide significant emission reductions for the state of California if widespread adoption is encouraged. However, to date, studies have not quantified this benefit. The proposed study would use a proprietary simulation model to assess the whether significant emission reductions can be obtained from the main uses of advanced, fast-response storage technologies throughout the State of California.

PREVIOUS WORK: A publicly-available study has assessed potential emission savings for Beacon Power's 20 MW Flywheel Power System when used for Frequency Regulation:

http://library.corporateir.net/library/12/123/123367/items/227756/BeaconEmissionReport_1_8_07.pdf

The study was conducted for Beacon Power, Sandia National Labs, and the U.S. DOE.

OBJECTIVE: The purpose of the proposed study is to quantify the potential emission savings gained by the adoption and utilization of fast-response storage devices in the state of California.

DESCRIPTION: The tasks will use a dynamic simulation model to assess specific storage applications, their impacts on emissions, and then quantifying the total potential savings. The project will examine two application areas and scenarios within those applications.

Application 1: Ancillary Services (1) Base Case: assessment (as in the Beacon Flywheel Report) for utilizing fast response storage for the California's current level of regulation or regulation alternative. (2) Renewable Energy Case: assessment for using fast response storage for the amount of projected regulation that will be required under California's 2020 Renewable Energy goals

Application 2: Commercial C&I Applications – As duration, transportability, and capacity of storage technologies increase, the technology may be able to replace a large amount of diesel generator utilization.

(1) Case 1: assess the emission savings gained from using storage in place of traditional generation technologies that participate in DR Programs.

(2) Case 2: measure the emission savings that is gained by using storage vs. diesel generation to cover outages or cases where traditional generation is used to maintain facility operations.

For the project, investigators will utilize a proprietary KREMLIN simulation tool capable of modeling entire electricity grid systems. The model has been used extensively to assess storage impacts for frequency regulation and use with renewables. It has been applied to ISO areas in the U.S. and is capable of working with up to 1,000 generators. The model has been adopted to include storage applications, emissions from the power plants and generators, and additional renewable applications such as wind, large solar and solar farms. This model will be set up specifically for the California ISO electricity grid.

BENEFITS: Californians can benefit from energy-generating technologies that reduce emissions of CO₂, NO_x, and SO_x. This study will look at the potential application of advanced storage technologies and assess the emissions savings that can be gained by their use. In each of the cases, storage devices may also have better performance characteristics than current technologies. Hence, the study will help show how storage can not only demonstrate better performance for specific applications, but will also help the state reduce emissions as well.

COSTS: \$150,000

TITLE: Analysis of Changes in Light-duty Vehicle Holdings by California Households

PROBLEM: ARB has adopted ambitious goals to reduce greenhouse gas emissions to 1990 levels by 2020; achieving these goals will require large reductions in emissions from all sources. To ensure that the state is on target to meet its objectives, data should be collected and monitored to verify that reductions are occurring on schedule, and to identify sectors or components that are not achieving their targets. In 2004 California light-duty vehicles accounted for 33% of all CO₂ emissions from fuel combustion, and 64% of all CO₂ emissions from mobile sources. Analysis of fuel sales data can provide insight into whether general AB32 targets for the transport sector are being met, but they do not provide information on whether fuel reductions are coming from greater use of more efficient vehicles in the current fleet, reductions in vehicle miles traveled, or purchases of more efficient vehicles.

PREVIOUS WORK: CARB's EMFAC model is a sophisticated tool that estimates the effects changes in vehicle stock, emission rates, and activity have on criteria pollutant and CO₂ emissions. The latest version of EMFAC includes vehicle counts by vehicle type and county, and estimates of annual mileage driven by vehicle type and model year from analysis of Smog Check inspection records. However EMFAC is updated only every few years, and provides information only at the county level.

OBJECTIVE: The proposed research will analyze existing vehicle registration databases to better understand recent changes in the composition of the current vehicle fleet (by type and age), at the household level. These databases can be monitored in the future to understand how changes in fuel prices and policies affect vehicle holdings and new vehicle purchases, and perhaps vehicle miles traveled and fuel consumption, at the household level.

DESCRIPTION: The Department of Motor Vehicles maintains vehicle registration records for all vehicles in the state. The data include vehicle license plate and identification number (VIN), as well as the vehicle owner and address, including zip code. The owner address can be used to infer driver characteristics (such as median household income or education level) from the 2000 (and later) national Census, at the zip code, tract, or block level; such data can be aggregated by vehicle age, type, and make/model, for all vehicles registered in the state. (It may be possible to obtain more exact information on household income and size from state income tax returns.) In addition, multiple vehicles registered to the same address can be aggregated to determine characteristics of vehicle "fleets" owned by California households.

Multiple years of DMV data can be assembled to characterize vehicle holdings of households (by number of vehicles and vehicle model year, type, and make/model) and to track vehicle movements within, into, and out of California and air basins. The data can be used to estimate how state policies influence households' purchases of new vehicles (for example, replacing a light truck with low fuel economy, with a car with higher fuel economy).

Vehicle holdings by household can eventually be merged with data on vehicle activity and fuel use to estimate fuel use by geographic area and household type, and to track fuel use over time in response to government policies. Smog Check inspection records provide odometer readings and miles traveled for individual vehicles. However, newer vehicles up to 6 years old, vehicles manufactured before 1976, and vehicles registered in many rural areas of the state are exempted from the Smog Check program; other sources would be needed to estimate the activity of these vehicles. In addition, Smog Check records only provide information on vehicle use over the two-year period between Smog Check inspections. Future efforts to collect more frequent data on vehicle activity, and fuel use, could be combined with vehicle holdings by household to track household vehicle activity and fuel use over time.

BENEFITS: An ongoing system to monitor the light-duty vehicle stock of California's households can be used to analyze what impact changes in fuel prices and government policies have on vehicle ownership patterns. Coupled with data on vehicle activity and/or fuel use, the system could also be used to track fuel use in response to government policies to reduce CO₂ emissions. The merged data can also be used to identify which geographic and socio-economic segments of the population should be targeted for further reductions in light-duty vehicle CO₂ emissions, in order to meet the CO₂-reduction goals of AB32.

COST: \$200,000

TITLE: Using Social Marketing to Alter Community Behavior and Reduce Greenhouse Gas Emissions: Morgan Hill Case Study

PROBLEM: A survey conducted by Yale University indicated that although many people are concerned about climate change, adopting sustainable behaviors conflicts with the social norms of American culture. In addition, addressing climate change requires more than one behavioral change, and many people do not know how to begin or question the impact their personal changes will have on a global scale. Finally, since making a significant difference requires more than one individual, personal efforts may seem futile in a world surrounded by unwilling participants. When addressing communitywide climate change, local government agencies do not have a long history of knowing which programs are effective and are similarly challenged by these personal dynamics.

PREVIOUS WORK: Research indicates that local governments underestimate the influence of social norms and rarely plan social marketing campaigns in accordance to the diffusion model. The diffusion model uses "early adopters" (15% of the population) to lead the way for a new behavior to be adopted by the "early majority" (next 35% of the population.) The expected outcome is that the "late majority" (additional 35% of the population) will be persuaded to implement the new behavior with little marketing effort and the behavior will be considered a norm. In addition, research also suggests that a small group working together to reduce their impact on climate change is more effective than a mass marketing campaign. Small groups effectively address barriers because individuals feel more accountable about their actions, are more likely to adopt a new sustainable behavior when they see others doing it, have a greater pooling knowledge and at the same time are creating a new social norm for the community.

OBJECTIVE: This research aims to determine the expected impact that the "Lose 5,000 Pounds of Carbon in 30 Days" program can have by using social marketing prompts, the diffusion model and small eco-teams.

DESCRIPTION: The City of Morgan Hill has piloted two Carbon Diet Clubs that have reduced an estimated 105,000 pounds of the community's greenhouse gases. The results of the pilot indicate that the program can be easily extended to the larger community and that on average a participant reduces 10,000 pounds of annualized greenhouse gas emissions. This research will extend this campaign to 35% of the households (4,400) in Morgan Hill over a three year period, affecting the majority of the population to create a social norm, and subsequently quantify the program's results.

The program is simple with participating households working in small groups made up of 5 to 8 households, known as a Carbon Diet Club. Each household commits to losing 5,000 pounds of annualized carbon dioxide emissions over a 30 day period. Carbon diet kits are given to each member containing the following:

- *A Carbon Diet Workbook:* This is the most vital component in the campaign. The workbook contains 24 actions split into two sections: cool lifestyles and cool households systems. Each action provides a carbon reduction number if the activity is done (e.g., a participant can reset his/her thermostat and claim a 1,200 lbs. carbon reduction.)

- *Kill-A-Watt*: Participants can check out this device to find phantom energy loss
- *Shower timers, reusable shopping bags and environmental information* related to reducing greenhouse gas emissions
- *A Free Home Energy Audit*

Weekly meetings are hosted by City staff or student interns during the participation month. During the meetings, households act as a support group and discuss problems and solutions to achieving their reduction goal.

This project involves extensive evaluation of the program's results. Specifically, the following research results are anticipated:

- Evaluate the effectiveness of using small groups to address more than one behavioral change to reduce a community's carbon footprint
- Analyze the long-term behaviors that were adopted from the campaign by comparing annual energy bills, vehicle mileage and behaviors before and after participation
- Create a social marketing model that can be utilized in other communities
- Apply the social diffusion model to 12,500 households in Morgan Hill
- Analyze effective groups for campaign targeting, such as churches, homeowner's associations neighborhood blocks or randomly formed groups, that will result in long term behavior changes
- Study how the campaign raised awareness in other areas, e.g. workplace practices
- Survey how home energy audits influence behavior and consumer choices
- Explain how to create a highly visible campaign and provide a cost benefit analysis

This research will provide a model that breaks down the barriers that prevent individuals from changing their behavior. The carbon diet kit in conjunction with group meetings makes the transition to sustainable behaviors easier and more consistent. Households are able to quantitatively define the difference they have made and the campaign creates a social norm.

BENEFITS: Provides a logical process for program planning and evaluation of a social marketing campaign that addresses climate change. Many other California communities will be able to reduce residential greenhouse gas emissions using the results of this research.

COST: \$250,000

COFUNDING/COLLABORATION: The City has budgeted funding to pay 50% of the campaign implementation and has received initial supplementary funding to provide home energy audits from PG&E. The City has begun exploring a relationship with the Lucas Graduate School of Business at San Jose State University to coordinate the evaluative steps of the project.

TITLE: Develop Tools to Assess Public Health Co-Benefits and Risks of Climate Change Policy

PROBLEM: In 2006, the Legislature passed and Governor Schwarzenegger signed AB 32, the Global Warming Solutions Act of 2006, which set the 2020 greenhouse gas emissions reduction goals into law. It directed the California Air Resources Board (ARB) to begin developing discrete early actions to reduce greenhouse gases while also preparing a scoping plan to identify how best to reach the 2020 limit. Implementation of climate-related regulations, such as the Low Carbon Fuel Standard and SB 375, will change emissions profiles and air pollution as well as time-activity patterns of Californians. Integrated assessment of health co-benefits and risks associated with climate policy is critical to ARB's mission. In addition to aggregate health impacts, a tool to assess public health co-benefits and risks of climate change policy should illuminate distribution of effects. For example, facilities will be erected to produce alternate fuels demanded by the Low Carbon Fuel Standard and land will be converted, and the local impacts may be distributed unevenly. While reduced fossil fuel consumption should improve air quality on a regional scale, actual exposures on community levels must be investigated. For example, there is evidence that smart growth and reduced urban sprawl can help combat obesity and its associated risks as well as reduce vehicle miles traveled, thus reducing in-vehicle traffic exposures. However, more pedestrian-friendly environments can also be associated with greater pollution exposures. In addition, land use changes may result in activities to produce alternate fuels, such as agriculture and biorefineries, being located near communities resulting in a changed profile of exposure in these communities.

PREVIOUS WORK: While several studies investigate particular impacts related to climate change policy in isolation, an integrated assessment of climate policy impacts is critical to ARB's mission. For example, studies indicate that neighborhoods with increased walkability reduce obesity and lower blood pressure¹, providing a benefit to the health of the inhabitants of the neighborhood in addition to reducing vehicle miles traveled². However research also indicates that pedestrian friendly environments may result in higher air pollution exposures³. There has been a call for a cost-benefits analysis of the impact of built environment interventions on greenhouse gas emissions and public health, particularly on the more vulnerable populations⁴.

OBJECTIVES: Support ARB's mandate to control greenhouse gas emissions while protecting public health developing a tool for integrated assessment of health co-benefits and risks associated with climate policy is critical to ARB's mission. In addition to aggregate health impacts, this tool should illuminate distribution of effects.

DESCRIPTION: There are several areas that could be emphasized to support the goals of this effort, including:

1. Identify how climate change regulations that alter emissions profiles, such as the Low Carbon Fuel Standard, impact public health at the local and individual level, including the impacts of reduced or changed exposures. Effects on children and the elderly and those with preexisting disease will also be assessed because they are more vulnerable to air pollution.

2. Assess how increases in smart growth may reduce pollution from traffic due to reduced vehicle miles traveled and increased health from reduced exposures and reduced stress due to less time spent in vehicles.
3. Assessment of possible exposures from biorefineries, agricultural activities to grow the crops needed in alternative fuels, as well as processing plants and alternative fuel plants (such as wind power plants) which may increase near communities. The focus will be on groups most affected by these changes, such as lower socioeconomic status communities, since they have fewer resources to move away from areas where increased farming or fuel production plants may be located.
4. Perform a cost-benefit analysis of the impact of interventions in the built environment on greenhouse gas emissions and public health.
5. Evaluate how the potential change in area dedicated to green space due to land use changes may result in health impacts.

BENEFITS: Analyses with these tools will be used by the Air Resource Board to develop and implement climate-related regulations that maximize health benefits, and will guide city planners in developing healthy "cool" communities.

COST: \$400,000

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TITLE: Social Responses to Climatic Changes and Extremes: Potential for and Constraints on Adaptation in the North Coast Wine Country

PROBLEM: Specialty agriculture such as winegrowing is an essential part of California's economy and society. Increasing evidence suggests that winegrowing is highly sensitive to climate change, particularly changes in climate extremes. However, the nature and extent of the biophysical and social (management) sensitivities, as well as the potential capacity and constraints on adaptation of the industry, remain relatively uncharted. These are critical to understand to promote the continuation of a viable local wine industry. The industry presents an excellent case study for examining the vulnerability to climate change as well as the adaptive capacity and barriers to adaptation, which are relevant to other forms of agriculture, and would greatly support California's emerging efforts in adaptation planning.

PREVIOUS WORK: Investigators have demonstrated that winegrape yields are sensitive to the changes in climate projected for California (Lobell et al., 2006a, b; 2007). Initial work also indicates that winegrape quality is sensitive to climate (Hayhoe et al., 2004). General frameworks for vulnerability assessments and adaptive capacity are available (e.g., Adger et al., 2007; Adger, 2006; Smit and Wandel, 2006), and some initial thinking on the types and importance of barriers to adaptation can be used as a first iteration on the constraints that may affect California's viticulture in adapting to climate change (Adger et al., 2009; Moser, 2009).

OBJECTIVE: The overall objective of this project is to comprehensively characterize the vulnerabilities, adaptation options and constraints of the North Coast winegrowing sector to climate change over the next several decades. An integrated social science/physical science vulnerability framework will be used to assess exposure, sensitivity, coping capacity and adaptation constraints of winegrowers to changes in relevant climatic conditions.

DESCRIPTION: Investigators will work closely with members of the wine industry in the North Coast region (here defined to include Napa and Sonoma counties) to conduct a vulnerability analysis of the coupled social-ecological system of winegrowing to climate change. Under this framework, the potential for harm (vulnerability) is a function of *exposure* to a stress such as changes in temperature or other climatic variables, *sensitivity* to that stress, and *ability to respond or adapt* to that stress. Investigators will examine historical management responses to past climate stresses, evaluate current levels of preparedness for climate change in the wine industry, and combine this information with existing and emerging statistically and dynamically downscaled climate scenarios to project the future vulnerability of the industry to climate change.

This work has three main goals, each to be reached through specific tasks: (1) Enhance California's experience in effective decision support through stakeholder dialogue, a broad survey of winegrowers, face-to-face interviews, and ongoing communication with stakeholders; (2) Understand key drivers of the North Coast winegrowing social-ecological system's vulnerability to climate variability and change through a characterization of biophysical and socio-economic sensitivity, exposure and adaptive capacity of winegrowers and the integration into a comprehensive vulnerability

assessment; and (3) Identify the real-world options, priorities, and constraints to adaptation to inform improved adaptation policies and practices through characterization of past vineyard responses to climate stresses, assessment of present preparedness for climate change, and analysis of future adaptation options.

This project will have a specific focus on how extreme events affect winegrowing, as these present some of the most challenging management situations in the winegrowing industry, and are likely to reveal the most difficult constraints on decision-making under uncertainty. We will conduct an economic valuation of the impacts of past extreme events as a first-order baseline for a preliminary and likely incomplete estimation of future economic impacts of climate change on this sector.

Importantly, the proposed project aims not only to advance scientific understanding in several key areas, but to serve as a pioneering test case for California's emerging efforts to identify adaptation options and barriers and use this understanding to provide decision-makers with effective decision support. Insights and results will also be communicated back to the science community to inform future research and scientific assessments such as the state's Climate Action Team reports and the next IPCC assessment.

BENEFITS: This project represents an important advance in California's climate impacts and adaptation research, offering a bottom-up perspective on the State's capacity to deal with unavoidable impacts. Additionally, it will strengthen California's capacity for effective decision support while also advancing several research frontiers.

COST: \$199,885

TITLE: The Impact of Changes in Economic Growth on California's GHG Emissions

PROBLEM: The volume and trend of California's aggregate GHG emissions will vary with its economic growth, increasing the difficulty of estimating the macro-economic effects of achieving a cap in a given year and the effect on certain policies such as the expected price of carbon in a cap and trade program. Every three years from 2012 through 2020, (and beyond), ARB will establish declining aggregate GHG emissions limits (caps) for California. As ARB estimates the feasible and cost-effective greenhouse gas emission reductions that can be achieved through market mechanisms in any given compliance period, it will be helpful to understand how baseline GHG emissions in a range of sectors would respond to projected changes in California's economic growth rate in the absence of climate policy.

BACKGROUND: Three variables strongly influence anthropogenic GHG emissions: population, economic productivity/capita, and carbon-intensity of production. Total GHG emissions can be estimated as the product of these three factors, and their rate of change can be used to estimate the trend of an economy's GHG emissions.

No one of these factors alone can determine the trend of California's GHG emissions. But, all else being equal, a prolonged economic contraction is expected to reduce an economy's rate of GHG emissions growth. Shrinking GDP should reduce per-capita GDP as well as population. In addition, reduction of California's GHG intensity is expected to slow during an economic contraction, as investment in emission-lowering technologies declines. In a prolonged economic expansion, we would expect the opposite impacts.

PREVIOUS WORK: In a 2008 report to Congress, the Congressional Research Service examined the interrelationships of the variables discussed above to explore their implications for policies that address climate change.³

The US Energy Information Administration has developed a national model that predicts energy use in a variety of economic sectors through 2030:

<http://www.eia.doe.gov/oiaf/aeo/aeohighmac.html>.

The World Resources Institute has developed a Climate Analysis Indicators Tool⁴ with a comprehensive and comparable database of greenhouse gas emissions data (including all major sources and sinks) and other climate-relevant indicators.

OBJECTIVE:

This California-specific study analyzes data on GHG emissions across the State's major economic sectors in the period during and prior to the current economic contraction to quantify observed relationships between changes in economic growth and related changes in GHG emissions.

³ Greenhouse Gas Emission Drivers: Population, Economic Development and Growth, and Energy Use
John Blodgett, Specialist in Environmental Policy; Larry Parker, Specialist in Energy and Environmental Policy December 31, 2008

⁴ <http://cait.wri.org/>

DESCRIPTION: The proposed work will entail identification of econometric and emission indicators for selected economic sectors during a defined time period, collection of economic and emission data for the study period. Data analysis will quantify observed relationships between econometric indicators and emissions for selected sectors. Using findings from previous step, investigators will develop sector-specific and aggregated adjustment factors for near-term (3-5 year) GHG emissions projections.

BENEFITS: Results of this research will offer improved understanding of the relationship between changes in economic growth and changes in GHG emissions, the ability to more accurately project aggregate and sector-specific GHG emissions of California's economy, and more effective design of market-based GHG emission reduction programs.

COST: \$100,000

TITLE: Scenario planning for 80% reduction in 2050

PROBLEM: Reducing greenhouse gases by 80 percent will require a complete transformation of the state's energy economy affecting every sector including electricity production, transportation and fuels, rural and urban land use, industry, agriculture and even the way we heat our homes and businesses. One of the challenges of developing strategies and policies to achieve this target is the difficulty of envisioning what our state might look like when we succeed. Scenario planning is a process of visualizing (1) probable future conditions or events, (2) consequences or effects of these future conditions, and (3) skillful means to respond to, or benefit from, future conditions. Scenario planning can be a valuable tool to help policy-makers and stakeholders define a portfolio of programs, policies, and strategies that will be most effective in achieving goals.

OBJECTIVE: To develop a set of plausible and positive scenarios for the future of California that achieves the 2050 targets (80% reduction) for greenhouse gas emissions. Scenarios will include sufficient detail such that they could be used to inform the policy makers who are working to achieve the goal. This would include information on technical, institutional, and political barriers that would need to be addressed to achieve the scenario.

DESCRIPTION: The research should include four subtasks, including:

1. Evaluation of existing long-range scenarios including those from CEC, UC, USDOE, IEA, Shell, and others and their relevance to California.
2. Development of a set of comprehensive scenarios across all sectors to illustrate several futures in which California achieves its 2050 goal of reducing economy-wide GHG's by 80%.
3. Development of a set of sector-specific scenarios to address more detailed questions including for the following sectors:
 - a. Transportation (example below)
 - b. Power generation
 - c. Industrial, Residential and Commercial facilities (IRC), including cooling and space/process heating
 - d. Agriculture/Forestry
 - e. Other? (High GWP, Black carbon, etc.)
4. Engage with key stakeholders to inform the scenario development and discuss the implications of the scenarios for policy-making.

For Transportation (example – other sectors to be fleshed out in solicitation):

Scenarios should consider all transportation subsectors, and identify strategies for improving efficiency, lowering the carbon intensity of fuels, and reducing travel demand. This analysis should address the following specific questions:

- What potential combination of vehicle sales, fleet composition, fuels usage, and GHG emissions is implied by achieving 80% GHG emission reductions by 2050?
- What are the various technology barriers and market constraints that must be overcome to achieve market share for the most promising low-carbon options?
- What are the resource constraints on pursuing the various energy carriers (electricity, hydrogen, low-carbon liquid biofuels)?

BENEFITS: Results of this research will help ARB synthesize a portfolio of regulations that will support realization of climate change goals and identify promising policies to support technologies and economic investment that will facilitate realization of climate change goals.

COST: \$150,000

TITLE 17. CALIFORNIA AIR RESOURCES BOARD**NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF PROPOSED AMENDMENTS TO THE CALIFORNIA CONSUMER PRODUCTS REGULATIONS**

The Air Resources Board (Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the Regulation for Reducing Emissions from Consumer Products, and Method 310, "Determination of Volatile Organic Compounds (VOC) in Consumer Products and Reactive Organic Compounds in Aerosol Coating Products."

DATE: September 24, 2009

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 E. Copley Dr.
Diamond Bar, California 91765

This item will be considered at a two day hearing of the Board, which will commence at 9:00 a.m., September 24, 2009, and may continue at 8:30 a.m., September 25, 2009. This item may not be considered until September 25, 2009. Please consult the agenda for the hearing, which will be available at least 10 days before September 24, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to sections 94508, 94509, 94510, 94511, 94512, 94513, and 94515, title 17, California Code of Regulations (CCR) and proposed amendments to Method 310, adopted September 25, 1997, as last amended May 5, 2005, which is incorporated by reference in section 94515, title 17, CCR, to add new sections 3.3.7, 4.3, 4.3.1, and 4.3.2.

Background:

Section 41712 of the California Health and Safety Code requires ARB to adopt regulations to achieve the maximum feasible reduction in VOC emissions from consumer products. As part of the regulatory process, ARB must determine that adequate data exist for it to adopt the regulations. ARB must also determine that the

regulations are technologically and commercially feasible, and necessary to carry out the Board's responsibilities under Division 26 of the Health and Safety Code. In addition, Health and Safety Code section 41712(c) provides that no regulation shall be adopted which requires the elimination of a product form. Section 41712 is primarily directed at attaining the State and federal ozone standards.

Pursuant to Health and Safety Code section 41712, ARB has adopted the Regulation for Reducing Emissions from Consumer Products (the "Consumer Products Regulation;" title 17, CCR, sections 94507-94517.

On September 25, 2007, ARB adopted the State Strategy for California's 2007 State Implementation Plan (2007 SIP). The 2007 SIP serves as California's overall plan to provide the emission reductions necessary to meet the federal ozone standard of 0.08 parts per million averaged over eight hours. The 2007 SIP anticipated that an additional 30 to 40 tons per day of VOC reductions will be achieved from consumer products statewide by January 1, 2014. The amendments approved by the Board at its June 26, 2008, hearing constitute the first 4.5 tons per day in meeting this target. Achieving additional VOC reductions from consumer products is an important element of the 2007 SIP and is necessary to attain State and federal air quality standards.

In 2006, Assembly Bill 32, The California Global Warming Solutions Act of 2006 (AB 32), was signed into law. AB 32 creates a comprehensive, multi-year program to reduce greenhouse gas (GHG) emissions in California, and added Division 25.5 (commencing with §38500) to the Health and Safety Code. Among other things, AB 32 requires ARB to design and adopt a Scoping Plan, by January 1, 2009, that identifies how GHG emissions can be reduced to 1990 levels.

AB 32 also recognizes that immediate progress in reducing GHG emissions can and should be made. In October 2007, the ARB approved a list of early action GHG emission reduction measures. A subset of these early action measures was identified as Discrete Early Action Measures. Discrete Early Action measures are Board adopted regulations to reduce GHG emissions, which are to be legally effective by January 1, 2010. One of the approved Discrete Early Action Measures is to reduce the use of compounds with high global warming potentials in consumer products. The goal of this measure is to achieve, at a minimum, an emissions reduction equivalent to reducing 0.25 million metric tons of carbon dioxide per year. The amendments approved at the June 26, 2008, hearing will provide about 0.23 million metric tons of CO₂ equivalents per year toward meeting the emission reduction target. The proposed amendments for this rulemaking will prevent the potential increased use of high global warming potential (GWP) compounds as products are reformulated to meet the new VOC limits for Double Phase Aerosol Air Freshener, Paint Thinner, and Multi-purpose Solvent products.

Description of Proposed Regulatory Action

The proposed regulatory action would amend the existing Consumer Products Regulation by adding and modifying product category definitions and by establishing new or lower VOC limits for three categories: 1) Double Phase Aerosol Air Fresheners, 2) Multi-Purpose Solvents and 3) Paint Thinners. For Double Phase Aerosol Air Fresheners, Staff is proposing to reduce the VOC limit from 25 to 20 percent by weight effective December 31, 2012. For the Multi-purpose Solvent and Paint Thinner categories, we are proposing two tiers of VOC limits. For both categories, the first tier limit is 30 percent by weight effective December 31, 2010, and the proposed second tier limit is 3 percent by weight effective December 31, 2013. For all three categories, the proposed limits will achieve a total VOC reduction of 14.7 tons per day statewide by January 1, 2014. This represents a 54 percent reduction in emissions from these categories.

To ensure that the reductions achieved by the Discrete Early Action Measure for consumer products occur, and greenhouse gas emissions do not increase, the proposed amendments would also limit the use of compounds with high GWP in the three product categories for which VOC limits are being proposed. These products could only use compounds with GWP factors below 150. The GWP values to be used in determining compliance are those set forth in the Intergovernmental Panel on Climate Change, Second Assessment Report.

New definitions and modifications to existing definitions are also being proposed. New definitions include "Aromatic Compound," "Artist's Solvent/Thinner," "High Temperature Coating," "Industrial Maintenance Coating," "Paint Clean-up," and "Zinc-Rich Primer." These new definitions are necessary to clarify the proposed amendments with respect to the new paint thinner standards. Modified definitions include "ASTM," "Multi-purpose Solvent," and "Paint Thinner." The ASTM definition was changed to reflect the revised name of the organization that sets the ASTM methods. The Multi-purpose Solvent and Paint Thinner definitions were modified to clarify products which are exempt from, or included, in the categories and to improve enforcement of the regulation. In addition, there are size modifications in the definitions for both dilutable and pre-mixed Automotive Windshield Washer Fluids. The definitions now state that Dilutable Windshield Washer Fluids are sold in containers greater than 10 gallons or one quart or less, while Pre-mixed Automotive Windshield Washer Fluids are sold in containers greater than one quart but less than 10 gallons.

The proposed regulatory action specifies other requirements for Multi-purpose Solvents and Paint Thinners. One proposed requirement is to prohibit the use of the toxic air contaminants methylene chloride, perchloroethylene, and trichloroethylene. Another proposed requirement is to temporarily prohibit manufacturers of flammable or extremely flammable products from using generic product names such as "Multi-purpose Solvent," "Paint Thinner," or "Paint Clean-up." This prohibition is intended to address concerns about the potential change in flammability of Multi-purpose Solvents and Paint Thinners that could occur as a result of the proposed amendments. The

prohibition does not apply to products that either include a hang tag or sticker with the statement "Formulated to meet California VOC limits; see warnings on label;" or products which display the name of the chemical that results in the product meeting criteria for "flammable" or "extremely flammable," such as "Acetone" in a font size at least as large as any other words on the principle display panel. This prohibition would be effective December 31, 2010 through December 31, 2015. In addition, to enhance enforceability, Staff is proposing that the total VOC content within the product formulation must be clearly displayed on the product container. Further, Staff is proposing to limit the aromatic compound content in these categories to address possible ozone forming potential increases and maximize air quality benefits. Finally, there are new proposed data reporting requirements for Multi-purpose Solvents and Paint Thinners, which are necessary for ARB staff to perform a technical assessment of the progress of reformulation efforts in advance of the second tier VOC limits.

The proposed changes to Method 310 are clarifications to specify analytical methods already being used and/or are needed to enhance the enforceability of the new, lower VOC limits that will become effective by 2010. The proposed changes also include new VOC content calculations for products with high water content or low VOC content.

A number of minor changes are also proposed to various provisions of the regulation in order to correct errors or improve clarity.

COMPARABLE FEDERAL REGULATIONS

The U.S. Environmental Protection Agency (U.S. EPA) has promulgated a national consumer products rule under section 183(e) of the federal Clean Air Act (40 CFR Part 59, subpart C, §§59.201 *et seq.*). The rule specifies VOC limits for a number of consumer product categories, and is similar in format to ARB's consumer products regulation.

Although the national regulation is similar in many aspects to the California regulation, it is less effective in reducing VOC emissions from consumer products. The U.S. EPA's rule does not regulate a number of product categories that are currently regulated under the ARB regulation. For the categories that are regulated under both rules, many of ARB's limits are more stringent than the U.S. EPA's limits. Because California has unique air quality problems, we must reduce VOC emissions from all categories, including consumer products, to the maximum extent feasible, to attain the federal and State ambient air quality standards for ozone.

The U.S. EPA's rule also differs in that it applies nationwide to consumer product manufacturers, importers and distributors (but not retailers), while the ARB regulation applies to any person (including retailers) who "sells, supplies, offers for sale, or manufactures consumer products for use in the State of California." Finally, the U.S. EPA's rule has an unlimited "sell-through" period for non-complying products manufactured before the effective date of the limits, whereas California law limits the sell-through period to three years.

U.S. EPA's consumer products rule also does not prohibit the use of certain toxic air contaminants. In aggregate, ARB's consumer products regulations have prohibited the use of certain chlorinated toxic air contaminants in 70 categories, resulting in emission reductions of over 13 tons per day.

There is no comparable federal regulation related to reducing GHG emissions in consumer products.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes the rationale for the proposed amendments and a summary of the potential environmental and economic impacts.

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing on September 24, 2009.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons identified below, or may be accessed on the ARB's website listed below.

Inquiries concerning the substance of the proposed regulatory action may be directed to Mr. David Mallory, Manager, Measures Development Section, Stationary Source Division, at (916) 445-8316, or Ms. Trish Johnson, Air Pollution Specialist, at (916) 445-3365.

Further, the agency representative and designated back-up contact persons, to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Lori Andreoni, Manager, Board Administration and Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB's website for this rulemaking at www.arb.ca.gov/regact/2009/cpmthd310/cpmthd310.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the cost or savings necessarily incurred by public agencies and private persons and business in reasonable compliance with the proposed regulatory action are presented below.

The Executive Officer has determined that the proposed regulatory action will not create costs or savings as defined in Government Code section 11346.5(a)(5) and 11346.5(a)(6) to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary cost or savings to State or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons and businesses. The Executive Officer has initially determined that there will be a potential cost impact on private persons or businesses directly affected as a result of the proposed regulatory action. As explained in the ISOR, the proposed amendments may have a significant adverse impact on some individual businesses but the overall statewide impacts are not expected to be significant.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has initially determined that the proposed amendments should have minimal impacts on the creation or elimination of jobs within the State of California, minimal impacts on the creation of new businesses and the elimination of existing businesses within the State of California, and minimal impacts on the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed amendments can be found in the ISOR.

The Board's Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will affect small businesses.

Before taking final action on the proposed regulatory action, ARB must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons or businesses than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the hearing, and may also be submitted by postal mail or by electronic submittal before the hearing. To be considered by the Board, written submissions not physically submitted at the hearing must be received no later than **12:00 noon, September 23, 2009**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require, that 20 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted in sections 38501, 38510, 38560, 38562, 38580, 39600, 39601, 41511, and 41712 of the Health and Safety Code. This action is proposed to implement, interpret, or make specific sections 38501, 38510, 38560, 38562, 38580, 39600, 39601, 41511, and 41712 of the Health and Safety Code.

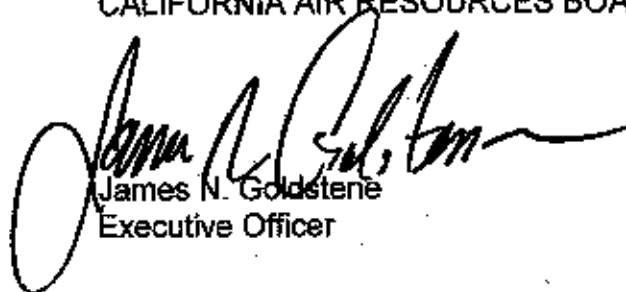
HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice and that the regulatory language as modified could result from the proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15-days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstone
Executive Officer

Date: July 28, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our website at www.arb.ca.gov.

California Environmental Protection Agency



Air Resources Board



**PROPOSED AMENDMENTS TO THE CALIFORNIA
CONSUMER PRODUCTS REGULATIONS**

INITIAL STATEMENT OF REASONS

**Release Date:
August 7, 2009**



TITLE 17. CALIFORNIA AIR RESOURCES BOARD**NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF PROPOSED AMENDMENTS TO THE CALIFORNIA CONSUMER PRODUCTS REGULATIONS**

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DATE: September 24, 2009

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 E. Copley Dr.
Diamond Bar, California 91765

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INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to sections 94508, 94509, 94510, 94511, 94512, 94513, and 94515, title 17, California Code of Regulations (CCR) and proposed amendments to Method 310, adopted September 25, 1997, as last amended May 5, 2005, which is incorporated by reference in section 94515, title 17, CCR, to add new sections 3.3.7, 4.3, 4.3.1, and 4.3.2.

Background:

Section 41712 of the California Health and Safety Code requires ARB to adopt regulations to achieve the maximum feasible reduction in VOC emissions from consumer products. As part of the regulatory process, ARB must determine that adequate data exist for it to adopt the regulations. ARB must also determine that the

regulations are technologically and commercially feasible, and necessary to carry out the Board's responsibilities under Division 26 of the Health and Safety Code. In addition, Health and Safety Code section 41712(c) provides that no regulation shall be adopted which requires the elimination of a product form. Section 41712 is primarily directed at attaining the State and federal ozone standards.

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Description of Proposed Regulatory Action

The proposed regulatory action would amend the existing Consumer Products Regulation by adding and modifying product category definitions and by establishing new or lower VOC limits for three categories: 1) Double Phase Aerosol Air Fresheners, 2) Multi-Purpose Solvents and 3) Paint Thinners. For Double Phase Aerosol Air Fresheners, Staff is proposing to reduce the VOC limit from 25 to 20 percent by weight effective December 31, 2012. For the Multi-purpose Solvent and Paint Thinner categories, we are proposing two tiers of VOC limits. For both categories, the first tier limit is 30 percent by weight effective December 31, 2010, and the proposed second tier limit is 3 percent by weight effective December 31, 2013. For all three categories, the proposed limits will achieve a total VOC reduction of 14.7 tons per day statewide by January 1, 2014. This represents a 54 percent reduction in emissions from these categories.

To ensure that the reductions achieved by the Discrete Early Action Measure for consumer products occur, and greenhouse gas emissions do not increase, the proposed amendments would also limit the use of compounds with high GWP in the three product categories for which VOC limits are being proposed. These products could only use compounds with GWP factors below 150. The GWP values to be used in determining compliance are those set forth in the Intergovernmental Panel on Climate Change, Second Assessment Report.

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prohibition does not apply to products that either include a hang tag or sticker with the statement "Formulated to meet California VOC limits; see warnings on label," or products which display the name of the chemical that results in the product meeting criteria for "flammable" or "extremely flammable," such as "Acetone" in a font size at least as large as any other words on the principle display panel. This prohibition would be effective December 31, 2010 through December 31, 2015. In addition, to enhance enforceability, Staff is proposing that the total VOC content within the product formulation must be clearly displayed on the product container. Further, Staff is proposing to limit the aromatic compound content in these categories to address possible ozone forming potential increases and maximize air quality benefits. Finally, there are new proposed data reporting requirements for Multi-purpose Solvents and Paint Thinners, which are necessary for ARB staff to perform a technical assessment of the progress of reformulation efforts in advance of the second tier VOC limits.

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A number of minor changes are also proposed to various provisions of the regulation in order to correct errors or improve clarity.

COMPARABLE FEDERAL REGULATIONS

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Although the national regulation is similar in many aspects to the California regulation, it is less effective in reducing VOC emissions from consumer products. The U.S. EPA's rule does not regulate a number of product categories that are currently regulated under the ARB regulation. For the categories that are regulated under both rules, many of ARB's limits are more stringent than the U.S. EPA's limits. Because California has unique air quality problems, we must reduce VOC emissions from all categories, including consumer products, to the maximum extent feasible, to attain the federal and State ambient air quality standards for ozone.

The U.S. EPA's rule also differs in that it applies nationwide to consumer product manufacturers, importers and distributors (but not retailers), while the ARB regulation applies to any person (including retailers) who "sells, supplies, offers for sale, or manufactures consumer products for use in the State of California." Finally, the U.S. EPA's rule has an unlimited "sell-through" period for non-complying products manufactured before the effective date of the limits, whereas California law limits the sell-through period to three years.

U.S. EPA's consumer products rule also does not prohibit the use of certain toxic air contaminants. In aggregate, ARB's consumer products regulations have prohibited the use of certain chlorinated toxic air contaminants in 70 categories, resulting in emission reductions of over 13 tons per day.

There is no comparable federal regulation related to reducing GHG emissions in consumer products.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes the rationale for the proposed amendments and a summary of the potential environmental and economic impacts.

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing on September 24, 2009.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons identified below, or may be accessed on the ARB's website listed below.

Inquiries concerning the substance of the proposed regulatory action may be directed to Mr. David Mallory, Manager, Measures Development Section, Stationary Source Division, at (916) 445-8316, or Ms. Trish Johnson, Air Pollution Specialist, at (916) 445-3365.

Further, the agency representative and designated back-up contact persons, to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Lori Andreoni, Manager, Board Administration and Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB's website for this rulemaking at www.arb.ca.gov/regact/2009/cpmthd310/cpmthd310.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the cost or savings necessarily incurred by public agencies and private persons and business in reasonable compliance with the proposed regulatory action are presented below.

The Executive Officer has determined that the proposed regulatory action will not create costs or savings as defined in Government Code section 11346.5(a)(5) and 11346.5(a)(6) to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary cost or savings to State or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons and businesses. The Executive Officer has initially determined that there will be a potential cost impact on private persons or businesses directly affected as a result of the proposed regulatory action. As explained in the ISOR, the proposed amendments may have a significant adverse impact on some individual businesses but the overall statewide impacts are not expected to be significant.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has initially determined that the proposed amendments should have minimal impacts on the creation or elimination of jobs within the State of California, minimal impacts on the creation of new businesses and the elimination of existing businesses within the State of California, and minimal impacts on the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed amendments can be found in the ISOR.

The Board's Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will affect small businesses.

Before taking final action on the proposed regulatory action, ARB must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome, to affected private persons or businesses than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the hearing, and may also be submitted by postal mail or by electronic submittal before the hearing. To be considered by the Board, written submissions not physically submitted at the hearing must be received no later than **12:00 noon, September 23, 2009**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

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Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require, that 20 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted in sections 38501, 38510, 38560, 38562, 38580, 39600, 39601, 41511, and 41712 of the Health and Safety Code. This action is proposed to implement, interpret, or make specific sections 38501, 38510, 38560, 38562, 38580, 39600, 39601, 41511, and 41712 of the Health and Safety Code.

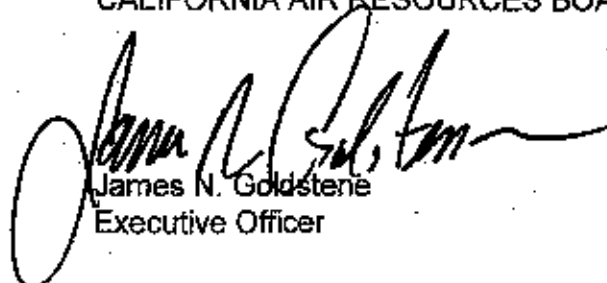
HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice and that the regulatory language as modified could result from the proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15-days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstone
Executive Officer

Date: July 28, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our website at www.arb.ca.gov.

**State of California
AIR RESOURCES BOARD**

**INITIAL STATEMENT OF REASONS
FOR PROPOSED AMENDMENTS TO THE
CALIFORNIA CONSUMER PRODUCTS REGULATIONS**

To be considered by the Air Resources Board at a
Public Hearing on September 24-25, 2009, at:

South Coast Air Quality Management District
Auditorium
21865 E. Copley Dr.
Diamond Bar, CA 91765

Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

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**State of California
AIR RESOURCES BOARD**

**PROPOSED AMENDMENTS TO THE
CALIFORNIA CONSUMER PRODUCTS REGULATIONS**

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**State of California
AIR RESOURCES BOARD**

**Initial Statement of Reasons for Proposed Amendments to the
California Consumer Products Regulations**

Executive Summary

EXECUTIVE SUMMARY

In this rulemaking, California Air Resources Board (ARB or Board) staff is proposing amendments to the Regulation for Reducing Emissions from Consumer Products (Consumer Products Regulation) and to Method 310 – Determination of Volatile Organic Compounds (VOC) in Consumer Products and Reactive Organic Compounds in Aerosol Coating Products (Method 310). The amendments are designed to reduce VOC emissions. The proposed amendments would set new VOC limits for Multi-purpose Solvent and Paint Thinner products and lower the existing VOC limit for Double Phase Aerosol Air Fresheners. When fully implemented, about 14.7 tons per day of VOC emission reductions would be achieved. We are proposing to prohibit the use of the Toxic Air Contaminants (TAC) methylene chloride, perchloroethylene, and trichloroethylene in Multi-purpose Solvent and Paint Thinner products. In addition, the aromatic content would be limited to 1 percent by weight in these categories. Compounds with high global warming potential (GWP) would be prohibited, under the proposal, in all three of the categories proposed for regulation.

The proposed toxic compound prohibitions and the GWP limits are mitigation measures designed to ensure that exposure to chlorinated solvent compounds and compounds with a high GWP are not used, respectively, as products are reformulated to meet new VOC limits. Further, the limit on the use of aromatic compounds is a mitigation measure designed to prevent an increase in ozone forming potential of reformulated products.

The regulation is codified in title 17, California Code of Regulations, sections 94507-94517. The proposed amendments to reduce VOC emissions would partially fulfill the consumer products reduction commitment contained in the State Strategy for California's 2007 State Implementation Plan (Strategy).

As proposed, new language additions to Method 310 would clarify analytical methods used to test low VOC or high water content consumer products. Other amendments would clarify and improve existing regulatory provisions.

This Executive Summary, together with Appendix A, the Technical Support Document, is the Initial Statement of Reasons for Proposed Rulemaking required by the California Administrative Procedure Act. Appendix B contains the regulation, and Method 310, with the proposed changes shown in underline and ~~strikeout~~ format.

Among other things, this Executive Summary provides a description of the proposed amendments to the Consumer Products Regulation and to Method 310, and explains the rationale for the proposed changes. In accordance with Government Code section 11346.2(a)(1), a "plain English" summary of the proposal is provided in Chapter V of the Technical Support Document (Appendix A).

A. AUTHORITY TO REGULATE CONSUMER PRODUCTS

Consumer products are chemically formulated products used by household and institutional consumers. Examples include detergents; cleaning products; floor finishes; personal care products; lawn and garden products; air fresheners; disinfectants; automotive specialty products; paint thinners; multi-purpose solvents; and aerosol paints.

The Health and Safety Code sets forth ARB's authority to regulate consumer products to control VOCs and greenhouse gases (GHG). Section 41712 specifies requirements to reduce VOC emissions as a ground-level ozone control strategy. Section 38500 *et seq.*, establishes authority to reduce the impacts of GHGs used in consumer products to slow climate change.

1. Health and Safety Code section 41712

In 1988, the California Clean Air Act (CCAA or "the Act") added section 41712 to the California Health and Safety Code. The intent of section 41712 is primarily to reduce ground-level ozone concentrations. Section 41712, along with subsequent amendments, requires ARB to adopt regulations to achieve the maximum feasible reduction in VOC emissions from consumer products. The CCAA specified that attainment of the California State ambient air quality standards is necessary to promote and protect public health, particularly of children, older people, and those with respiratory diseases. The Legislature also directed that these standards be attained by the earliest practicable date.

Prior to adoption, the Board must determine that adequate data exist to establish that the regulations are necessary to attain State and federal ambient air quality standards; and the regulations are commercially and technologically feasible. The Act further stipulates that regulations adopted must not eliminate any product form, and that recommendations from health professionals be considered when developing VOC control measures for health benefit products.

2. Health and Safety Code section 38500 *et seq.*

In 2006, Assembly Bill (AB) 32, The California Global Warming Solutions Act of 2006, was signed into law. This law created a comprehensive, multi-year program to reduce GHG emissions in California. The California Health and Safety Code, commencing with section 38500, contains the provisions. AB 32 requires ARB to develop regulations and consider market-based compliance mechanisms that will ultimately restore California's GHG emissions to the 1990 baseline year by 2020. Beyond the requirements of AB 32, the Governor's Executive Order EO-S-03-05 calls for an 80 percent GHG reduction from 1990 levels by 2050.

AB 32, among other things, requires immediate progress, described as Discrete Early Action Measures, to reduce GHGs. Discrete Early Action Measures are defined as regulations adopted to reduce GHG emissions that become enforceable by January 1, 2010. Reduction of compounds with high GWP that are used in consumer products has been designated as a Discrete Early Action Measure (ARB, 2007b).

B. EXISTING REGULATIONS

Over the last twenty years, the Board has taken numerous actions to fulfill the legislative mandates pertaining to the regulation of consumer products. Three regulations have been adopted that affect 125 consumer product categories by setting 174 VOC limits. These limits, when fully effective, will have resulted in reducing emissions by about 200 tons per day, an overall 44 percent reduction in VOC emissions from consumer products. At its June 26, 2008, hearing, the Board approved amendments that set new or lower VOC limits for 19 categories of consumer products with an additional 25 VOC limits (ARB, 2008e). These amendments became legally effective on July 18, 2009 and will reduce VOC emissions by an additional 5.8 tons per day when fully effective. The June 2008 amendments also established the first limit to reduce the impact of Pressurized Gas Duster product emissions on global warming. Limiting the emissions of GHGs in this category is equivalent to reducing about 0.2 million metric tons of carbon dioxide per year.

We have also reduced exposure to Toxic Air Contaminants (TACs). Emissions of TACs have been reduced by over 13 tons per day by prohibiting use of chlorinated compounds in 70 categories.

In addition, two voluntary regulations, the Alternative Control Plan and the Hairspray Credit Program, have been adopted to provide compliance flexibility to companies. These five regulations are codified in title 17, California Code of Regulations, sections 94500 to 94575.

C. REGULATORY DEVELOPMENT PROCESS

In order to involve the public, the Consumer Products Regulation Workgroup (CPRWG), was reconvened in 2004. Participation in the CPRWG was, and continues to be, open to any member of the public. The CPRWG participated in the development of the 2006 Consumer and Commercial Products Survey (2006 Survey) and 2008 Paint Thinner and Multi-purpose Solvent Survey Update (Survey Update). These surveys serve as the basis for this proposal. The CPRWG was instrumental in the development of these proposed amendments. Consumer product manufacturers; chemical producers; marketers; trade associations; environmental groups; air districts; and various other stakeholders are all active participants.

In addition to the CPRWG meetings, an initial public meeting was held in August of 2008 to begin the public process of developing this proposal. A public workshop to discuss the data from the 2006 Survey and Survey Update, as well as proposed VOC

limits, was held on April 1, 2009. Prior to the April workshop, we posted materials to the consumer products program website for review and comment. A second public workshop to discuss the proposed amendments with stakeholders is scheduled for early August 2009.

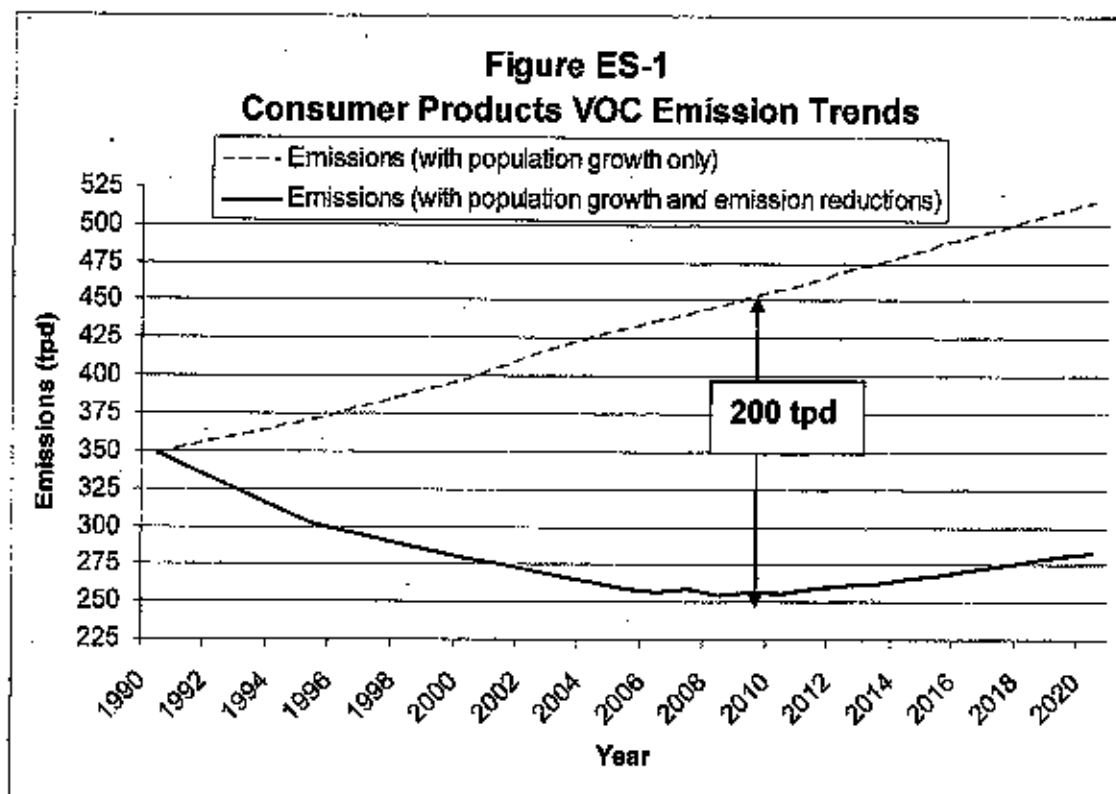
D. VOC EMISSIONS

Although each consumer product may seem to be a small source of VOC emissions, the cumulative use of these products by over 38 million Californians results in significant VOC emissions (DOF, 2008). Given the severity of the air pollution problems in California, further emission reductions from all sources contributing to the formation of ground-level ozone are necessary.

Emissions of VOCs from consumer products contribute to the formation of both ground-level ozone and particulate matter pollution. This section, however, focuses on reducing emissions from consumer products as a ground-level ozone control strategy. As evidence of the magnitude of consumer product VOC emissions, it is estimated that in 2010 consumer products emissions will be approximately 255 tons per day, or about 12 percent of the overall Statewide VOC inventory. In this same year, consumer product emissions will comprise about 19 and 7 percent of VOC emissions in the South Coast Air Quality Management District (SCAQMD) and the San Joaquin Valley Air Pollution Control District (SJVAPCD), respectively. Without further actions, consumer product emissions are expected to grow to approximately 283 tons per day in 2020, representing 14 percent of statewide VOC emissions (ARB, 2009a).

As control measures for other VOC sources become effective, consumer product emissions become more important in the SCAQMD. It is estimated that emissions from consumer products will be the largest source of VOC emissions in the SCAQMD in 2020. While the ozone forming potential of consumer product emissions is less than some other source categories (e.g., light duty passenger vehicles), clearly, further reductions in VOC emissions from consumer products and other VOC sources are needed if attainment of the State and federal ozone standards are to be achieved.

Despite these projections, ARB's consumer products program has made significant progress. Since 1989, ARB regulations, along with numerous amendments to the regulations, have substantially reduced VOC emissions from consumer products. Absent these regulations today, consumer product emissions would likely be about 450 tons per day. Figure ES-1 shows that statewide consumer product VOC emissions have been reduced by over 200 tons per day in 2010. However, Figure ES-1 also shows that without further actions population growth will likely reverse the trend.



The emission values in Figure ES-1 are derived from several data sources. The 1990 to 2007 emissions are taken from the ARB Forecasted Emissions by Summary Category, 2008 Almanac (ARB, 2008c). Emissions are then grown in proportion to population increase. Population growth is in accordance with estimates in the California Environmental Protection Agency's (Cal/EPA) Statewide Human Population Table found in the Population and Vehicle Trends Report (ARB, 2008d). For categories regulated in the 2006 and 2008 Consumer Products Amendments, emission values from the 2003 Consumer and Commercial Products Survey and the projected emissions reductions resulting from the VOC limits approved in 2006 and 2008, are reflected in Figure ES-1.

E. CONSUMER PRODUCT VOC EMISSION REDUCTION COMMITMENTS IN THE STATE IMPLEMENTATION PLAN (SIP)

Reduction of VOC emissions is necessary to attain the ambient air quality standards for ozone. In 1988, with the passing of the CCAA, the importance of controlling emissions from consumer products was set forth. To meet the federal ozone standard, in 1994 emission reductions from consumer products became part of the State Implementation Plan (SIP) for ozone. In this SIP, consumer products measures were put in place to work towards attaining the federal peak one-hour ambient air quality standard for ozone. In the 2003 SIP, ARB again reiterated the commitment to reduce consumer products VOC emissions to meet the one-hour federal ozone standard.

In response to these mandates, three regulations with 174 VOC limits for 125 categories of consumer products (including antiperspirants and deodorants and 36 aerosol coating products categories) were established. The adopted limits to meet these commitments will achieve a 44 percent reduction in overall VOC emissions from consumer products by the year 2010.

However, the 2003 SIP was withdrawn and the remaining consumer product emission reduction commitment was incorporated into the 2007 Strategy. This Strategy includes California's plan to attain the national ozone standard of 0.08 parts per million (ppm) averaged over eight-hours. In the Strategy, ARB has committed to an additional 30 to 40 tons per day VOC reduction from consumer products by January 1, 2014. The amendments that became effective on July 18, 2009, provide the first increment, about 4.5 tons per day, toward meeting the commitment. An additional emission reduction of about 1.3 tons per day will be achieved in 2015.

Table ES-1 shows our progress toward meeting the consumer products commitment in the Strategy. The anticipated 2010 Amendments include four cleaning products categories, (non-aerosol General Purpose Cleaners and Degreasers, Glass Cleaners, and aerosol Furniture Maintenance Products) which staff are currently evaluating for further reductions. Additional discussion regarding these categories can be found in section L, Future Plans. We are continuing the review of data from the 2006 Consumer and Commercial Products Survey as a further basis for identifying and evaluating additional categories for emission reduction opportunities. If feasible, additional proposals would be brought for consideration before the Board in 2010.

Table ES-1
Consumer Product VOC Reductions Accredited Toward SIP Commitment

| Consumer Products Rulemaking | VOC Reductions (tons per day) |
|--|-------------------------------|
| June 2008 Amendments | 4.5 |
| September 2009 Amendments (this proposal) | 14.7 |
| 2010 Cleaning Products Amendments (under development) | 5 – 8 |
| Additional Reductions from 2006 Survey Product Categories | 5.8 – 12.8 |
| Totals Reductions by January 1, 2014 | 30 – 40 |

The Strategy also acknowledges that VOC reductions from consumer products are becoming more difficult to achieve. In light of this, the Strategy includes a commitment to explore innovative reduction strategies in the longer term. These measures would include investigating emission reduction opportunities through reactivity-based standards and alternative market-based mechanisms. If these mechanisms cannot produce meaningful emission reductions from the consumer products source category, then other approaches would be evaluated. Some of these approaches include the purchase of VOC emission reduction credits; and funding of special projects to reduce

emissions or accelerate reductions from pollution sources outside of the consumer products industry.

The amendments proposed in this rulemaking are the second increment of emission reductions which further fulfill the Strategy commitment for VOC reductions from consumer products.

F. SCAQMD RULE 1143 – CONSUMER PAINT THINNERS AND MULTI-PURPOSE SOLVENTS

In March 2009, SCAQMD adopted Rule 1143, "Consumer Paint Thinners and Multi-Purpose Solvents" which, upon the effective date, will achieve VOC emissions reductions from consumer Multi-purpose Solvents and Paint Thinners used in the South Coast Air Basin. The VOC limits we are proposing for Multi-purpose Solvents and Paint Thinners are new limits for previously unregulated categories. In absence of a statewide regulation, SCAQMD has the authority to adopt limits affecting these products.

Upon approval of this proposal and implementation of SCAQMD Rule 1143, manufacturers of Multi-purpose Solvent and Paint Thinner products will be required to meet the Rule 1143 limits for products sold or supplied for use in the South Coast Air Basin, and the statewide limits for products sold to all areas of California, outside the South Coast Air Basin. The VOC limits we are proposing are virtually equivalent to those adopted by SCAQMD, however, the effective dates are different. The effective dates for Rule 1143 are January 1, 2010, and January 1, 2011 for the first and second tier VOC limits respectively, while our proposed effective dates are December 31, 2010 and December 31, 2013.

We are proposing to provide one additional year for manufacturers to meet the first tier limit simply due to the time necessary for State regulations to become legally effective, per State law, compared to the shortened time frame for local air district rules to become legally effective. For the second tier limit, we believe it has not been demonstrated that products meeting the 3 percent VOC limit will function as paint thinners for all solvent-borne coatings available in commerce. While we are encouraged about the future viability of low VOC thinners, such as soy based products, it has not yet been demonstrated that they are ready for introduction into the market. There is still a need for paint thinners that are compatible with solvent-borne coatings, for a period of time, in areas of the State other than the South Coast Air Basin because SCAQMD has more stringent VOC coating limits than many other areas of the state. Therefore, we determined it was appropriate that the second tier, 3 percent VOC limit be effective December 31, 2013, giving manufacturers sufficient time to develop low VOC thinners that are compatible with solvent-borne coatings.

Additionally, the second tier limit could lead to an increase in sales of more highly flammable products, such as acetone. An acetone-based "Paint Thinner" product will function differently than the former "Paint Thinner" product. Without enough lead time,

we are concerned that acetone products will be the most likely pathway to compliance. To allow sufficient time for development of less flammable, and/or less costly alternatives, we are proposing an effective date of December 31, 2013 for the 3 percent VOC limit.

In order to avoid double-counting category sales and VOC emissions, we have subtracted from the statewide values, the portion of Multi-purpose Solvent and Paint Thinner sales, VOC emissions, and reductions that occur in the South Coast Air Basin, based on population (DOF, 2008). The calculated VOC emissions and reductions for the Multi-purpose Solvent and Paint Thinner categories listed in Table ES-2, are the correct values which can be credited toward the proposed regulation. More detail on our proposal for the Multi-purpose Solvent and Paint Thinner categories can be found in the Technical Support Document, Chapter VI, section B.

G. ESTIMATED VOC EMISSIONS FROM CATEGORIES PROPOSED TO BE REGULATED

The 2006 Survey and the Survey Update serve as the basis for the proposed amendments to reduce VOC emissions. The 2006 Survey and the Survey Update provided detailed information on the formulations of consumer products proposed for regulation, including complete speciation of VOCs, low vapor pressure VOC (LVP-VOC) solvents, and key exempt ingredients. Total volumes of inorganic and other compounds were also reported. Information on sales, product form, customer types, and company size and economics were also included. For this rulemaking, the 2009 emissions and reduction estimates were grown from 2006 and 2008 sales. Annual population growth factors were calculated using the California Environmental Protection Agency's (Cal/EPA) Statewide Human Population Table found in the Population and Vehicle Trends Report (ARB, 2008d). We estimate that the 2009 VOC emissions from the categories proposed for regulation are more than 22 tons per day.

H. SUMMARY OF PROPOSED AMENDMENTS

Amendments are being proposed to the following sections in the Consumer Products Regulation: section 94508 "Definitions;" section 94509 "Standards for Consumer Products;" section 94510 "Exemptions;" section 94512 "Administrative Requirements;" section 94513 "Reporting Requirements;" and section 94515 "Test Methods." The proposed amendments to these sections are summarized below. In this section, we are also providing a summary of amendments to Method 310. Chapter V of the Technical Support Document contains more detailed information on each proposed requirement.

1. Definitions (Section 94508)

Section 94508 "Definitions," provides all of the terms used in the Consumer Products Regulation which are not self-explanatory. The proposed amendments to the Regulation include the modification of three definitions, and the addition of six new definitions. These definitions are necessary to define categories proposed for VOC

limits, clarify products that are not subject to the VOC limits, or to improve the enforceability of the Consumer Products Regulation.

2. Proposed Amendments to Standards for Consumer Products (Section 94509)

Table of Standards: The proposed regulatory action would amend the existing Consumer Products Regulation by specifying VOC limits for the product categories shown in Table ES-2. Note that for Double Phase Aerosol Air Freshener we are proposing to lower the existing VOC limit to 20 percent, effective December 31, 2012. Table ES-2 also shows that statewide VOC emissions would be reduced by approximately 14.7 tons per day when the limits are fully effective. These reductions would provide further progress toward fulfilling the consumer products element in the Strategy.

Table ES-2
Proposed VOC Limits, Emissions, and Reductions at Effective Date

| Product Category | Product Form | Proposed VOC Limit (percent by weight) | 2009 VOC Emissions* (tons per day) | Effective Date | Reductions Upon Effective Date (tons per day) |
|--|--------------------------|--|------------------------------------|----------------|---|
| Double Phase Aerosol Air Freshener | Aerosol | 20 | 10.2 | 12/31/2012 | 2.0 |
| Multi-purpose Solvent & Paint Thinner | Non-aerosol | tier 1: 30 | 12.5 ⁺ | 12/31/2010 | 8.4 ⁺ |
| | | tier 2: 3 | — | 12/31/2013 | 3.9 ⁺ |
| Total Emissions 2009 | 22.6 tons per day | | | | |
| Total VOC Reductions by end of 2013 | 14.7 tons per day | | | | |

* Survey emissions adjusted for market coverage, grown to the 2009 calendar year, and rounded.

+ Does not include emissions or reductions in the South Coast Air Basin.

It should be noted that the emissions and reductions listed for the Multi-purpose Solvent and Paint Thinner categories are combined because we have determined that the products are used interchangeably. A further discussion can be found in the Technical Support Document, Chapter VI, section B, "Multi-purpose Solvent and Paint Thinner."

Other Provisions:

a. Automotive Windshield Washer Fluid Label Clarification

Minor clarifying changes are proposed to the labeling requirements pertaining to dilutable automotive windshield washer fluid in section 94509(b). This proposal will require automotive windshield washer fluid manufacturers to clearly identify on the product label when the product is ready to use versus dilutable. This change is intended to ensure that the lowest VOC products are used and previously calculated emissions reductions are achieved.

b. Limit on Use of Global Warming Compounds

In accordance with AB 32, we are proposing to prohibit the use of compounds with global warming potential (GWP) values of 150 or greater in "Double Phase Aerosol Air Freshener," "Multi-Purpose Solvent," and "Paint Thinner" products. These provisions are contained in new subsections 94509(t) and (u). These proposals are intended to minimize the climate change impacts of products reformulated to comply with the proposed VOC limits.

c. Toxics Prohibition

Under the California Environmental Quality Act (CEQA), ARB is required to identify and mitigate any possible significant adverse environmental impacts of regulatory actions. It is unlikely, but possible, that manufacturers may, in response to new VOC limits for Multi-purpose Solvent and Paint Thinner products, choose to reformulate with chlorinated solvents that are TACs. Therefore, in accordance with CEQA, we are proposing in new subsection 94509(u), a prohibition of the use of methylene chloride, perchloroethylene, and trichloroethylene in the "Multi-purpose Solvent," and "Paint Thinner" categories.

d. Photochemical Reactivity

Also in section 94509(u), there is a proposal to limit the use of aromatic compounds in "Multi-Purpose Solvent" and "Paint Thinner" products to 1 percent by weight. This requirement is intended to mitigate the possibility that manufacturers could replace current VOC solvents used in Multi-purpose Solvent and Paint Thinner products with highly reactive compounds.

3. Proposed Amendments to Exemptions, Section 94510(m)

Proposed Temporary Small Size Exemption for Paint Thinner: The proposal contains a provision to temporarily exempt very small (eight fluid ounces or less) containers of Paint Thinner from compliance with the VOC limits until December 31, 2013. This exemption is designed to allow consumers to continue to be able to purchase typical Paint Thinners to be used with paints where the established VOC limit allows for fairly high concentrations of solvents. In addition, there is an existing exemption from the VOC limits for architectural coatings packaged in containers with a volume of one liter (1.057 quart) or less. Therefore, we believe a limited and temporary small container exemption is appropriate for Paint Thinners. Absent this provision, these solvent-borne paint products may be discarded, resulting in increasing the solid or hazardous waste stream or affecting water quality. This proposal should mitigate these potential consequences. We expect that the emissions impacts of this small size exemption will be minimal.

4. Proposed Amendments to Administrative Requirements, Section 94512(e)

Proposed Modification to Labeling Requirements: Under the proposal, Multi-purpose Solvent and Paint Thinner products would be required to display the percent VOC content, by weight, as determined from actual formulation data. This requirement will enhance the enforceability of the proposed VOC limits for these products and provide useful information to the consumer.

On May 25, 2000, the Board approved a labeling requirement for Aerosol Adhesive Products, requiring that products display the VOC standard as is specified in the California Consumer Products Regulation (ARB, 2000). Additionally, on June 24, 2004, the Board approved the addition of four other product categories to this requirement. While the requirement we are proposing for Multi-purpose Solvent and Paint Thinner products is slightly different, requiring the VOC content of the product rather than the VOC standard, it parallels the labeling requirements previously approved by the Board.

Also, to address the concern regarding the flammability of low-VOC Multi-purpose Solvent and Paint Thinner products, "Flammable" or "Extremely Flammable" products would not be able to display a general name on the principle display panel, such as "Paint Thinner," "Multi-purpose Solvent," "Clean-up Solvent," or "Paint Clean-up." Manufacturers may choose to sell a "Flammable" or "Extremely Flammable" product with one of these general names if they do one of the following: provide an attached hang tag or sticker that includes the statement "Formulated to meet California VOC limits, see warnings on label;" or display on the principle display panel in a font size as large as or larger than any other words on the panel, the common name of the chemical compound that results in the product meeting the criteria for "Flammable" or "Extremely Flammable."

These requirements are intended to alert the consumer of a potential change in formulation of these products which could present a fire hazard if used improperly. Additional discussion regarding the flammability concern is provided in K. Environmental Impacts.

5. Proposed Amendments to Reporting Requirements, Section 94513(g)

We are proposing 30 percent by weight VOC limits for Multi-purpose Solvent and Paint Thinner products, effective December 31, 2010. These limits are challenging, but feasible for manufacturers to meet within the time-frame proposed. We are also proposing technology forcing 3 percent by weight second tier VOC limits for Multi-purpose Solvent and Paint Thinner products, effective December 31, 2013. To ascertain if manufacturers are on track, and that technology advances as expected, we are proposing that manufacturers report their progress towards meeting these limits.

As proposed in new subsection 94513(g), Multi-purpose Solvent and Paint Thinner manufacturers would be required to supply by June 30, 2012, detailed written updates

on their research and development efforts undertaken to achieve compliance with the 3 percent by weight VOC limits. The reports would include sales and formulation data for products sold in 2011, as well as detailed information on the raw materials evaluated for use; maximum incremental reactivity (MIR) values for any VOC or LVP-VOC used or evaluated; the function of the raw material evaluated; hardware evaluated; testing protocols used; the results of the testing; and the cost of reformulation efforts.

6. Proposed Amendments to Test Methods, Section 94515

To ensure the ozone forming potential of Multi-purpose Solvent and Paint Thinner products does not increase as a result of the implementation of the proposed VOC limits, staff is proposing to limit the use of VOC aromatic compound content to no more than 1 percent by weight, effective December 31, 2010. A further discussion regarding the need for limiting the use of these highly reactive ingredients is provided in the Technical Support Document, Chapter VIII, Environmental Impacts.

I. COMPLIANCE WITH THE PROPOSED AMENDMENTS

Manufacturers have the flexibility to choose from a variety of formulation options to meet the applicable limits (see Chapter VI, Description of Product Categories). To comply with VOC limits, VOC solvents or propellants may need to be replaced, or partially replaced, with VOC exempt ingredients. This may require using acetone or another exempt solvent, or formulating with a VOC exempt propellant. Manufacturers may also need to change the valve, container, delivery system, or the other components of the consumer product depending on the individual formulation.

To meet the VOC limit for Double Phase Aerosol Air Fresheners, the most straightforward reformulation pathway is to utilize less hydrocarbon propellant in the formulation and add more water. Another reformulation option is to use VOC exempt propellants such as HFC-152a or HFC-134a. The likelihood of this reformulation choice is minimal because of the increased cost of these propellants. However, we are proposing a GWP limit of 150 for the category to ensure that high GWP propellants are not used in reformulations to meet the VOC limit. The proposed VOC limits can be met without a significant increase in the use of TACs or GHGs. We believe that products can and will be reformulated primarily through reduction in the amount of hydrocarbon propellant with possibly some modification or adjustments to the surfactants and/or the valve/spray nozzle.

To meet the proposed first tier VOC limits for Multi-purpose Solvent and Paint Thinner products, the most likely "reformulation" pathway is product substitution (i.e. increasing the sales of existing complying products and discontinuing sale of non-complying products). To meet the proposed second tier VOC limit for Multi-purpose Solvent and Paint Thinner products, reformulation options include developing water-based formulations, in addition to product substitution. We believe that products can and will be reformulated through reduction or replacement of VOC solvents with VOC exempt ingredients or through technologies that include using LVP-methyl esters, hydrocarbon

solvents, or water emulsion technology. Possible reformulation options could also include chlorinated toxic compounds, and compounds that could compromise the predicted ozone benefits of the limits. However, because these formulation options are not necessary, and the proposal includes specific prohibitions to prevent them, products cannot be reformulated using these options and possible adverse impacts will be prevented.

Table ES-3 summarizes, for the proposed VOC limits, data related to the complying marketshares (based on sales), as well as the number of products that currently comply relative to total number of products reported. It should be noted that there are currently a few Multi-purpose Solvent and Paint Thinner products, with significant market presence, formulated slightly above 30 percent VOC by weight. These products will only need a modest reformulation to comply with the proposed 30 percent standard. The complying marketshare in Table ES-3, for the first tier limit for the Multi-purpose Solvent and Paint Thinner categories, would be significantly higher if these products already complied with the proposed 30 percent VOC limit.

Table ES-3
Summary of Complying Products and Complying Marketshares

| Product Category | Product Form | Proposed VOC Limit (wt%) | Number of Complying Products/Total | Complying Marketshare (%) |
|---------------------------------------|--------------|--------------------------|------------------------------------|---------------------------|
| Double Phase Aerosol Air Freshener | Aerosol | 20 | <10 / 60* | <1 |
| Multi-purpose Solvent & Paint Thinner | Non-aerosol | tier 1: 30 | 18 / 165 | 11.3 |
| | | tier 2: 3 | 15 / 165 | 11.2 |

Source: 2006 Consumer & Commercial Products Survey and Paint Thinner & Multi-purpose Solvent Survey Update.
*60 products (product groups) reported. Total of 231 products reported if fragrance variants are considered.

Manufacturers can also comply with the proposed amendments through the use of the Innovative Products Provision (IPP) or the Alternative Control Plan (ACP). The IPP allows manufacturers of "innovative products" to comply with the Consumer Products Regulation if they demonstrate through clear and convincing evidence that their product will result in less VOC emissions than a complying product that meets the applicable VOC limit. The innovative product may result in less emissions due to some characteristic of the product formulation, design, delivery system, or other factors.

The ACP allows manufacturers to average the emissions from products above and below the applicable VOC limits, as long as the overall emissions are less than or equal to the emissions that would have occurred had all the products complied with the VOC limits. Manufacturers must submit an application which includes the VOC content of the products in the plan, a method of verifying the sales of each product in the plan, and other information necessary to track overall emissions.

J. ECONOMIC IMPACTS

The economic impacts of the proposed amendments are summarized here. Our complete analysis of these impacts is contained in Chapter VII of the Technical Support Document.

1. Overall Cost

We estimate that the overall cost to comply with the proposed amendments is about \$3.1 million per year for ten years, for a total of \$31 million. This amount includes both recurring (e.g., raw materials) and nonrecurring (e.g., research and development) costs and is estimated based on assumptions specific to each category. The cost represents the average of low and high cost estimates and represents our prediction of the costs most likely to be incurred.

2. Cost Effectiveness

Another measure of the economic impacts of the proposal is to determine the "dollars to be spent per pound of VOC reduced," or cost effectiveness (CE). The CE of the proposed amendments has been calculated to be about \$0.29 per pound of VOC reduced. This is based on expected emission reductions of about 14.7 tons per day. This cost effectiveness is better than other recent consumer products rulemakings. The CE of amendments proposed in 2004, 2006, and 2008 was about \$2.40, \$2.35 and \$6.23 per pound of VOC reduced, respectively. The lower cost per pound of VOC reduced for this rulemaking results from the relatively large reduction in VOC emissions being achieved from only three product categories.

3. Return on Owner's Equity (ROE)

Another measure of the impacts of the proposed amendments on manufacturers is to determine the ROE. ROE is a calculation which compares a company's percentage reduction in profitability after incurring the costs associated with the proposed amendments. In calculating ROE, we make the conservative assumption that manufacturers will absorb all compliance costs without passing any of these costs on to the consumer. Our analysis found that the overall reduction in profitability ranges from 5.4 percent to about 24.2 percent, with an average reduction in profitability of about 14.8 percent. The ROE of about 24.2 percent combined the ROEs estimated from the first tier and second tier limits for the Multi-purpose Solvent and Paint Thinner categories. Thus, the potential exists that some businesses may experience a significant impact in their profitability. In light of this, the assessment of ROE requires further explanation.

The ROE for sample businesses complying with the proposed limit for Double Phase Aerosol Air Freshener, and the first tier limit for the Multi-purpose Solvent and Paint Thinner categories, declined by about 7.5 percent. This is not a significant change in the average profitability of typical businesses in California. In factoring in the second

tier limit for the Multi-purpose Solvent and Paint Thinner categories, however, we estimated the ROE to decline by up to 14.7 percent. The overall average reduction in profitability from complying with all of the VOC limits is 14.8 percent. Because of the predicted magnitude of the percent decline in profitability for Multi-purpose Solvent/Paint Thinner product manufacturers, we believe they will pass through to the consumer a portion, or all, compliance costs to maintain their profitability. We also would expect the impact on profitability to be lessened, to a degree, if we assume a normal growth pattern occurs for this affected industry sector, with the sales and profits increasing over time.

We believe that overall, most affected businesses profitability will not be adversely affected. If they are unable to absorb all or a portion of the compliance costs, these costs will be passed through to the consumer.

4. Impacts on California Businesses

Because we believe that manufacturers will pass their compliance costs onto the consumer, we believe the proposed amendments would not significantly alter the profitability of most businesses, as shown in our ROE analysis, we do not expect a noticeable change in employment; business creation; elimination or expansion; and business competitiveness in California. However, the proposed amendments may impose economic hardship on businesses with very little or no margin of profitability.

5. Increased Cost to Consumers and Licensed Contractors

As a result of this proposal, consumers may have to pay more for some products, depending on the extent to which manufacturers pass along their compliance costs. If all assumed compliance costs are passed on to the consumer, we estimate the cost per unit increase would range from negligible or no cost for a Double Phase Aerosol Air Freshener product to about \$0.75 for a Multi-purpose Solvent/Paint Thinner product reformulated to meet both tiers of proposed VOC limits. The aforementioned costs do not include typical retail mark-up.

Because we expect that to maintain profitability (see ROE analysis) some businesses will pass on compliance costs to the consumer, we estimated the increased cost the consumer may experience. By apportioning annual sales of Multi-purpose Solvent/Paint Thinner products to the California population, we estimated that residents purchase less than one container of Multi-purpose Solvent/Paint Thinner product per year. Thus, considering normal retail mark-up, the consumers' cost increase to purchase a Multi-purpose Solvent/Paint Thinner product would increase by about \$1.50 per gallon.

However, Multi-purpose Solvent/Paint Thinner products are more commonly purchased by contractors. If we apportion all sales of the Multi-purpose Solvent and Paint Thinner categories to licensed contractors, we estimate purchases of approximately five gallons per year, per contractor. Considering normal retail mark-up, the cost increase per

product to licensed contractors purchasing Multi-purpose Solvent/Paint Thinner products would be about \$8 per year (CDCA, 2009).

6. Fiscal Impacts

No significant adverse economic impacts to any local or State agency were identified.

K. ENVIRONMENTAL IMPACTS

The proposed amendments to the Consumer Products Regulation are primarily designed to reduce VOC emissions. Therefore, implementing the proposed VOC limits would have an overall positive impact on the environment by reducing exposure to ground-level ozone. Other proposed amendments would either have no impact or would have beneficial impacts on the environment. No significant adverse impacts were identified.

We evaluated how the proposed amendments would impact ground-level ozone concentrations; particulate matter (particularly secondary organic aerosols); climate change; stratospheric ozone depletion; solid waste disposal; water quality; energy use; public safety; agricultural resources; and air toxic emission exposure. While no significant adverse impacts are expected, in instances where a potential adverse impact was identified, staff is proposing mitigation measures in accordance with CEQA or authority granted under AB 32. A complete analysis of the potential environmental impacts of the proposal is contained in Chapter VIII of the Technical Support Document.

The proposed amendments would result in a VOC reduction of about 14.7 tons per day by the end of 2013. Our qualitative health risk assessment concludes that because VOCs are ozone precursors, public health is further protected by reducing these emissions. The actual lowering of health risks has not been quantified. However, it has been estimated (Ostro *et al.*, 2006) that about 630 fewer premature deaths would occur each year in California from exposure to ozone if California were to attain the State ozone standard. The reductions resulting from this proposal would be an incremental step toward achieving the State ozone standard. Implementing the proposed VOC limits, however, could lead to potential adverse impacts. The potential impacts identified and measures to mitigate the impact follows.

1. Limit on Use of Global Warming Compounds

Several compounds with high global warming potentials could be used in reformulated products. For Double Phase Aerosol Air Freshener products, the use of VOC-exempt propellants such as hydrofluorocarbon (HFC) 152a and HFC-134a are reformulation options. For Multi-Purpose Solvent and Paint Thinner products, there is a slight possibility that solvents with high global warming potentials could be used. To minimize climate change impacts from implementing the proposed VOC limits, we are proposing to prohibit use of compounds with GWP values above 150 in Double Phase Aerosol Air Freshener, Multi-Purpose Solvent, and Paint Thinner products. These provisions are

proposed in subsections 94509(t) and 94509(u). This proposal would allow use of the propellant HFC-152a in Double Phase Aerosol Air Freshener. However, the proposed VOC limit for this category is feasible without the use of this compound.

2. Potential Toxics Impacts

In the Survey Update, no use of methylene chloride, perchloroethylene, or trichloroethylene was reported for Multi-purpose Solvent and Paint Thinner products. However, use of these chlorinated TAC solvents, particularly the VOC-exempt compounds methylene chloride and perchloroethylene, is a potential option as products are reformulated to comply with the proposed limits. Therefore, to ensure that the public is not exposed to these chlorinated TAC solvents from use of Multi-purpose Solvent and Paint Thinner products, we are proposing in new section 94509(u), to prohibit the use of methylene chloride, perchloroethylene, and trichloroethylene in Multi-purpose Solvent and Paint Thinner products. No adverse impacts on other media are expected from this proposal.

3. Photochemical Reactivity Considerations

During development of the proposal for Multi-purpose Solvent and Paint Thinner products, we evaluated the reduction in ozone forming potential that would occur from implementation of the first tier 30 percent by weight VOC limit and the second tier 3 percent by weight VOC limit. This analysis showed that some reformulation options could result in products with higher ozone forming potential, which could erode the expected air quality benefits. To ensure that predicted reductions in ozone forming potential occur, we are proposing to limit the VOC aromatic compound content of products to 1 percent by weight. This proposal would not result in further VOC mass reductions, but would result in further reducing the ozone formation potential of reformulated products.

4. Safety

Reformulations of Multi-purpose Solvent and Paint Thinner products could result in increased fire hazards should manufacturers choose to reformulate using highly flammable solvents such as acetone or methyl acetate, both exempt VOCs. Several amendments are proposed to mitigate this potential hazard. First, new provisions are proposed in subsection 94512(e). This provision would apply to Multi-purpose Solvent and Paint Thinner products required to be labeled "Flammable" or "Extremely Flammable," to comply with federal regulations. As proposed, these products would not be able to display a general name on the principle display panel, such as "Paint Thinner," "Multi-purpose Solvent," "Clean-up Solvent," "Paint Clean-up," or other similar name. Manufacturers may choose to sell a "Flammable" or "Extremely Flammable" product with one of these general names if they do one of the following: provide an attached hang tag or sticker that includes the statement "Formulated to meet California VOC limits, see warnings on label," or display on the principle display panel, in a font size as large as or larger than any other words on the panel, the common name of the

chemical compound that results in the product meeting the criteria for "Flammable" or "Extremely Flammable."

Additionally, to potentially minimize the increased fire hazard from the use of Multi-purpose Solvent and Paint Thinner products, we are proposing an effective date of December 31, 2013 for the second tier VOC limit. This additional compliance time is provided to allow for development of additional reformulation technologies and development of potentially less flammable products. We will assess progress of development of low VOC, less flammable products through a technical assessment prior to the effective date of the second tier limit. This is described below in "Technical Assessment."

We are also proposing to temporarily exempt very small (eight fluid ounces or less) containers of Paint Thinner from compliance with the VOC limit until December 31, 2013. This measure is designed to allow consumers to purchase currently marketed Paint Thinner products to be used with previously purchased solvent-borne paints. This should further reduce potential fire hazards. Also, absent this provision, these paint products could be discarded, resulting in increasing solid or hazardous waste disposal or adversely affecting water quality. Therefore, this proposal is designed to mitigate these potential consequences.

5. Technical Assessment

As described above, several adverse impacts could occur as products reformulate to meet the proposed VOC limits, particularly the second tier VOC limit for Multi-purpose Solvent and Paint Thinner products. Because of this, we believe that an assessment of reformulations should be conducted prior to the December 31, 2013 effective date. As proposed in new subsection 94513(g), Multi-purpose Solvent and Paint Thinner manufacturers would be required to supply formulation data and detailed written updates on research and development efforts undertaken to achieve compliance with the second tier, 3 percent by weight VOC limit. These data will enable staff to perform a technology assessment in mid-2012 to evaluate manufacturers' progress toward meeting this limit. We also intend to evaluate the safety and ozone forming potential of reformulation options, and, if necessary propose further measures to ensure that ozone reduction benefits occur and that fire hazards are minimized.

L. ENVIRONMENTAL JUSTICE

This proposal is consistent with the ARB's Environmental Justice Policy to reduce health risks in all communities, including low-income and minority communities. Generally, use of consumer products is fairly uniform across the State, tracking with population, and their emissions are spread over the course of a day, rather than concentrated at a particular time of day. For these reasons, we do not believe that people of any given race, culture, or income would be more impacted than any others would. All Californians should benefit equally from the reduction in VOC emissions from the consumer product categories proposed for regulation.

M. FUTURE PLANS

Future activities include continued review of the 2006 Consumer and Commercial Products Survey. This survey will serve as the basis for additional VOC and GHG reductions measures for consumer products. Additional reductions are needed to meet consumer product VOC reduction commitments in the Strategy and to reduce the GWP of consumer products, under AB 32.

During 2009, we are conducting a risk assessment regarding public exposure to the potentially toxic compounds xylenes, toluene, dibutyl phthalate, and formaldehyde in nail coating formulations used in nail salons. Air quality modeling is being done to estimate outdoor exposure to these compounds from an individual business, as well as, cumulative emissions from multiple facilities.

The Paint Remover/Stripper category will also be evaluated during 2009 for potential VOC and toxic air contaminant reductions upon the completion of the 2006 Consumer and Commercial Products Survey Data Summaries.

Non-aerosol General Purpose Cleaners, General Purpose Degreasers, Glass Cleaners, and aerosol Furniture Maintenance Products are under evaluation for further regulation. Part of this evaluation is to determine if potential adverse impacts would result from the use of predicted reformulations used to comply with proposed lower VOC limits. We are working with Office of Environmental Health Hazard Assessment staff to develop health values for various LVP-VOC glycol ethers that could be used in reformulated products. We are also working with State Water Resources Control Board staff to evaluate water quality impacts from use of cleaning products. Of particular concern is a family of surfactants, the alkylphenol ethoxylates. Evidence indicates these surfactants are toxic to aquatic organisms, with the main concern being the estrogenic effects of their degradation products. Upon completion of this evaluation, we intend to propose to the Board in 2010, new limits for these categories, which we expect to achieve 5 – 8 tons per day VOC reductions toward the consumer products commitment in the Strategy.

Sales and formulation information for Dry Clean Only Spot Removers obtained from a separate survey sent out to dry cleaning chemical manufacturers on January 14, 2009, is currently being evaluated. This evaluation will enable staff to determine if reductions of VOCs and/or TACs from Dry Clean Only Spot Removers is feasible.

N. RECOMMENDATION

We recommend that the Board adopt the proposed amendments to the Consumer Products Regulation and Method 310.

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Appendix A**Initial Statement of Reasons for Proposed Amendments to the
California Consumer Products Regulations****Technical Support Document**

I. INTRODUCTION

A. OVERVIEW

In this rulemaking, California Air Resources Board (ARB or Board) staff is proposing amendments to the Regulation for Reducing Emissions from Consumer Products (Consumer Products Regulation) and to Method 310 – Determination of Volatile Organic Compounds (VOC) in Consumer Products and Reactive Organic Compounds in Aerosol Coating Products (Method 310). The amendments are designed to reduce VOC emissions. The proposed amendments would set new VOC limits for Multi-purpose Solvent and Paint Thinner products and lower the existing VOC limit for Double Phase Aerosol Air Fresheners. When fully implemented, about 14.7 tons per day of VOC emission reductions would be achieved by December 31, 2013. We are proposing to prohibit the use of the toxic air contaminants methylene chloride, perchloroethylene, and trichloroethylene in Multi-purpose Solvent and Paint Thinner products. In addition, the aromatic content would be limited to 1 percent in these categories. Compounds with high global warming potential (GWP) would be prohibited, under the proposal, in all three of the categories proposed for regulation.

The proposed amendments to reduce VOC emissions would partially fulfill the consumer product reduction commitment contained in the State Strategy for California's 2007 State Implementation Plan. The proposed toxic compound prohibition and the GWP limit are mitigation measures designed to ensure that exposure to chlorinated solvents and climate change impacts are minimized, respectively, as products are reformulated to meet new VOC limits. The limitation on the use of aromatic compounds is proposed to ensure that reductions of ozone generated from Multi-purpose Solvent and Paint Thinner products being reformulated to meet the mass VOC limits occur as predicted. The amendment to Method 310 is to add new language that would clarify analytical methods used to test low VOC or high water content consumer products.

This Technical Support Document, Appendix A, is ARB staff's technical justification and analysis of the proposed amendments. It is part of the Initial Statement of Reasons (ISOR) for Proposed Amendments to the California Consumer Products Regulations. The proposed amendments can be found in Appendix B of this document.

Included in this Technical Support Document is the following information:

- background information on the consumer products program related to the control of VOC and GHG emissions;
- information on the process used to develop the proposed amendments;
- an assessment of why the proposed amendments meet the requirements of State law;
- a review of the emissions from the categories proposed for regulation and the overall need for the emission reductions;

- a description of the proposed amendments;
- an analysis of the estimated economic and environmental impacts of the proposed amendments; and
- a summary of future activities.

B. ENABLING LEGISLATION

In 1988, the California Clean Air Act (CCAA or "the Act") became law and was enacted to address the State's serious air pollution problems and the inability of many areas in California to attain the State and federal ambient air quality standards. The CCAA added section 41712 to the California Health and Safety Code. Section 41712, along with subsequent amendments, requires ARB to adopt regulations to achieve the maximum feasible reduction in VOC emissions from consumer products. Prior to adoption, the Board must determine that adequate data exist to establish that the regulations are necessary to attain State and federal ambient air quality standards. The regulations must also be commercially and technologically feasible.

Section 41712 defines a consumer product as a chemically formulated product used by household and institutional consumers. Consumer products include, but are not limited to: detergents; cleaning compounds; air fresheners; polishes; floor finishes; paint thinner; multi-purpose solvents; cosmetics; personal care products such as antiperspirants and hairsprays; home, lawn, and garden products; disinfectants; sanitizers; automotive specialty products; and aerosol paints. Other paint products, such as furniture or architectural coatings, are not part of ARB's consumer products program because local air districts regulate them.

The Act further stipulates that regulations adopted must not eliminate any product form, and that recommendations from health professionals be considered when developing VOC control measures for health benefit products. Health and Safety Code section 41712, gives ARB authority to control emissions from a very diverse number of products sold statewide to household, commercial and institutional consumers. The primary goal of this section was to set forth a program to reduce ground-level ozone concentrations, as part of the overall effort to attain ambient air quality standards.

In 2006, Assembly Bill (AB) 32 was signed into law. This law created a comprehensive, multi-year program to reduce global warming compound emissions in California. AB 32 added section 1 division 25.5 (commencing with section 38500) to the California Health and Safety Code. These sections require ARB to develop regulations and consider market mechanisms that will ultimately reduce California's GHG emissions equivalent to the 1990 baseline year by 2020. Among other things, AB 32 requires ARB to make immediate progress towards the reduction of GHG emissions. Specific Discrete Early Action Measures were to be identified and regulations for the identified sources are to be adopted and enforceable by January 1, 2010. Beyond the requirements of AB 32, the Governor's Executive Order EO-S-03-05 calls for an 80 percent GHG reduction from 1990 levels by 2050.

C. BACKGROUND

1. Existing Consumer Product Regulations

To date, the Board has taken numerous actions to fulfill the legislative mandate pertaining to the regulation of VOCs in consumer products, including antiperspirants, deodorants, and aerosol coating products. Three regulations have been adopted that affect 125 consumer product categories by setting 174 VOC limits. These limits have resulted in reducing emissions by about 200 tons per day, an overall 44 percent reduction in VOC emissions.

We have also reduced exposure to toxic air contaminants (TAC). Emissions of TACs have been reduced by 13 tons per day by prohibiting use of certain chlorinated compounds in 63 categories.

In addition, two voluntary regulations, the Alternative Control Plan and the Hairspray Credit Program have been adopted to provide compliance flexibility to companies. The five consumer product regulations are codified in title 17, California Code of Regulations, sections 94500 to 94575:

- Antiperspirants and Deodorants (Article 1, sections 94500-94506.5);
- Consumer Products (Article 2, sections 94507-94517);
- Aerosol Coating Products (Article 3, sections 94520-94528);
- Alternative Control Plan (Article 4, sections 94540-94555); and
- Hairspray Credit Program (Article 5, sections 94560-94575).

Regulation of consumer products began in 1989 with adoption of the Antiperspirants and Deodorants Regulation. The "general" Consumer Products Regulation was approved in 1990 and has been amended numerous times. The most recent amendments to the Consumer Products Regulation were approved June 26, 2008 (ARB, 2008e). At the June hearing, the Board approved amendments that would set new or lower VOC limits for 19 categories of consumer products. These approved amendments will reduce VOC emissions by an additional 5.8 tons per day statewide when fully effective. Also at the June hearing, the Board approved amendments that would prohibit use of certain chlorinated compounds in an additional seven categories of consumer products. These approved amendments will reduce TAC emissions by an additional 0.2 tons per day when fully effective. The Aerosol Coatings Regulation was adopted in 1995 and was amended in 2000. A complete summary of consumer products program regulatory actions with dates of regulatory amendments are provided in Appendix C.

2. Consumer Products and the State Implementation Plan (SIP)

a. State Implementation Plans

Federal clean air laws require areas with unhealthy levels of ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide and inhalable particulate matter to develop State Implementation Plans (SIPs) describing how they will attain national ambient air quality standards (NAAQS).

A SIP is a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), local air district rules, and State and federal regulations. Many of California's strategies apply statewide, including emission standards for cars and heavy-duty trucks, fuel regulations, and limits on emissions from consumer products. State law designates ARB as the lead agency for all purposes related to the SIP. Local air districts and other agencies, such as the Department of Pesticide Regulation, prepare SIP elements and submit them to ARB for review and approval. ARB forwards SIP revisions to the United States Environmental Protection Agency (U.S. EPA) for approval and publication in the Federal Register. The Code of Federal Regulations (CFR) Title 40, Chapter I, Part 52, Subpart F, Section 52.220 lists all of the items which are included in the California SIP. Some California SIP submittals are pending U.S. EPA approval.

Consumer product VOC emissions are known to contribute to concentrations of both ground-level ozone and particulate matter with diameters of 2.5 micrometers or less ($PM_{2.5}$). The link between consumer product VOC emissions and ground-level ozone concentrations is well-established. However, their impact on $PM_{2.5}$ concentrations is less clear. Because VOCs are ozone precursors, specific consumer product control measures have been developed related to ozone control. These measures have been included in SIPs. For this reason, our summary here focuses on consumer product strategies that have been, and are, designed to meet ambient air quality standards for ozone.

b. 1994 California State Implementation Plan for Ozone

On November 15, 1994, ARB adopted the California State Implementation Plan for Ozone (1994 SIP). This plan included measures designed to meet the previous federal peak one-hour ozone standard of 0.12 parts per million (ppm). Achieving significant VOC reductions from consumer products was a key element of the 1994 SIP. Several rulemakings were proposed and adopted to work toward meeting the SIP commitment.

c. 2003 State and Federal Strategy and 2003 South Coast SIP

On October 23, 2003, the ARB adopted the 2003 Statewide Strategy, which identified the Board's near term regulatory agenda to reduce ozone and particulate matter and to adopt new measures for each year from 2003 to 2008. The ozone control elements were again designed toward attaining the federal one-hour ozone standard.

The 2003 SIP contained two measures for consumer products. These measures were designated as CONS-1 and CONS-2. The CONS-1 measure was designed to achieve VOC emission reductions from consumer products of at least 2.3 tons per day in the South Coast Air Basin and 5.3 tons per day statewide by 2010. On June 26, 2004, the Board approved a CONS-1 measure (the "2004 Amendments"), which will achieve 3.0 tons per day in VOC emission reductions in the South Coast Air Basin by 2010, and achieve 6.9 tons per day in VOC emission reductions statewide by 2010 (ARB, 2004b). The CONS-1 measure became legally effective on June 20, 2005. As of this writing, all but one of the CONS-1 VOC limits are in full effect. The CONS-1 commitment has been fulfilled.

The ARB also committed to present new consumer product category limits to the Board between 2006 and 2008 to achieve VOC emission reductions from consumer products of between 8.5 tons per day and 15 tons per day in the South Coast Air Basin by 2010. Statewide, the CONS-2 measure was to achieve 20-35 tons per day in emission reductions by 2010. Amendments to the Consumer Products Regulation in 2006, which will result in reductions of 4.9 tons per day in South Coast and 11.5 tons per day statewide, partially fulfilled this commitment (ARB, 2006a).

The 2003 SIP was withdrawn from consideration and is no longer in effect. However, the remaining commitment from the CONS-2 measure has been incorporated in the 2007 Strategy commitment which is described below.

d. State Strategy for California's 2007 State Implementation Plan (Strategy)

In July 1997, U.S. EPA established a new federal ozone standard. As opposed to a one-hour peak ozone standard, the new ozone standard established a limit of 0.08 ppm averaged over eight hours (U.S. EPA, 1997). On April 15, 2004, U.S. EPA designated 15 areas as non-attainment in California for the eight-hour ozone standard (ARB, 2008e). Many, but not all of these areas were also designated as non-attainment for the federal one-hour standard. New non-attainment areas include a number of rural Sierra Nevada foothill counties and additional parts of the Sacramento Valley. The one-hour standard was revoked on June 15, 2005, one year after the effective date of the new designation, and SIPs showing how each area will meet the eight-hour standard were submitted to U.S. EPA in 2007.

To address the eight-hour standard, the Strategy was adopted at the September 25, 2007, Board hearing (ARB, 2007d). The Strategy describes the scope of the State's ozone and PM_{2.5} non-attainment problems and sets forth ARB's plan on how California can comply with federal standards. This is a comprehensive Strategy designed to attain federal air quality standards through technologically feasible, cost effective, and far reaching measures.

The Strategy is the first plan designed to show how California will meet the national eight-hour ozone standard. Because the eight-hour standard is more stringent than the one-hour standard, U.S. EPA set presumptive deadlines that allow more time for

attainment. Nonetheless, the measures California has adopted to meet the one-hour standard remain in place and will deliver substantial new reductions over the next few years.

Specific to consumer products, in the Strategy, ARB committed to reducing consumer product VOC emissions statewide by 30 to 40 tons per day by 2014. The amendments approved at the June 26, 2008, hearing will provide about 4.5 tons per day toward meeting the commitment. An additional 1.3 tons per day of VOC emission reductions will occur by the end of 2015.

Further reductions from consumer products are important because VOC emissions from consumer products are predicted to become the largest source of VOC emissions in the South Coast Air Basin, and the third largest source in the San Joaquin Valley Air Basin by 2020. The Strategy, in combination with local actions, provides emission reductions necessary to meet the eight-hour ozone standard in these two most challenging regions.

VOC reductions from consumer products are becoming more difficult to achieve. In light of this, the Strategy includes a commitment to explore innovative reduction strategies in the longer term. One such measure would include investigating emission reduction opportunities through reactivity-based standards. A reactivity-based approach relies on the scientific principle that different chemical compounds react to form different amounts of ozone in the atmosphere. Reactivity-based standards reduce emissions of the most photochemically reactive compounds.

Alternative market-based mechanisms would also be explored to encourage the development, distribution, and purchase of cleaner, very low, or zero VOC emitting products. Examples of mechanisms to explore are an environmental product labeling program, programs where companies set their own emission reduction goals, and the use of print and broadcast media for public education. If these mechanisms cannot produce meaningful emission reductions from the consumer products source category, then other approaches would be evaluated. Some of these other approaches include the purchase of VOC emission reduction credits; and funding of special projects to reduce emissions or accelerate reductions from pollution sources outside of the consumer products industry.

e. Future State Implementation Plans

Up-to-date information on SIP activities can be found on ARB's website at: <http://www.arb.ca.gov/planning/sip/sip.htm>. ARB staff proposes to revise the 2007 SIP as may be appropriate in a 2010 mid-course review SIP update to: reflect the emission benefits of newly adopted regulations; provide more detail on the State's intended actions to fulfill the commitment to achieve emission reductions in total by specific dates; update as necessary the emissions inventories for federal ozone and PM_{2.5} non-attainment areas; and revise as necessary other plan aspects, including motor vehicle emissions budgets. The 2010 mid-course review may show the need for additional

emission reductions from consumer products.

On March 12, 2008, U.S. EPA reduced the eight-hour "primary" ozone standard to a level of 0.075 ppm. U.S. EPA also strengthened the secondary eight-hour ozone standard to the level of 0.075 ppm, making it identical to the revised primary standard. The final rule became effective on May 27, 2008. These changes will require that new SIPs be drafted. A complete new state strategy will be developed for 2013. The 2013 SIP will likely require more VOC reductions from consumer products.

3. Consumer Products and the California Global Warming Solutions Act of 2006 (AB 32)

Various consumer products may contain GHGs in their formulations. Most often these GHGs are propellants such as hydrofluorocarbons (HFCs) and carbon dioxide (CO₂). To a lesser extent some GHGs are used as solvents.

As mentioned earlier, AB 32 requires immediate progress, described as Discrete Early Action Measures. ARB was required to identify measures and adopt regulations to reduce GHG emissions, that would be enforceable by January 1, 2010. ARB has since approved those early measures and incorporated them into California's Climate Change Scoping Plan (Scoping Plan) that was approved by the Board in December 2008. Reduction of compounds with high global warming potential (GWP) used in consumer products was designated a Discrete Early Action Measure. Therefore, as an approved measure, ARB staff has committed to eliminate or reduce the use of GHG compounds with high GWP that are used in consumer products.

The GHG emission reduction from consumer products is estimated to be 0.25 million metric tons of carbon dioxide (CO₂) equivalents or more, if feasible. The amendments approved at the June 26, 2008, Board hearing will provide about 0.23 million metric tons of CO₂ equivalents per year toward meeting the estimated feasible reduction target. In this rulemaking, we are proposing GWP limits as mitigation measures to ensure that GHG emission do not increase. These measures will not provide additional GHG reductions. However, from information we have gathered from consumer product surveys, we are currently evaluating whether GHG emission reductions from other consumer product categories are feasible. Based on this evaluation, staff may propose additional GHG reduction measures in future rulemakings.

4. National Consumer Products Regulations

On September 11, 1998, U.S. EPA promulgated a national consumer products regulation, the "National Volatile Organic Compound Emission Standards for Consumer Products (40 CFR Part 59, Subpart C, Sections 59.201 et seq.)." This action set national VOC emission standards for 24 categories of consumer products. The regulation became effective on September 11, 1998, and the VOC limits became effective on December 10, 1998. There are similarities and differences between the

California and national consumer products regulations; however, the national regulation does not preclude states from adopting more stringent regulations. In 2006, U.S. EPA began work on amendments to their existing national consumer products regulation. Their amendments are based on California's CONS-1 (2004 Consumer Products Regulation Amendments) categories and limits. The amendments are expected to become effective in 2009, with a compliance date of January 2010.

U.S. EPA has also recently promulgated a national regulation for aerosol coatings (spray paints) based on ARB's Aerosol Coatings Regulation. This is a reactivity-based regulation. The national aerosol coatings regulation was promulgated on March 24, 2008. The compliance date is currently being amended to July 1, 2009, (U.S. EPA, 2008).

The national consumer products regulation is similar in many aspects to the California regulation. However, even after the federal 2009 amendments become effective; it will still be less effective in reducing VOC emissions from consumer products. The national regulation does not regulate a number of product categories that are currently regulated under the ARB regulation. For the categories that are regulated under both regulations, many of ARB's limits are more stringent than the federal limits. Therefore, ARB's consumer products regulations have achieved significant additional reductions over those that would be achieved by federal regulation alone.

The federal regulation also does not prohibit the use of certain toxic air contaminants. The California Consumer Products Regulation already includes prohibitions on the use of certain toxic air contaminants in 70 categories, including the amendments approved at the June 26, 2008, Board hearing, resulting in a reduction of toxic compound emissions of over 13 tons per day.

Because California has unique air quality problems, reducing VOC emissions from all categories, including consumer products, to the maximum extent feasible, is necessary to attain the federal and State ambient air quality standards for ozone.

As of the date of this staff report, there are no national consumer products regulations related to reducing GHG emissions.

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1. Air Resources Board. Initial Statement of Reasons for Proposed Rulemaking Proposed Amendments to the California Consumer Products Regulation. May 9, 2008. (ARB, 2008e)
2. Air Resources Board. Technical and Clarifying Modifications to April 26, 2007 Revised Draft Air Resources Board's State Strategy for California's 2007 Implementation Plan. Released April 26, 2007. Adopted by the Air Resources Board on September 27, 2007. (ARB, 2007d)
3. Air Resources Board. Initial Statement of Reasons for Proposed Amendments to the California Consumer Products Regulation and the Aerosol Coatings Regulation. September 29, 2006. (ARB, 2006a)
4. Air Resources Board. Initial Statement of Reasons for the Proposed Amendments to the California Aerosol Coating Products, Antiperspirants and Deodorants, and Consumer Products Regulations, Test Method 310, and Airborne Toxic Control Measure for para-Dichlorobenzene Solid Air Fresheners and Toilet/Urinal Care Products. May 7, 2004. (ARB, 2004b)
5. United States Environmental Protection Agency. National Volatile Organic Compound Emission Standards for Aerosol Coatings; Direct Final Rule. (40 CFR Parts 51 and 59) Federal Register: March 24, 2008. Volume 73. Number 57. (U.S. EPA, 2008)
6. United States Environmental Protection Agency. National Ambient Air Quality Standards for Ozone; Final Rule. Federal Register: July 18, 1997. Volume 62. Number 138: 38855-38896. (U.S. EPA, 1997)

II. DEVELOPMENT OF PROPOSED AMENDMENTS

This chapter contains a description of the public process used to develop the proposed amendments. The Administrative Procedure Act (APA) (Government Code section 11340 *et seq.*) requires that development of regulations must allow for public input. This chapter also describes our evaluation of emission reduction opportunities, and alternatives to the final proposal that were considered.

A. PUBLIC PROCESS FOR DEVELOPING PROPOSED LIMITS

In order to involve the public, the Consumer Products Regulation Workgroup (CPRWG), was reconvened in 2004. Participation in the CPRWG was, and continues to be open to any member of the public. The CPRWG participated in the development of the 2006 Consumer and Commercial Products Survey (2006 Survey), which serves as the basis for portions of this proposal (ARB, 2007f). The CPRWG was also involved in the development of these proposed amendments.

Further outreach, beyond the CPRWG, was conducted to identify and involve stakeholders in the development of the proposed paint thinner and multi-purpose solvent amendments. As part of the process, in November 2008, ARB conducted a survey update for the Paint Thinner and Multi-purpose Solvent categories (ARB, 2008f). The intent of the survey update was to obtain sales data for the 12-month period starting from October 1, 2007, through September 30, 2008. The survey was conducted in response to comments from stakeholders that indicated the market for Multi-purpose Solvents and Paint Thinners had changed since our 2003 Consumer and Commercial Products Survey.

Consumer product manufacturers, chemical producers, marketers, trade associations, consultants, and various other stakeholders listed below, have actively participated in the process.

- American Chemistry Council
- Coalition for Clean Air
- Consumer Specialty Products Association
- Environmental Working Group
- Institute for Research and Technical Assistance
- National Aerosol Association
- National Paint and Coatings Association
- Office of the State Fire Marshal
- Western Aerosol Information Bureau

Representatives from local air districts and agencies, including the South Coast Air Quality Management District and the United States Environmental Protection Agency were also involved in the process.

ARB staff maintains a mailing list of over 5,000 companies and interested parties, including environmental and community organizations, which received information throughout the development of the proposed amendments. We have established an electronic list serve for ARB's Consumer Products Program, which has over 1,300 subscribers, to allow subscribers to receive timely, pertinent information. We also have a consumer products program public website with a webpage for the 2009 Consumer Products Regulatory Work Group Activity.

An initial public meeting was held in August of 2008 to announce to interested parties ARB's intent to regulate the products affected by this proposal. On March 30, 2009, staff posted draft volatile organic compound (VOC) limits and definitions for the categories proposed for regulation to the website. The data and proposals were discussed at a public workshop on April 1, 2009. At the meeting, staff discussed the draft regulatory categories, proposed limits, and the rulemaking timeline. The meeting served as a forum for stakeholder comments on the proposals and schedule. A second public workshop for this rulemaking is scheduled for early August 2009 to seek further input on the staff's proposal.

To solicit additional information and comments, numerous individual meetings and teleconferences were held with stakeholders. At several of these meetings, which were requested by industry associations, interested parties presented technical information related to reformulation of products. We also reviewed survey data, and researched technical literature, patents, and trade journals during the development of this proposal.

B. STAFF EVALUATION OF EMISSION REDUCTION OPPORTUNITIES

Development of the proposed amendments began with review of the data submitted for the categories proposed for regulation. These data were reported as part of the 2006 Survey and the 2008 Paint Thinner and Multi-purpose Solvent Survey Update (Survey Update). Over 570 companies responded to the surveys with information on over 12,000 products (ARB, 2007f). The 2006 Survey was designed to obtain the comprehensive information necessary to develop new consumer product emission standards that together would achieve a minimum VOC emission reduction of 30 to 40 tons per day by 2014, and GHG emission reductions equivalent to reducing an estimated 0.25 million metric tons of CO₂ (MMT CO₂e) by 2020. The Survey Update was designed to obtain sales data for the 12 month period starting from October 1, 2007, through September 30, 2008.

In addition to the survey data and staff's research, the proposal also considered technical information provided by interested parties. During the workgroup and workshop process, we presented specific proposals and alternatives to the public for consideration. Modifications were made to the original proposal after consideration and evaluation of comments.

C. ALTERNATIVES CONSIDERED

Government Code section 11346.2 requires ARB to consider and evaluate reasonable alternatives to the proposed regulation and provide reasons for rejecting those alternatives. We identified three alternative approaches to the current proposal: "No Action," "Set Different Limits," and "Set Limits for Different Categories."

1. Alternative One – No Action

A "No Action" alternative would be to forego adopting the proposed amendments, or delay adoption of the proposed measures. The "No Action" alternative would result in failing to make progress toward meeting our SIP commitments (see Chapter I, Introduction). In the case of not meeting the SIP commitments, there is a potential for loss of federal funds. The citizens of California would not benefit from the improved air quality that would result from the reduction of emissions being proposed. This alternative would have no cost to business.

2. Alternative Two – Set Different Limits

As was discussed in section B above, we thoroughly evaluated each category for which a limit is proposed. Limits were proposed based on low emitting technologies reported in the 2006 Survey and Survey Update. Stakeholders provided additional information pertinent to the categories and, in some cases, proposed alternative limits. We evaluated all comments and determined the most feasible limit and effective dates from all of the alternatives proposed or considered. The final proposal contains limits that were determined to obtain the maximum feasible reduction, were commercially and technologically feasible, preserved product forms (as required by Health and Safety Code Section 41712), and together achieved the necessary emission reductions to partially fulfill ARB's SIP commitments.

3. Alternative Three – Set Different Effective Dates

For the Multi-purpose Solvent and Paint Thinner categories, a specific alternative we analyzed was to propose the same VOC limits and time frames that the SCAQMD approved in March 2009 under Rule 1143, Consumer Paint Thinners and Multi-purpose Solvents. Rule 1143 contains two tiers of VOC limits, virtually equivalent to our proposed limits. However, the effective dates are significantly different; Rule 1143 being January 1, 2010, and January 1, 2011 for the first and second tier VOC limits respectively, while our proposed effective dates are December 31, 2010 and December 31, 2013. In our proposal, we are providing one additional year for manufacturers to meet the first tier limit simply due to the time necessary for State regulations to become legally effective, per State law, compared to the shortened time frame for local air district rules to become legally effective.

For the second tier limit, we believe it has not been demonstrated that products meeting the 3 percent VOC limit will function as paint thinners for all solvent-borne coatings

available in commerce. While we are encouraged about the future viability of low VOC thinners, such as soy based products, it has not yet been demonstrated that they are ready for introduction into the market. There is still a need for paint thinners that are compatible with solvent-borne coatings, for a period of time, in areas of the State other than SCAQMD because SCAQMD has more stringent VOC coating limits than many other areas of the state. Therefore, we determined it was appropriate that the second tier, 3 percent VOC limit be effective December 31, 2013, giving manufacturers ample time to develop low VOC thinners that are compatible with solvent-borne coatings.

Additionally, the second tier limit could lead to an increase in sales of extremely flammable products, such as acetone. An acetone-based product labeled "Paint Thinner," will be formulated differently than the former "Paint Thinner" product and will behave differently than what the household consumer is used to. Without enough lead time for manufacturers, we are concerned that acetone products will be the most likely of a limited number of known pathways to compliance. To allow ample time for development of less flammable, and/or less costly alternatives, we are proposing an effective date of December 31, 2013 for the 3 percent VOC limit.

4. Alternative Four – Set Limits for Different Categories

The proposed categories, for this current action, include three categories that were deferred during the June 2008 Amendments to the California Consumer Products Regulation, because at the time, staff could not set limits and demonstrate that the limits were commercially or technologically feasible without further investigation.

For this current action, staff is proposing new or lower VOC limits for three categories that would achieve the maximum feasible reductions, and partially fulfill ARB's SIP commitments. It should be noted that ARB has already set 174 VOC limits which, when fully effective, will have resulted in reducing emissions by about 200 tons per day, an overall 44 percent reduction in VOC emissions from consumer products. Additional product categories surveyed in the 2006 Survey will be evaluated for future regulatory action.

REFERENCES

1. Air Resources Board. Paint Thinner and Multi-purpose Solvent Survey Update. November 4, 2008. (ARB, 2008f)
2. Air Resources Board. 2006 Consumer & Commercial Products Survey. July 24, 2007. (ARB, 2007f)

III. STATUTORY REQUIREMENTS FOR EMISSION REDUCTIONS

In this chapter, we describe State law requirements related to setting volatile organic compound (VOC) limits, and how our proposals meet these criteria. We also provide information related to the number of complying products and the marketshare they hold, which indicates that the limits are commercially and technologically feasible within the timeframes provided.

A. VOC REDUCTIONS

Health and Safety Code section 41712 gives ARB authority to control emissions from a very diverse number of products sold statewide to household and commercial consumers. By law, "Consumer Product" means a chemically formulated product used by household and institutional consumers, including, but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; aerosol paints; and automotive specialty products; but does not include other paint products, furniture coatings, or architectural coatings.

Section 41712 requires the Board to adopt regulations to achieve the maximum feasible reduction in VOCs emitted by consumer products after making certain determinations. Prior to adoption, the Board must determine that adequate data exist to establish that the regulations are necessary to attain State and federal ambient air quality standards and the regulations are commercially and technologically feasible, and necessary. Amendments to section 41712 in 1996 specified that regulations adopted by the Board cannot result in the elimination of a product form. Product form refers to the shape and/or structure of the product such as liquid; solid; powder; gel; crystal; aerosol; or pump spray.

The Board must consider the effect that the limits or requirements proposed for health benefit products will have on the efficacy of those products in killing or inactivating agents of infectious diseases such as viruses, bacteria, and fungi. In this regard, the Board must consult with health professionals when developing VOC control measures for health benefit products.

The Board must also meet its obligations under the State Implementation Plan (SIP). ARB's SIP commitments are described in both the Executive Summary and in Chapter I.

Related to VOC reductions, Chapter IV describes why the proposed amendments are necessary to attain ambient air quality standards, and why the data are adequate to adopt the proposed limits. Our focus in this chapter is on why the proposed VOC limits are commercially and technologically feasible. During the early development of consumer product regulations, guidelines were established to ensure that these statutory criteria were met when setting limits. These guidelines and statutory criteria were followed in developing the proposed amendments. Section C, below, describes

the terms "technologically feasible" and "commercially feasible," as they relate to VOC reductions.

B. GREENHOUSE GAS REDUCTIONS

Assembly Bill 32 (AB 32) was signed into law in 2006. It is codified in Health and Safety Code section 38500 *et. seq.* These sections require ARB to develop regulations and consider market mechanisms that will ultimately reduce California's greenhouse gas emissions equivalent to the 1990 levels by 2020. It required ARB to identify a list of "discrete early action greenhouse gas reduction measures" by June 30, 2007. Once on the list, these measures are to be developed into regulatory proposals, adopted by the Board, and made legally enforceable (approved by Office of Administrative Law) by January 1, 2010. Reduction of compounds with high GWP that are used in consumer products was designated as one of these measures, and became part of the State's comprehensive strategy when the Board approved the Scoping Plan on December 12, 2008.

In accordance with section 38562, certain criteria are to be met in developing regulations to meet GHG reduction goals. Among other things, the regulations must be equitable, minimize costs, and maximize the benefits to California. The GHG regulations are also required to be technologically feasible and cost-effective. AB 32 requires ARB to identify and evaluate emission reduction and mitigation opportunities for anthropogenic non-CO₂ GHGs such as sulfur hexafluoride (SF₆) and hydrofluorocarbons (HFC).

For this rulemaking, we evaluated the potential use of GHGs as products are reformulated to meet the VOC limits. As we found that there existed a possibility that high GWP compounds could be used, we are proposing mitigation measures.

C. TECHNOLOGICAL AND COMMERCIAL FEASIBILITY OF VOC LIMITS

The proposed VOC limits were set based on the lower VOC content technologies existing within a product category, or are based on low emitting technology transfer from other products. In doing this, staff made sure that the various product forms within each category would be preserved. For the categories proposed for regulation, there are products on the market which currently comply. Where there is low complying market share, lower emission technology exists that can provide a pathway for compliance.

1. Technologically Feasible

Health and Safety Code section 41712(b) requires that the Board adopt consumer product regulations that are "technologically feasible." Technological feasibility is a different concept than "commercial feasibility," and does not take into account the cost of reformulating a product. We believe that a proposed limit is technologically feasible if it meets at least one of the following criteria: (1) the limit is already being met by at

least one product within the same category, or (2) the limit can reasonably be expected to be met in the time frame provided through additional development efforts.

In setting the proposed VOC limits, an effort was made, wherever possible, to ensure that multiple reformulation technologies exist which would allow products to comply. Proposed limits were set at VOC levels that staff determined could be met without increased use of toxic air contaminants, greenhouse gases, or ozone-depleting compounds. General reformulation options include addition of exempt solvents such as acetone, use of low vapor pressure (LVP)-VOC solvents, use of VOC exempt propellants, increased use of surfactants, and use of inorganic compounds.

2. Commercially Feasible

Health and Safety Code section 41712(b) also requires the Board to adopt consumer product regulations that are "commercially feasible." The term "commercially feasible" is not defined in State law. In interpreting this term, the staff has utilized the reasoning employed by the United States Court of Appeals for the District of Columbia in interpreting the federal Clean Air Act. In the leading case of International Harvester Company v. Ruckelshaus, (D.C. Cir. 1973) 478 F. 2d 615, the Court held that the U.S. EPA could promulgate technology-forcing motor vehicle emission limits which might result in fewer models and a more limited choice of engine types for consumers, as long as the basic market demand for new passenger automobiles could be generally met.

Following this reasoning, we have concluded that a regulation is "commercially feasible" as long as the "basic market demand" for a particular consumer product can be met. "Basic market demand" is the underlying need of consumers for a product to fulfill a basic, necessary function. This must be distinguished from consumer "preference," which may be towards specific attributes of a particular product. A "preference" is the choice of consumers for a certain product or products based upon fragrance, cost, texture, etc.

By way of example, a consumer has a basic market demand for a glass cleaner to remove soils, grease, dirt or grime from their windows. Glass cleaners may be formulated with glycol ether solvents or with ammonia. Consumers may choose an ammoniated glass cleaner because they prefer the performance characteristics, or they may choose a non-ammoniated glass cleaner because they dislike the smell of ammonia. This distinction is not recognized by all parties. Some stakeholders have expressed the view that consumers do not have a "basic market demand" for a general class of products, but that consumers instead have a number of separate and distinct "basic market demands" for many specialty products with differing characteristics.

ARB staff believes the consumer "preference" interpretation of "basic market demand" is inconsistent with the reasoning from the International Harvester case. To adopt such a narrow interpretation would be inconsistent with the clearly expressed legislative intent that "...the State board shall adopt regulations to achieve the maximum feasible

reduction in reactive organic compounds emitted by consumer products..." (Health and Safety Code section 41712(a)). In order to achieve emission reductions, manufacturers of high VOC products which perform the same basic function as lower VOC counterparts must reduce the amount of VOCs in their products. It is expected that when a product's formulation changes, some attributes of the product will also change. If ARB were to establish limits which accounted for every distinct feature of every product, then each product would require a limit unto itself. Using this approach, it would be impossible to achieve the maximum feasible reduction in VOC emissions.

Most currently marketed products have some unique features that differentiate them from other products. Consumers who purchase a product have demonstrated a preference over other competing products. This distinction between "preference" and "basic market demand" was clearly made in the International Harvester case. In the International Harvester case, the court stated that the proposed emission limits would be feasible even though they may result in the unavailability of certain kinds of vehicles and engine types people preferred, as long as the basic market demand for passenger cars could be generally met. Applying this principle to consumer products, the proposed amendments allow the basic market demand to be met for each product category, even though it may no longer be possible to manufacture products with some specific attributes. ARB staff believes that this approach complies with Health and Safety Code section 41712.

D. COMPLIANCE WITH THE PROPOSED AMENDMENTS

Manufacturers have the flexibility to choose from a variety of formulation options to meet the applicable limits (see Chapter VI). To comply with VOC limits, VOC solvents or propellants may need to be replaced, or partially replaced, with VOC exempt ingredients. This may require using acetone or another exempt solvent, increasing product solids, or formulating with a VOC exempt propellant. Manufacturers may also need to change the valve, container, delivery system, or the other components of the consumer product depending on the individual formulation.

To meet the VOC limit for Double Phase Aerosol Air Fresheners, the most straightforward reformulation pathway for manufacturers of non-complying products is to replace some of the hydrocarbon propellant with water. Although another reformulation option is to use VOC exempt propellants such as HFC-152a or HFC-134a. The likelihood of this reformulation choice is minimal because of the increased cost of these propellants. However, we are proposing a GWP limit of 150 for the category to ensure that incremental use of high GWP propellants are not used in reformulations to meet the VOC limit. ARB staff has proposed VOC limits that can be met without a significant increase in the use of Toxic Air Contaminants or greenhouse gases. We believe that products can and will be reformulated primarily through reduction in the amount of hydrocarbon propellant with possibly some modification or adjustments to the surfactants and/or the valve/spray nozzle.

To meet the proposed Multi-purpose Solvent and Paint Thinner first tier VOC limit, the most likely "reformulation" pathway is product substitution (i.e. increasing the sales of existing complying products and discontinuing sale of non-complying products). To meet the proposed second tier Multi-purpose Solvent and Paint Thinner VOC limits, reformulation options for manufacturers of non-complying products include, in addition to product substitution, developing water-based formulations. We believe that products can and will be reformulated through reduction or replacement of VOC solvents with VOC exempt ingredients, such as LVP-methyl esters, or water emulsion technology. Possible reformulation options could also include chlorinated toxic compounds, and compounds that could compromise the predicted ozone benefits of the limits. However, because these formulation options are not necessary, and the proposal includes specific prohibitions to prevent them, products can not be reformulated using these options and possible adverse impacts will be prevented.

Table III-1 summarizes, for the proposed VOC limits, data related to the complying market shares (based on sales), as well as the number of products or product groups that currently comply relative to total number of products reported.

**Table III-1
Summary of Complying Products and Complying Marketshares**

| Product Category | Product Form | Proposed VOC Limit (wt%) | Number of Complying Products/Total | Complying Market Share (%) |
|---------------------------------------|--------------|--------------------------|------------------------------------|----------------------------|
| Double Phase Aerosol Air Freshener | Aerosol | 20 | <10 / 60 | <1 |
| Multi-purpose Solvent & Paint Thinner | Non-aerosol | Tier 1: 30 | 18 / 165 | 11.3 |
| | | Tier 2: 3 | 15 / 165 | 11.2 |

Source: 2008 Consumer and Commercial Products Survey and 2008 Paint Thinner and Multi-purpose Solvent Survey Update.

Table III-1 shows that the complying marketshares range from less than 1 percent to 11.3 percent. Based on these complying marketshares and the number of complying products, we believe the proposed VOC limits, although challenging, are commercially and technologically feasible within the timeframes proposed. It should be noted that there are currently a few Multi-purpose Solvent and Paint Thinner products, with significant market presence, formulated slightly above 30 percent VOC by weight. These products will only need a modest reformulation to comply with the proposed 30 percent standard. The complying marketshare in Table III-1, for the first tier limit for Multi-purpose Solvent and Paint Thinner, would be significantly higher if these products already complied with the proposed 30 percent VOC limit.

Manufacturers can also comply with the proposed amendments through the use of the Innovative Products Provision (IPP) or the Alternative Control Plan (ACP). The IPP allows manufacturers of "innovative products" to comply with the Consumer Products Regulation if they demonstrate through clear and convincing evidence that their product will result in less VOC emissions than a complying product that meets the applicable VOC limit. The innovative product may result in less emissions due to some characteristic of the product formulation, design, delivery system, or other factors.

The ACP allows manufacturers to average the emissions from products above and below the applicable VOC limits, as long as the overall emissions are less than or equal to the emissions that would have occurred had all the products complied with the VOC limits. Manufacturers must submit an application which includes the VOC content of the products in the plan, a method of verifying the sales of each product in the plan, and other information necessary to track overall emissions.

IV. EMISSIONS

California's extreme air quality problems require unique strategies for improving air quality and slowing climate change. In this chapter, we provide an overview of criteria pollutant air quality and climate change problems which are germane to the regulation of consumer products. We also describe the need for significant emission reductions from all sources contributing to these problems. This chapter includes a description of the need for the regulation of consumer products and provides a summary of the emissions from the categories proposed for regulation. For a detailed summary of the product categories, the reader is referred to Chapter VI.

A. CRITERIA POLLUTANTS, AMBIENT AIR QUALITY STANDARDS, CLIMATE CHANGE, AND TOXIC AIR CONTAMINANTS

Federal and state ambient air quality standards have been established to protect California's population from the harmful effects of ozone and particulate matter (PM). An ambient air quality standard sets legal limits on the level of an air pollutant in the outdoor (ambient) air necessary to protect public health. Both ARB and U.S. EPA are authorized to set standards. Assembly Bill 32, the California Global Warming Solutions Act of 2006 (AB 32), was signed into law by the Governor in September 2006 to address climate change.

Volatile organic compound (VOC) emissions from consumer products contribute to the formation of both ozone and fine PM. Other sources of VOCs include emissions from fuel combustion, coatings and paints. PM pollution is the result of both direct and indirect emissions. Direct sources of PM include emissions from fuel combustion and wind erosion of soil. Indirect PM emissions result from the chemical reaction of VOCs, nitrogen oxides (NO_x), sulfur oxides, and other chemicals in the atmosphere. While carbon dioxide (CO_2) is the greenhouse gas (GHG) emitted in the largest quantity, other significant GHGs include, but are not limited to, methane, nitrous oxide, and hydrofluorocarbons (HFCs). Related to the role of consumer products, HFCs are the primary source of GHG emissions. To a lesser extent hydrochlorofluorocarbons (HCFC), and hydrofluoroethers (HFE) play a role.

1. Ozone

Ozone formation in the lower atmosphere results from a series of chemical reactions between VOCs and nitrogen oxides in the presence of sunlight. The rate of ozone generation is related closely to both the amount and reactivity of VOC emissions as well as the amount of NO_x emissions available in the atmosphere (Seinfeld and Pandis, 1998). Ozone is a colorless gas and the chief component of urban smog. It is one of the State's more persistent air quality problems. Ninety-three percent of Californians, or 36 million people, live in areas designated as non-attainment for the federal eight-hour ozone standard. California experienced 41 percent of the total national ozone exposure, based on analysis of population exposure conducted by ARB staff for the

years 2000 through 2002 (ARB, 2006b). California occupies the top five spots and has six out of the top ten areas with the highest levels of ozone (2004 design values).

It has been well documented that ozone adversely affects the respiratory function of humans and animals. Research has shown that, when inhaled, ozone can cause respiratory problems, aggravate asthma, impair the immune system, and cause increased risk of premature death. Human health studies show that short-term exposure to ozone injures the lung (ARB, 2008e). In some animal studies, permanent structural changes with long-term exposures to ozone concentrations considerably above ambient were seen; these changes remain even after periods of exposure to clean air (U.S. EPA, 2006). Exposure to levels of ozone above the current ambient air quality standard can lead to lung inflammation, lung tissue damage, and a reduction in the amount of air inhaled into the lungs.

Ozone is a strong irritant that can cause constriction of the muscle cells in the airways that result in symptoms such as coughing, chest tightness, shortness of breath, and increased asthma symptoms (ARB, 2008e). Recent evidence suggests that ozone may be linked to the onset of new asthma in very active children (McConnell *et al.*, 2002). Ozone has also been associated with premature death. Based on 2004 - 2006 data, premature deaths from ozone exposure in California are estimated at 590. Ozone in sufficient doses can also increase the permeability of lung cells, rendering them more susceptible to toxins and microorganisms. Other health effects associated with ozone exposure include hospitalizations and school absences. Of course, the greatest risk from ozone exposure is to those who are active outdoors during smoggy periods, such as children, athletes, and outdoor workers.

Not only does ozone adversely affect human and animal health, but it also affects vegetation, resulting in reduced yield and quality in agricultural crops, disfiguration or unsatisfactory growth in ornamental vegetation, and damage to native plants. During the summer, ozone levels are often highest in the urban centers in Southern California, the San Joaquin Valley, and Sacramento Valley, which are adjacent to the principal production areas in the State's multibillion-dollar agricultural industry (USDA, 2006). ARB studies indicate that ozone pollution damage to crops is estimated to cost agriculture over \$500 million dollars annually (ARB, 1987; ARB, 2006b).

2. Fine Particulate Matter

Particulate matter (PM) is a complex mixture of tiny particles that may consist of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. These particles vary greatly in shape, size and chemical composition, and can be made up of many different materials such as metals, soot, soil, and dust. As described above, PM can be directly emitted from sources, such as diesel PM, or can be produced indirectly from sources which emit precursors that are converted to PM by atmospheric processes. Particles ten micrometers or less in diameter are defined as "respirable particulate matter" or "PM₁₀." PM₁₀ and particles 2.5 micrometers or less in diameter (PM_{2.5}) can be inhaled deep into the lungs. PM_{2.5} contributes significantly to regional

haze and reduction of visibility in California. Besides reducing visibility, the acidic portion of PM (nitrates, sulfates) can harm crops, forests, aquatic and other ecosystems (ARB, 2002).

Considerable epidemiologic research over the past 15 years has investigated the responses of humans to PM. The principal health effects of PM exposure are summarized below:

- Many studies have consistently found statistical associations between PM_{2.5} and premature death with both long-term (Pope *et al.*, 2004; Pope *et al.*, 2002; Krewski *et al.*, 2000; Laden *et al.*, 2006) and daily exposures (e.g., Dominici *et al.*, 2005; Dominici *et al.*, 2003; Laden *et al.*, 2000). The association with premature mortality is considerably stronger for annual average PM_{2.5} exposure than for daily average PM_{2.5}. That is, long-term exposure appears to pose a greater risk of death than short-term exposure.
- A recent study suggests that long-term exposure to PM_{2.5} may influence the risk of adverse cardiovascular events in women (Miller *et al.*, 2007), including hospitalization or death from heart attack or stroke.
- Daily exposure to PM_{2.5} has been associated with hospitalization for heart and lung related causes (Moolgavkar, 2003; Zanobetti *et al.*, 2003). Others have found that exposure to PM_{2.5} resulted in increased emergency room visits, exacerbation of asthma, and other respiratory diseases (Peel *et al.*, 2005; Sheppard *et al.*, 2003). Other research indicates that exposure to PM_{2.5} leads to increased asthma medication usage (Gent *et al.*, 2003), and increased asthma symptoms (e.g., Delfino *et al.*, 2002; Whittemore and Korn, 1980). Exposure to PM_{2.5} has also been associated with an increase in the loss of work days (Ostro *et al.*, 1993; Ostro *et al.*, 1989).
- Older adults with pre-existing chronic heart or lung disease are at greatest risk of experiencing adverse effects related to PM_{2.5} exposure (Moolgavkar, 2003; Dominici *et al.*, 2006; Symons *et al.*, 2006).

There is some evidence that particulate matter and ozone may have greater effects in children than in adults. This may be because they inhale more PM_{2.5} and ozone per pound of body weight than do adults, and because they breathe more rapidly than adults. Adverse effects reported in children include reduced lung function and reduced lung growth in higher pollution areas (Gauderman *et al.*, 2004; Gauderman *et al.*, 2002; Gauderman *et al.*, 2000) that may at least partially reverse if the child moves to an area with cleaner air (Avol *et al.*, 2001); increased asthma and bronchitis symptoms (Gauderman *et al.*, 2005; McConnell *et al.*, 1999); increased school absenteeism (Gilliland *et al.*, 2001); and increased risk of acquiring asthma for children who engage in three or more outdoor sports and live in areas with high ozone concentrations (McConnell *et al.*, 2002).

3. Ambient Air Quality Standards

In April 2005, the Board reviewed California's one-hour peak standard for ozone and determined that it alone was not sufficiently protecting public health. Consequently, ARB adopted a new eight-hour ozone standard of 0.07 parts per million (ppm) averaged over eight hours, while retaining the existing one-hour ozone standard at 0.09 ppm. Regarding particulate matter, the Board adopted stricter standards in 2002, which include a PM₁₀ annual average standard of 20 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and a new annual average PM_{2.5} standard of 12 $\mu\text{g}/\text{m}^3$. The State PM₁₀ standard for a 24-hour period remains at 50 $\mu\text{g}/\text{m}^3$. The national and State ambient air quality standards for ozone and PM are shown in Table IV-1.

Table IV-1
Ambient Air Quality Standards for Ozone, PM₁₀ and PM_{2.5}

| Pollutant | Averaging Time | State Standard | National Standard |
|-------------------|-----------------------------------|--|--|
| Ozone | 1 hour | 0.09 ppm (180 $\mu\text{g}/\text{m}^3$) | ----- |
| | 8 hour | 0.070 ppm (137 $\mu\text{g}/\text{m}^3$) | 0.075 ppm* (147 $\mu\text{g}/\text{m}^3$) |
| PM ₁₀ | 24 hour Annual Arithmetic Mean | 50 $\mu\text{g}/\text{m}^3$ 20 $\mu\text{g}/\text{m}^3$ | 150 $\mu\text{g}/\text{m}^3$ ----- |
| PM _{2.5} | 24 hour Annual Arithmetic Mean | ----- 12 $\mu\text{g}/\text{m}^3$ | 35 $\mu\text{g}/\text{m}^3$ 15 $\mu\text{g}/\text{m}^3$ |

Source: Air Resources Board, Ambient Air Quality Standards April 1, 2008 (ARB, 2008a).

* This standard became effective on March 27, 2008. The 2007 SIP demonstrates attainment with the previous standard of 0.08 ppm.

Table IV-1 reflects the newly revised national eight-hour standard for ozone of 0.075 ppm, which was promulgated on March 27, 2008. The U.S. EPA's rescission of its one-hour ozone standard is also reflected (U.S. EPA, 1997). Despite these revisions to the national standards, Table IV-1 shows that California's standards for PM and ozone continue to be more health protective than those at the federal level.

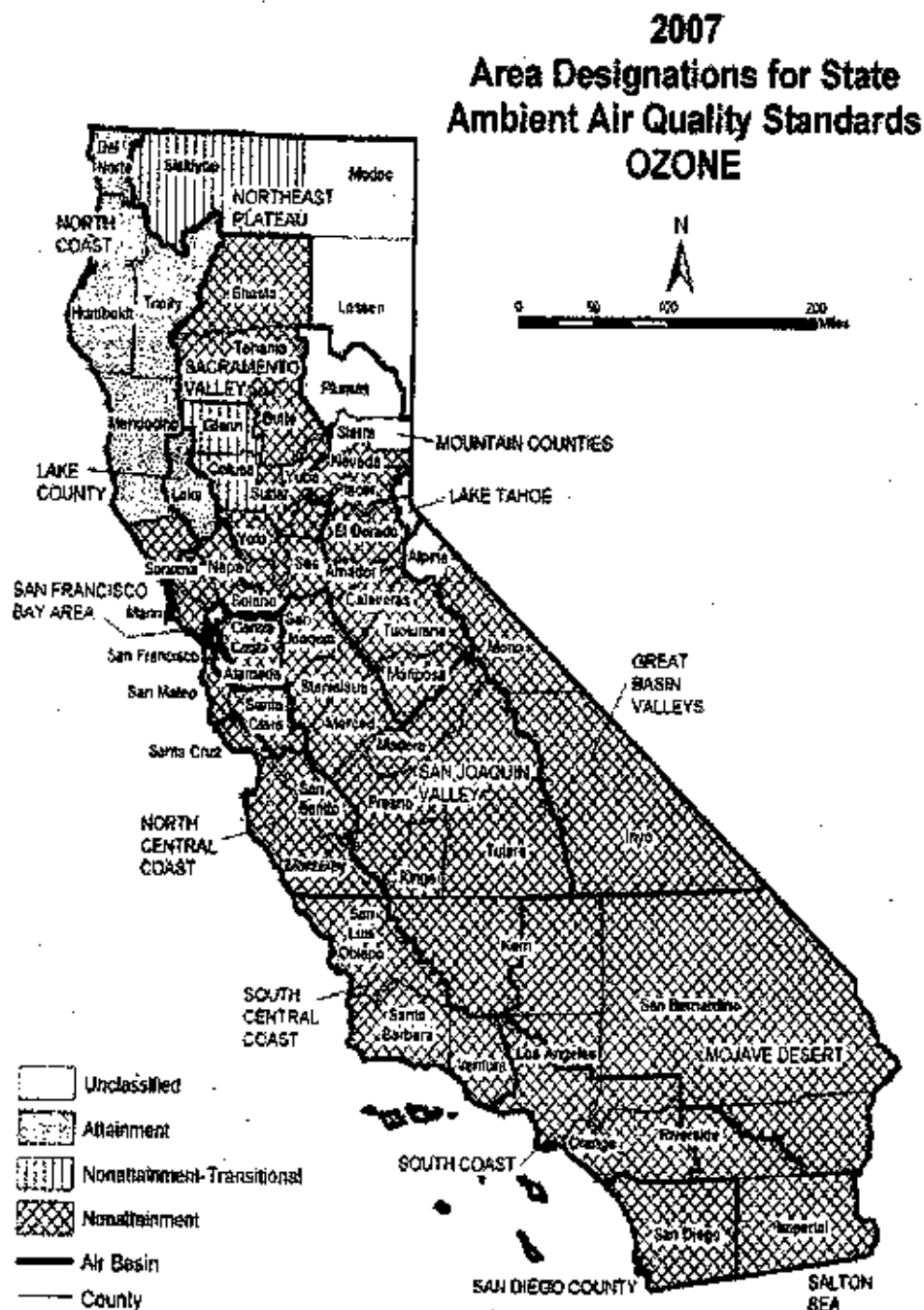
4. Area Designations for California Ambient Air Ozone Standard

The California Clean Air Act (CCAA) of 1988 has the fundamental goal that all areas of California are to attain the State ambient air quality standards for ozone by the earliest practicable date. As specified in the CCAA, ARB has designated areas of California to be in "attainment" or "non-attainment" for the State ozone standards.

For the year 2007, Figure IV-1 shows the counties designated as non-attainment (or non-attainment transitional, which is a subcategory of non-attainment) for the State ozone standard. As shown, unhealthy levels of ozone are not limited to urban areas,

but can be found in nearly every county in California. This map clearly indicates the extent and magnitude of the ozone problem in California.

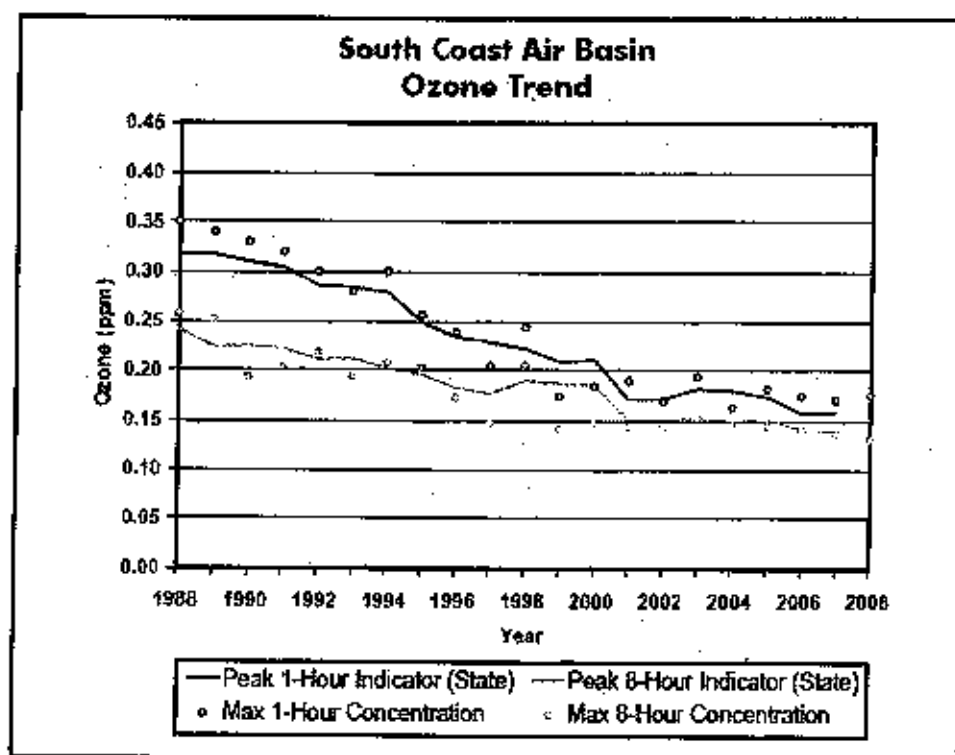
Figure IV-1



The areas that are non-attainment for the State ozone standards are also non-attainment for the previous 0.08 ppm federal eight-hour ozone standard. The new federal non-attainment designations include a number of rural Sierra Nevada foothill counties and additional parts of the Sacramento Valley. The federal one-hour standard was revoked on June 15, 2005, one year after the effective date of the designations. SIPs showing how each non-attainment area would meet the previous 0.08 ppm eight-hour ozone standard were submitted in 2007. In order to maintain progress towards clean air, the federal Clean Air Act prohibits backsliding on the control program.

Recent air quality trends have shown that progress is being made towards achieving the State ozone standard. For the South Coast Air Basin all of the ozone statistics between 1988 and 2008, show an overall steady decline, as seen in Figure IV-2. The average maximum 8-hour ozone concentration for the three year period, 2006 to 2008, was over 41 percent lower than the maximum 8-hour ozone concentration in 1990. Also, the number of days above the standards has declined dramatically. The downward trend for both the eight-hour and one-hour ozone concentrations is similar (ARB, 2009).

Figure IV-2
South Coast Air Basin Ozone Trend

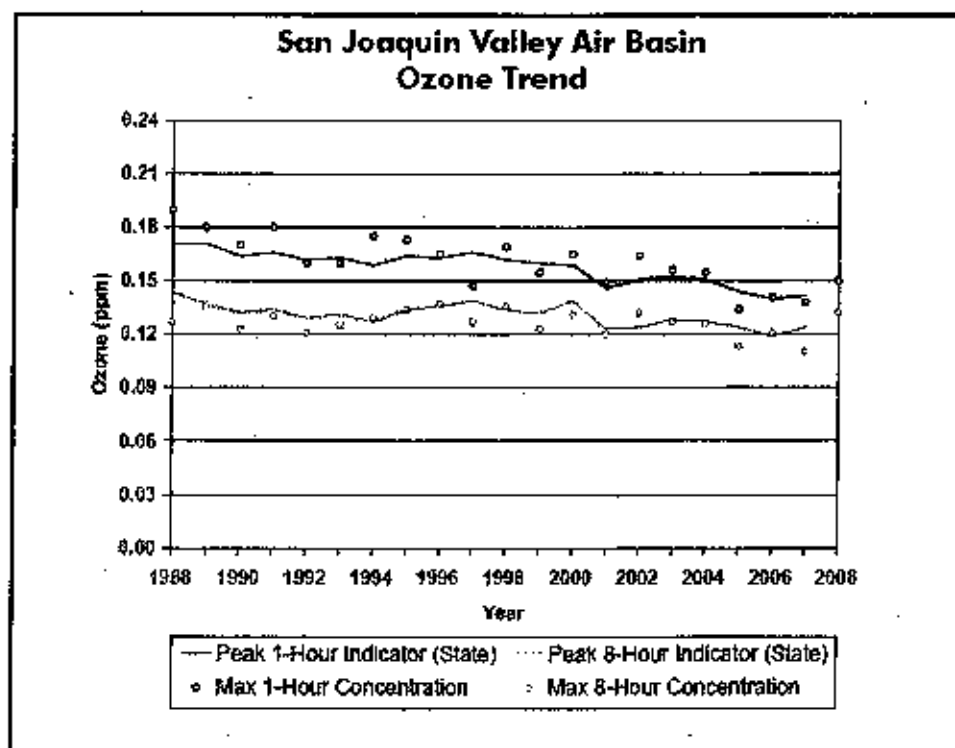


Source: ARB 2009 Almanac

The ozone problem in the San Joaquin Valley ranks among the most severe in the State. Looking at ozone air quality from a historical perspective is challenging because of the lack of long-term monitors prior to 1990. Furthermore, monitoring did not include the sites in the portions of the basin with the worst pollution problems until 1990. For

this reason, we are using 1990 as the beginning year to characterize trends. Similar to other areas of the state, exceedence days have declined at a faster rate than peak levels. From 1990 to 2008, peak levels declined by an average of 10 percent while the number of State and national eight-hour standard exceedence days declined by 17 percent and 21 percent, respectively. Most of this progress has occurred since 2003. However, the number of exceedence days in 2005 and 2007 were among the lowest in this eighteen year period (ARB, 2009). Figure IV-3 shows the ozone trend between years 1988 and 2008 for the San Joaquin Valley Air Basin.

Figure IV-3
San Joaquin Valley Air Basin Ozone Trend



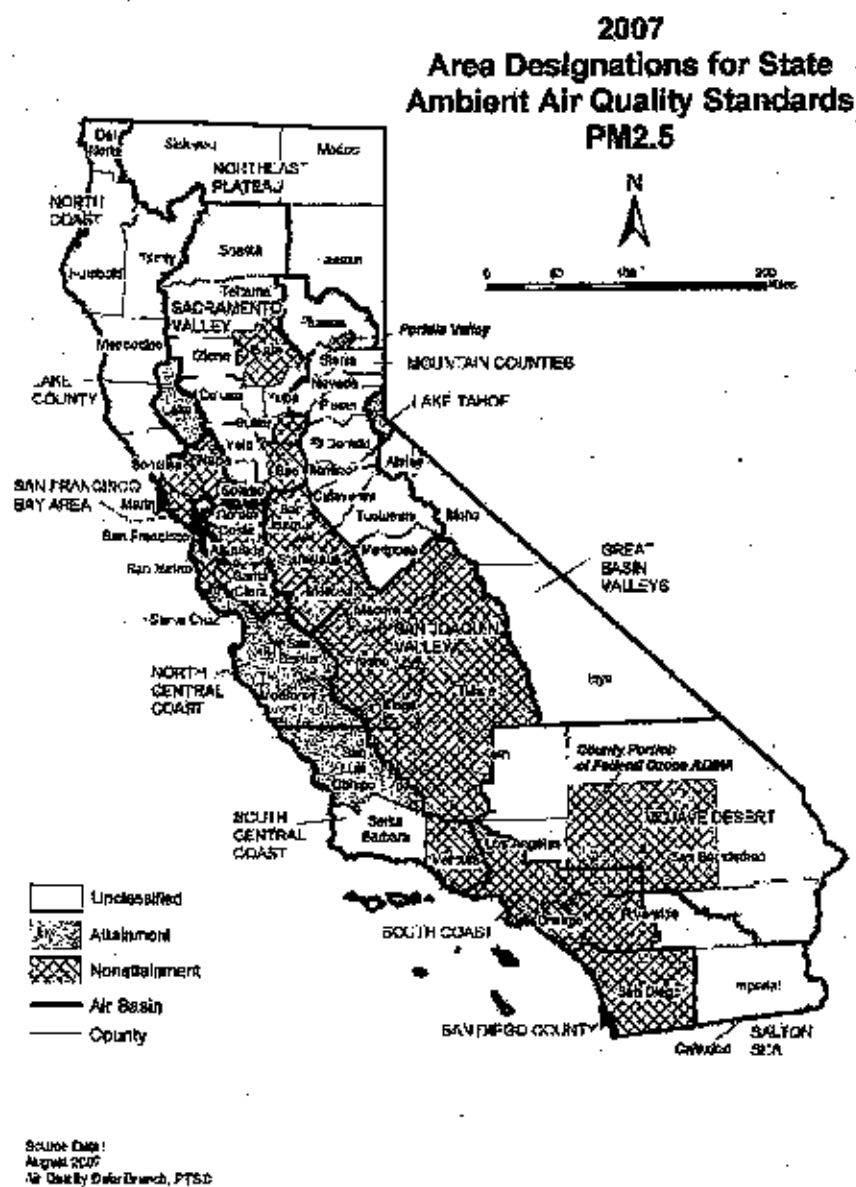
Source: ARB 2009 Almanac

Despite over 25 years of regulatory efforts and the decline of smog levels in areas such as the South Coast Air Basin and the San Joaquin Air Basin, ozone continues to be an important environmental and health concern in California and more emission reductions are necessary. The State Strategy for California's 2007 State Implementation Plan addresses the State measures necessary to meet the previous national ozone standard of 0.08 ppm averaged over eight hours.

5. Area Designations for California Ambient Air $PM_{2.5}$ Standard

Figure IV-4 shows the counties designated as non-attainment for the State $PM_{2.5}$ standard. As with ozone, unhealthy levels of $PM_{2.5}$ are not limited to urban areas, but can be found in many counties throughout California.

Figure IV-4



Related to the federal $PM_{2.5}$ standard, in December 2007, ARB submitted non-attainment area recommendations and appropriate boundaries to U.S. EPA, in response to the new federal 24-hour $PM_{2.5}$ standard of $35 \mu\text{g}/\text{m}^3$ established on December 18, 2006. The non-attainment area recommendations are based on 2004-2006 $PM_{2.5}$ air quality monitoring data. ARB recommended that the South Coast Air Quality Management District (SCAQMD); San Joaquin Valley Air Pollution Control District (SJVAPCD); Bay Area Air Quality Management District; Sacramento Metro Air Quality Management District; the combined cities of Marysville/Yuba City; the City of Chico; and the City of Calxico be designated as non-attainment for the new 24-hour $PM_{2.5}$ standard. Thus, most of the areas shown in Figure IV-4 are also non-attainment for the federal 24-hour $PM_{2.5}$ standard.

The $PM_{2.5}$ SIP for SCAQMD was approved by the Board in September 2007 and was submitted to U.S. EPA in November 2007. The $PM_{2.5}$ SIP for SJVAPCD was approved by the Board in May 2008 and was submitted to U.S. EPA in June 2008.

6. Climate Change

Climate change, or global warming, is the process whereby emissions of anthropogenic pollutants, together with other naturally-occurring gases, absorb infrared radiation in the atmosphere, leading to increases in the overall average global temperature. Changes in the atmospheric abundance of GHGs alter the energy balance of the climate system. These changes are expressed in terms of radiative forcing. The standard definition of "greenhouse gas" includes, but is not limited to, six substances as identified in the Kyoto Protocol; carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

The Global Warming Potential (GWP) of a compound may reflect a direct effect as well as an indirect effect on global warming. The direct effect is the warming due to the absorption of radiation by molecules of the compound in question. VOCs, CO_2 , and HFCs all have direct effects. The indirect effect is due to the impact that the presence of the compound has on the concentration of other GHGs. For example, VOCs contribute indirectly to global warming, because they react chemically in the atmosphere to increase GHG concentrations of ozone and methane. While VOCs do have direct effects, they are considered GHGs primarily because of their role in creating ozone, and in prolonging the life of methane in the atmosphere.

By convention, the GWP index is defined relative to CO_2 which has a GWP of 1. The Second Assessment Report (SAR) (IPCC, 1996), defines the GWP of a GHG as the ratio of the time-integrated radiative forcing impact from an instantaneous release of 1 kilogram (kg) of a trace substance relative to that of 1 kg of CO_2 . The standard units of measurement used to express the emissions of a GHG is, million metric tons of CO_2 equivalents (MMT CO_2e) per year.

The GWP values used by ARB are generally the 1996 SAR GWP values (ARB, 2007c). These values are used when converting emissions of GHGs to carbon dioxide

equivalent values (CO₂e). The SAR GWP values are used to be consistent with the Board's Discrete Early Action Report, other statewide and national GHG inventories, and ARB's Scoping Plan. When no SAR GWP value is listed, ARB uses the 2007 Fourth Assessment Report (FAR) GWP value (IPCC, 2007).

The climate warming impact from emissions of GHGs is the product of two factors: (1) the mass of GHG emitted, and (2) its warming potential. In addition to uncertainty in the mass of emissions, there is also uncertainty in attributes of warming potential (as a function of direct and indirect warming impacts and the atmospheric lifetime) and thus in the assessment of GWP.

7. Toxic Air Contaminants

As part of our obligations under CEQA, the ARB staff is required to evaluate and mitigate potential adverse environmental impacts resulting from regulatory proposals. Also, pursuant to Health and Safety Code section 39650 et seq., the ARB is required to identify and control toxic air contaminants (TACs). The Health and Safety Code defines a TAC as "...an air pollutant which may cause or contribute to an increase in mortality or serious illness, or which may pose a hazard to human health." Moreover, in accordance with section 39666 of the Health and Safety Code, for TACs for which no safe exposure threshold has been established, the ARB is required to "... reduce emissions to the lowest level achievable through application of best available control technology or a more effective control method...."

Several chemicals currently used in the consumer product formulations considered for regulation have been identified as TACs. An increased or continued use of TACs in any of the consumer product categories considered for regulation could lead to a potential adverse environmental impact. ARB staff has evaluated this potential and has concluded that there would be a potential adverse environmental impact of implementing the VOC limits. Therefore, staff is proposing mitigation measures designed to ensure that use of TACs will be reduced or prohibited, resulting in a positive environmental impact.

In the federal Clean Air Act Amendments of 1990, the United States Environmental Protection Agency (U.S. EPA) identified perchloroethylene (Perc), methylene chloride (MeCl), and trichloroethylene (TCE) as hazardous air pollutants (HAPs) because evidence indicated the substances may have adverse effects on human health or the environment.

Staff found that the proposed prohibition on use of Perc, MeCl, and TCE in Multi-purpose Solvent and Paint Thinner products is necessary to reduce the health risk associated with use of these compounds. Staff has identified the potential for increased chances of contracting cancer from using products containing these compounds. The proposed prohibitions are necessary to mitigate potential adverse impacts that would result from implementing VOC limits for these categories. The prohibitions would also

align with State law that requires use of BACT in instances where no safe exposure threshold is known.

B. IMPORTANCE OF REGULATING CONSUMER PRODUCTS VOC AND GHG EMISSIONS AND TOXIC AIR CONTAMINANTS

In Section A above, we described how consumer products' emissions contribute to the formation of ground level ozone and PM_{2.5} and climate change. In this section, we provide information on the importance of regulating VOC and GHG emissions.

1. VOC Emissions

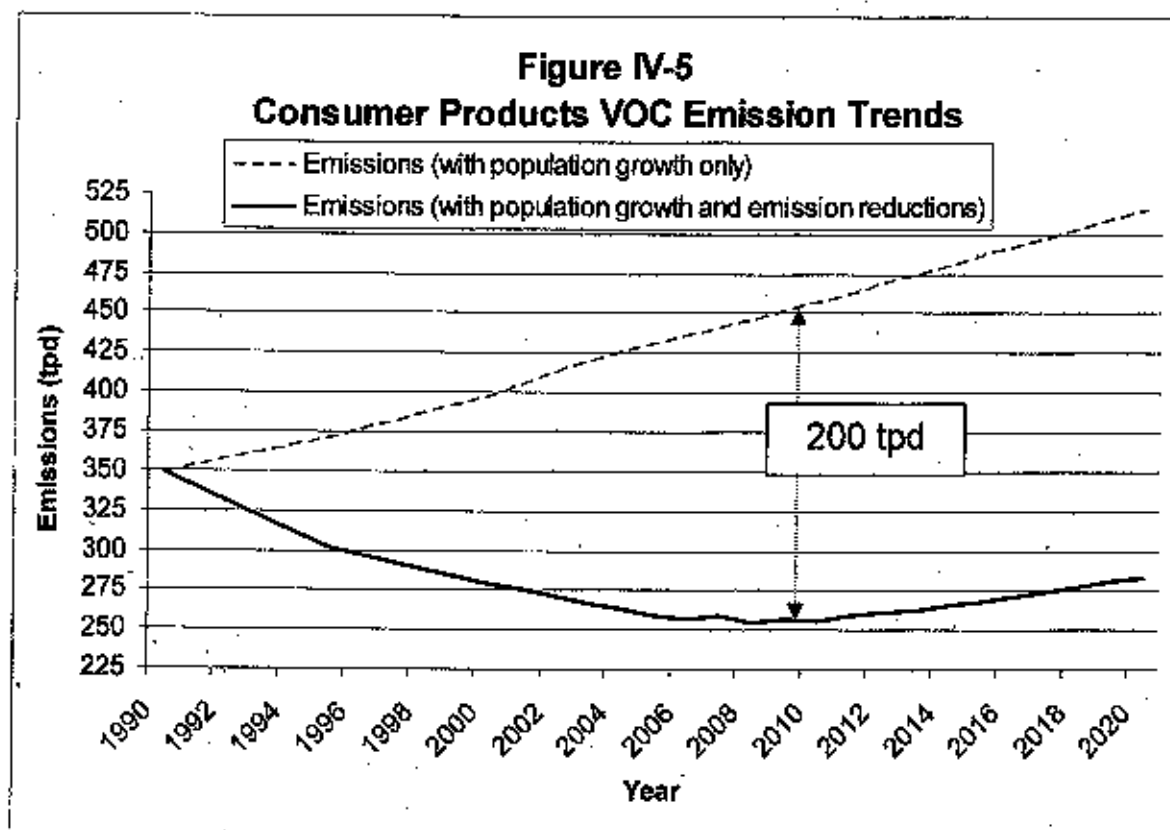
Consumer products are a significant source of VOC emissions in California. This section focuses on reducing emissions from consumer products as a ground-level ozone control strategy. Although each consumer product may seem to be a small source of emissions, the cumulative use of these products by over 38 million Californians results in significant emissions (DOF, 2007). Given the severity of the air pollution problems in California, further dramatic emission reductions from all sources contributing to ground-level ozone are necessary.

As evidence of the magnitude of consumer product VOC emissions, it is estimated that in 2010 consumer products emissions will be approximately 255 tons per day, or about 12 percent of the overall statewide VOC inventory. In this same year, consumer product emissions will comprise about 19 and 7 percent of VOC emissions in SCAQMD and SJVAPCD, respectively. Without further actions, consumer product emissions are expected to grow to approximately 283 tons per day in 2020, representing 14 percent of statewide VOC emissions (ARB, 2007h).

As control measures for other VOC sources (i.e. mobile sources) become effective, consumer product emissions become more important in the SCAQMD. It is estimated that emissions from consumer products will be the largest source of VOC emissions in the SCAQMD in 2020. However, using the maximum incremental reactivity (MIR) scale (see Title 17, CCR section 94700-94701) as the basis for comparison of ozone forming potential, consumer product emissions are over two times less reactive than are emissions from on-road motor vehicles. Regardless of the ozone-forming potential of various source categories, clearly, further reductions in VOC emissions from consumer products and other VOC sources are needed, if ozone attainment is to be achieved and maintained.

Despite these projections, ARB's consumer products program has made significant progress. Since 1989, regulations adopted by the ARB, along with numerous amendments to the regulations, have substantially reduced VOC emissions from consumer products. Absent these regulations today, consumer product emissions would likely be about 450 tons per day. Figure IV-5 shows that statewide consumer product VOC emissions have been reduced by over 200 tons per day in 2010. However, Figure IV-5 also shows that without further actions population growth would

likely reverse the trend.



The emission values in Figure IV-5 are derived from several data sources. The 1990 to 2007 emissions are taken from the ARB Forecasted Emissions by Summary Category, 2008 Almanac (ARB 2008c). Emissions are then grown in proportion to expected population increase. Population growth is in accordance with estimates in the California Environmental Protection Agency's (Cal/EPA) Statewide Human Population Table found in the Population and Vehicle Trends Report (ARB, 2008d). For categories regulated in the 2008 Consumer Products Regulation Amendments, emission values from the 2003 Survey and the projected emissions reductions resulting from the VOC limits approved by the Board at its June 2008, hearing, are reflected in Figure IV-5.

As shown in Figure IV-5, the important emission reductions that have been realized from the ARB's Consumer Products Program are beginning to be partially offset by population growth. California's population is expected to grow to 40 million by 2010 (DOF, 2007). Therefore, ARB must continue its commitment to pursue additional technologically and commercially feasible reductions in consumer products emissions.

As was described in Chapter I, the Health and Safety Code, as well as SIPs, set forth requirements to control emissions. To meet the federal standards, emission reductions from consumer products became part of the California State Implementation Plan (SIP) for ozone in 1994. In this SIP, consumer products measures were put in place to work

towards attaining the federal one-hour ambient air quality standard for ozone. In the 2003 SIP, ARB reiterated the commitment to reduce consumer products VOC emissions to meet the one-hour federal ozone standard.

In response to these mandates, adopted limits will achieve a 44 percent reduction in overall VOC emissions from consumer products by the year 2010. Despite these reductions, more are necessary to attain the federal ozone standard.

In 2007, a new SIP was adopted. This State Strategy for California's 2007 State Implementation Plan (Strategy) includes California's plan to attain the federal ozone standard of 0.08 ppm averaged over eight hours. The consumer products commitment in this strategy supplements the 1994 and 2003 commitments. In the Strategy, ARB has committed to an additional 30 to 40 tons per day VOC emissions reduction from consumer products by 2014.

Because significant further VOC emissions reductions are necessary to attain the federal ozone standard, the reductions from the amendments proposed in this report are therefore "necessary" within the meaning of section 41712 of the Health and Safety Code. In addition, section 41712(b)(1) of the Health and Safety Code provides that a regulation's "necessity" is to be evaluated in terms of both the State and federal standards.

The applicable State and federal laws show that both the U.S. Congress and the California Legislature intended progress toward clean air be made as quickly as possible. The CCAA specifically declares that it is the intent of the Legislature that the State air quality standards be achieved "...by the earliest practicable date..." (See Health and Safety Code, sections 40910 and 40913(a); see also the uncodified section 1(b)(2) of the Act (Stats. 1988, Chapter 1568)). A similar intent is expressed in the federal Clean Air Act, which declares that the federal air quality standards are to be achieved "...as expeditiously as practicable..." (See sections 172(a)(2), 181(a), and 188(c) of the federal Clean Air Act). For all of the reasons described above, the proposed amendments are "necessary" within the meaning of section 41712 of the Health and Safety Code.

The amendments proposed in this rulemaking are the second increment toward fulfilling the 2007 Strategy commitment for VOC reductions from consumer products.

2. Greenhouse Gas Emissions

We acknowledge that the GHG emissions contribution of consumer products is modest relative to other sources, such as vehicle exhaust. However, the severe consequences of climate change requires reductions from any source where it is feasible. While staff is still in the process of developing the consumer product GHG inventory, we do know from past surveys that several GHGs are used in consumer products. For categories proposed for regulation, no GHGs of concern were reported. However, several GHG could be used as products reformulate.

GHG propellants and several solvents with fairly high GWPs could be used to meet the proposed VOC limits. These compounds are typically low photochemically reactive compounds that are VOC exempt and have been used as a reformulation strategy to reduce VOC content in other categories. Compounds of interest include HFCs, HCFCs, HFEs, CO₂, and N₂O. However, the propellants HFC-134a and HFC-152a are the predominate GHGs used in consumer products today. In instances where flammability is a concern, HFC-134a is used. HFC-134a is a non-flammable propellant, whereas HFC-152a is minimally flammable. Compressed CO₂ is also used as a propellant, but the GHG emissions are negligible compared to the emissions from HFCs. Table IV-2 shows some examples of GHGs that are used in consumer products.

Table IV-2
Global Warming Potential of Selected Compounds Used in Consumer Products

| Compound | SAR GWP* | FAR GWP** |
|-----------------|----------|-----------|
| CO ₂ | 1 | 1 |
| HFE-7200 | N/A | 59 |
| HFC-152a | 140 | 124 |
| HCFC-141b | N/A | 725 |
| HFC-134a | 1300 | 1430 |
| HFC-43 10mee | 1300 | 1640 |

* 100 year timeframe, SAR value

** 100 year timeframe, FAR value

As shown in Table IV-2, HFC-152a has a GWP of 140, while HFC-134a has a GWP of 1300. The value for HFC-134a is approximately ten times greater than the GWP of HFC-152a and 1300 times greater than CO₂.

GHG emissions data are available from the 2006 Consumer and Commercial Products Survey (2006 Survey). In the 2006 Survey, we surveyed manufacturers of consumer products to determine the usage of compounds with high GWP in several categories of consumer products. The 2006 Survey will be used to develop the GHG inventory for consumer products. We will evaluate the survey data for product categories where compounds with high GWP are used to determine if there is a potential to reduce them without increasing the use of VOCs. Additionally, we will identify product categories where the pathway to reformulation may increase the use of high GWP compounds and set GWP limits as a mitigation measure.

To minimize climate change impacts, we are proposing to prohibit the use of compounds with a GWP of 150 or higher.

3. Toxic Air Contaminant Emissions

Under the California Environmental Quality Act, ARB is required to identify and mitigate any possible significant adverse environmental impacts of regulatory actions. It is unlikely, but possible, that manufacturers may, in response to new VOC limits for Multi-purpose Solvent and Paint Thinner products, choose to reformulate with chlorinated

solvents that are TACs. Therefore, in accordance with CEQA, we are proposing in new subsection 94509(u), a prohibition of the use of methylene chloride, perchloroethylene, and trichloroethylene in the "Multi-purpose Solvent," and "Paint Thinner" categories.

C. ESTIMATED EMISSIONS FROM CATEGORIES PROPOSED TO BE REGULATED

1. Consumer and Commercial Products Surveys

The 2006 Consumer and Commercial Products Survey (2006 Survey) was mailed to over 5,000 companies in July 2007. The Paint Thinner and Multi-purpose Solvent Survey Update (Survey Update) was sent to twenty-one companies in November 2008. Data received from the 2006 Survey and the Survey Update formed the basis for the emissions used in this rulemaking.

The 2006 Survey and the Survey Update provided staff with detailed information on the formulations of consumer products proposed for regulation, including complete speciation of VOCs, low vapor pressure VOC (LVP-VOC) solvents, and key exempt ingredients (ARB, 2007f; ARB, 2008f). Total volumes of inorganic and other compounds were also provided. Information on sales, product form, customer types, and company size and economics were also requested.

The results of the Surveys for the categories proposed for regulation were discussed at the April 1, 2009, public workshop, and input from industry was used to correct inaccuracies in the data. For this rulemaking, the 2009 emissions and reduction estimates, when the limits become effective, were grown from 2006 and 2008 sales data and the State Department of Finance's 2008 population estimates. Population growth is in accordance with estimates in the California Environmental Protection Agency's (Cal/EPA) Statewide Human Population Table found in the Population and Vehicle Trends Report (ARB, 2008d).

Staff is confident that the 2006 Survey had adequate representation of the available technologies for Double Phase Aerosol Air Freshener, and the Survey Update had adequate representation of the Multi-purpose Solvent and Paint Thinner technologies, in the market place and finds that the data meet the requirement in Health and Safety Code section 41712(b) to base regulations on "adequate data." This assumption has been verified by discussions with manufacturers, category research, shelf surveys, and the wide range of VOC content reported for products in the categories slated for regulation.

The proposed amendments were developed based on the 2006 Survey results, as well as results from the Survey Update conducted in November 2008. The intent of the survey update was to obtain sales data for the 12 month period starting from October 1, 2007, through September 30, 2008. The survey was conducted in response to comments from stakeholders that indicated the market for Multi-purpose Solvent and

Paint Thinner had changed since these categories were last surveyed during our 2003 Survey.

In developing these proposals, we worked with stakeholders on each category proposed for regulation. Numerous product labels and associated literature for each category were analyzed. Category information was also obtained from shelf surveys, trade journals, Internet sites, textbooks, patents, and directly from manufacturers.

2. Emission Estimates for Categories

The total VOC emissions from the categories proposed for regulation are estimated to be about 22.7 tons per day in 2009. Table IV-3 summarizes these emissions, as well as the anticipated VOC emission reductions when the proposed limits become effective.

In March 2009, the South Coast Air Quality Management District (SCAQMD) adopted Rule 1143, Consumer Paint Thinners and Multi-purpose Solvents (Rule 1143) which will achieve VOC emission reductions from consumer paint thinners and multi-purpose solvents used in the South Coast Air Basin. In order to avoid double-counting of VOC emissions and emission reductions, staff has subtracted from the statewide values, the portion of Multi-purpose Solvent and Paint Thinner VOC emissions and reductions that can be attributed to the South Coast Air Basin, based on population (DOF, 2008). Approximately 43 percent of California's population resides in the South Coast Air Basin, therefore 43 percent of the VOC emissions and reductions from the Multi-purpose Solvent and Paint Thinner categories were subtracted from the statewide values shown in Table IV-3.

If adopted, once all limits become effective, the VOC emission reductions will be approximately 14.7 tons per day.

Table IV-3
Proposed VOC Limits, Emissions, and Reductions at Effective Date

| Product Category | Product Form | Proposed VOC Limit (percent by weight) | 2009 VOC Emissions* (tons per day) | Effective Date | Reductions Upon Effective Date (tons per day) |
|--|--------------------------|--|------------------------------------|----------------|---|
| Double Phase Aerosol Air Freshener | Aerosol | 20 | 10.2 | 12/31/2012 | 2.0 |
| Multi-purpose Solvent & Paint Thinner | Non-aerosol | Tier 1: 30 | 12.5* | 12/31/2010 | 8.4* |
| | | Tier 2: 3 | --- | 12/31/2013 | 3.9* |
| Total Emissions 2009 | 22.6 tons per day | | | | |
| Total Reductions by end of 2013 | 14.7 tons per day | | | | |

* Survey emissions adjusted for market coverage, grown to the 2009 calendar year, and rounded.

* Does not include SCAQMD Rule 1143 reductions.

3. Greenhouse Gas Emissions

Development of the proposed amendments to minimize use of high GWP value compounds began with the emissions data and product formula data from the 2006 Survey and the Survey Update. According to the data reported, hydrofluorocarbon (HFC) propellants are not currently used in Double Phase Aerosol Air Freshener. In addition, no high GWP solvents are used in Multi-purpose Solvent and Paint Thinner products. This finding demonstrates that HFC propellants and high GWP solvents, are not critical to the formulation of Double Phase Aerosol Air Freshener, Multi-purpose Solvent, or Paint Thinner products.

However, one reformulation pathway to meet the proposed VOC limit for Double Phase Aerosol Air Freshener, could be to replace some of the VOC propellant with VOC exempt propellants such as HFC-152a or HFC-134a. HFC-134a has a GWP of 1300 while HFC-152a has a GWP of 140. In addition, it is possible that manufacturers could choose to use high GWP solvents as a reformulation option in response to the VOC limits for Multi-purpose Solvent and Paint Thinner. Consequently, in this rulemaking, we are proposing a GWP limit for Double Phase Aerosol Air Freshener products, Multi-purpose Solvent, and Paint Thinner products as a mitigation measure to minimize climate change impacts as products are reformulated.

The proposed GWP limit of 150 prevents the use of HFC-134a in reformulated Double Phase Aerosol Air Freshener, which would potentially significantly increase GHG emissions, but would allow use of HFC-152a. If a small amount of HFC-152a were used in formulations the impact on climate change would likely be negligible. The proposed GWP limit also prevents the use of high GWP solvents in Multi-purpose Solvent and Paint Thinner. Because of cost and corporate policies, we also do not believe that it is likely that manufacturers would choose options that would significantly increase GHG emissions in these categories. If adopted by ARB, this will be the second and third GWP standards in place for consumer products in California.

3. Toxic Air Contaminants

In the Survey Update, no use of methylene chloride, perchloroethylene, or trichloroethylene was reported for Multi-purpose Solvent and Paint Thinner products. However, use of these chlorinated TAC solvents, particularly the VOC-exempt compounds methylene chloride and perchloroethylene, is a potential option as products are reformulated to comply with the proposed limits. Therefore, to ensure that the public is not exposed to these chlorinated TAC solvents from use of Multi-purpose Solvent and Paint Thinner products, we are proposing in new section 94509(u), to prohibit the use of methylene chloride, perchloroethylene, and trichloroethylene in Multi-purpose Solvent and Paint Thinner products. No adverse impacts on other media are expected from this proposal.

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V. PROPOSED AMENDMENTS TO THE CONSUMER PRODUCTS REGULATION AND METHOD 310

In this chapter, we provide a plain English description of the proposed amendments to the California Regulation for Reducing Emissions from Consumer Products (Consumer Products Regulation) and explain the rationale for the amendments. The regulation is codified in title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Article 2, Consumer Products, sections 94507-94517. A description of the proposed changes to Method 310 "Determination of Volatile Organic Compounds (VOC) in Consumer Products and Reactive Organic Compounds in Aerosol Coating Products" (Method 310) is also included.

Where applicable, key terms or concepts involved in each proposed amendment are described. The discussion in this chapter is intended to satisfy the requirements of Government Code section 11343.2, which requires that a non-controlling "plain English" summary of the regulation be made available to the public. The proposed amendments to the Consumer Products Regulation and Method 310 can be found in Appendix B.

Amendments are being proposed to the following sections in the Consumer Products Regulation: section 94508 "Definitions;" section 94509 "Standards for Consumer Products;" section 94510 "Exemptions;" section 94511 "Innovative Products;" section 94512 "Administrative Requirements;" section 94513 "Reporting Requirements;" and section 94515 "Test Methods." New sections are being proposed for Method 310. The Method 310 new sections are: 3.3.7, 4.3, 4.3.1, and 4.3.2. All of these amendments are discussed below in detail.

In the sections below, we describe the proposed amendments and the rationale for them. The proposal includes six new definitions, the modification of three existing definitions, a lower VOC limit for one category, new VOC limits for two categories and a global warming potential (GWP) limit for the three categories. For Multi-purpose Solvents and Paint Thinners, our proposal also includes special labeling and reporting requirements; a prohibition on the use of Toxic Air Contaminant (TAC) chlorinated solvents; a limitation on the VOC aromatic compound content along with a requirement to supply information to aid in enforcing this provision; and special labeling and reporting requirements. A more detailed discussion of the existing regulatory requirements for consumer products can be found in additional ARB publications which are referenced at the end of this chapter (ARB, 2008b; ARB, 2006a; ARB, 2004b; ARB, 1999; ARB, 1997b; ARB, 1991a; ARB, 1990c).

A. **DEFINITIONS (SECTION 94508)**

Section 94508, "Definitions," provides all the terms used in the Consumer Products Regulation which are not self-explanatory. The proposed amendments to the regulation include new definitions for "Aromatic Compound," "Artist's Solvent/Thinner," "High-Temperature Coating," "Industrial Maintenance Coating," "Paint Clean-up," and "Zinc-Rich Primer." These new definitions are in support of the new Paint Thinner standards

to help clarify products that are not subject to the VOC limits. The proposed amendments include modified definitions of "ASTM," "Multi-purpose Solvent," and "Paint Thinner." The ASTM definition was changed to reflect the proper name of the organization that develops standard analytical test methods. We are proposing to modify the "Multi-purpose Solvent" and "Paint Thinner" definitions to clarify products included in or excluded from the categories, and to improve enforcement of the regulation. The "Paint Thinner" definition was revised to make it clear that it does not include "Artist's Solvent/Thinner" and, therefore, these products are not subject to the regulation if the size requirements in the new "Artist's Solvent/Thinner" definition are met.

Artists' Solvents and Thinners were surveyed in ARB's 2006 Consumer and Commercial Products Survey (ARB, 2007f). The category sales and emissions reported for these products were minuscule. Also, based on market research and consultations with industry experts, we have learned that these products are required to meet the Labeling of Hazardous Art Materials Act (LHAMA) within the Federal Hazardous Substances Act. LHAMA requires that any art material, including solvents, meet ASTM D 4236, Standard Practice for Labeling Art Materials for Chronic Health Hazards, to protect consumers of any age from potential health hazards of these products (ASTM, 2005). ASTM D 4236 requires that the art material must be reviewed by a board certified or qualified toxicologist and labeled consistent with the standard. We visited several art material stores and noted that the sales price of Artists' Solvents and Thinners was substantially higher compared to the sales prices per volume of Multi-purpose Solvent and Paint Thinner products sold at home improvement and paint stores. Therefore, we believe that these products are unlikely substitutes for Multi-purpose Solvent and Paint Thinner products and an exemption from the proposed VOC limits and provisions is appropriate for Artist's Solvents/Thinners, labeled to meet ASTM D 4236 and packaged in containers with a capacity less than or equal to 32 fluid ounces.

The proposed amendments to the regulation also include new size parameters for both the dilutable and pre-mixed "Automotive Windshield Washer Fluid" products. These modifications are intended to clarify the types of products that are included in these categories. This change would allow a wider range of dilutable products, to encourage manufacturers to ship concentrated products. Allowing smaller containers to be sold in concentrated form should reduce product weight leading to reduced transportation costs and the air emissions associated with the movement of such products by truck or other conveyance.

B. STANDARDS FOR CONSUMER PRODUCTS (SECTION 94509)

1. Proposed Amendments to Section 94509(a) - Table of Standards

The proposed regulatory action would amend the existing Consumer Products Regulation by specifying VOC limits for the product categories shown in

Table V-1. Of the three proposed limits, Double Phase Aerosol Air Freshener been has previously regulated, while there are two tiers of new limits proposed for Multi-purpose Solvent and Paint Thinner. The effective dates of these VOC limits are shown in Table V-1 below.

**Table V-1
Proposed VOC Limits, Product Forms, and Effective Dates**

| Product Category | Product Form | Proposed VOC Limit (percent by weight) | Effective Date |
|------------------------------------|--------------------------|--|----------------|
| Double Phase Aerosol Air Freshener | Aerosol | 20 | 12/31/2012 |
| Multi-purpose Solvent: Tier 1 | Non-aerosol | 30 | 12/31/2010 |
| Multi-purpose Solvent: Tier 2 | Non-aerosol | 3 | 12/31/2013 |
| Paint Thinner: Tier 1 | Non-aerosol | 30 | 12/31/2010 |
| Paint Thinner: Tier 2 | Non-aerosol | 3 | 12/31/2013 |
| Total Emissions 2009 | 22.6 tons per day | | |
| Total VOC Reductions 2013 | 14.7 tons per day | | |

We are also proposing to modify the Table of Standards to delete the "(all forms) dilutable and pre-mixed" description under "All other areas" from "Automotive Windshield Washer Fluids." This proposal is intended to clarify that the 1 percent VOC limit by weight in non-Type A Areas, applies to concentrates as well as dilutable products (after the label recommended dilution has taken place). This proposed modification should end the confusion that led some affected parties to believe that limits varied for these situations. It should be noted that there are different VOC limits pertaining to products sold in different areas of California, Type "A" areas and all other areas (non-Type A areas). Type A areas are those portions of California where freezing temperatures are expected to occur frequently.

2. Other Proposed Amendments to Section 94509

Modification to 94509(b)(3)

We are proposing to modify the provision in subsection 94509(b)(3) related to "Automotive Windshield Washer Fluids (Dilutable)" to specify that a product must specifically state on the front panel that the product should be diluted prior to use. This proposed modification is intended to make it clear to the consumer when a product should be diluted prior to use, to ensure that emission reductions continue to occur, and to enhance enforceability of the regulation.

Proposed GWP Limit – 94509(t) and (u)

For Double Phase Aerosol Air Fresheners, one possible reformulation pathway to meet lower VOC limits would be to replace, or partially replace, hydrocarbon propellant with VOC exempt propellants which could have higher Global Warming Potential (GWP) values. To ensure that this does not occur in reformulations to meet the proposed VOC limit, we are proposing in new subsection 94509(t)(1) to prohibit the use of any chemical

with a GWP value of 150 or greater. In new subsection 94509(u)(1)(A), we are proposing language prohibiting the use of any chemical with a GWP value of 150 or greater in Multi-purpose Solvents and Paint Thinners. This provision is proposed because there is a slight possibility that manufacturers could replace current VOC solvents used in Multi-purpose Solvents and Paint Thinners with compounds with high GWP. In subsections 94509(t)(2),(3), and (4), and 94509(u)(2),(3) and (4), we are adding provisions, virtually identical to those in provisions pertaining to GWP limits for other categories, to support the GWP Value limit. Specifically, these provisions include a three year product sell-through allowance for products manufactured prior to the effective date, a notification to purchasers from the supplier for products sold during the last six months of the sell-through period, and allowance for impurities. These proposals are in accordance with ARB's authority to regulate greenhouse gases under AB 32.

Proposed Toxic Air Contaminant Prohibition 94509(u)

In section 94509(u)(1)(B) we are proposing to prohibit the use of specific chlorinated TACs in "Multi-purpose Solvent," and "Paint Thinner." We believe that it is unlikely, but possible, that manufacturers may, in response to new VOC limits, choose to reformulate with chlorinated solvents that are Toxic Air Contaminants. To ensure that this does not occur, we are proposing in new subsection 94509(u)(1)(B), to prohibit the use of methylene chloride, perchloroethylene, and trichloroethylene. Therefore, in accordance with the California Environmental Quality Act (CEQA), we are proposing mitigating measures for these two categories for which we are setting new VOC limits. In subsection 94509(u)(2), we are proposing language to allow a three year sell through for products manufactured prior to the effective date of the TAC prohibition.

Proposed Aromatic Compound Content Limit Section 94509(u)

Further, in section 94509(u)(1)(C), we are proposing to limit the VOC aromatic compound content of "Multi-Purpose Solvent" and "Paint Thinner" products to 1 percent by weight, also in accordance with CEQA. This mitigation measure is proposed to ensure that in response to new VOC limits for "Multi-Purpose Solvent" and "Paint Thinner," manufacturers do not formulate with compounds that have the potential to increase the ozone forming potential of the products. We conducted an analysis and determined that products reformulating to meet the 30 percent limit using highly reactive aromatic VOCs would erode or negate the expected ozone reduction benefits predicted. For more detail regarding the reactivity analysis see Chapter VIII, Environmental Impacts.

Finally, in section 94509(u)(2), (3) and (4), in addition to the proposals described above, we are proposing the following provisions: a three-year product sell-through allowance for products manufactured prior to the limit effective date; a notification to purchasers from the supplier for products sold during the last six months of the sell-through period; and an allowance for impurities with regards to the GWP limit and TAC prohibition.

C. TEMPORARY EXEMPTION FOR SMALL CONTAINERS – PROPOSED NEW SUBSECTION 94510(m)

We are proposing in section 94510(m) to exempt small containers of "Paint Thinner" from the VOC and aromatic compound limits until December 31, 2013. To qualify for the exemption, products must be sold and packaged in containers less than or equal to eight fluid ounces. We determined that consumers may need small amounts of paint thinner to thin solvent-borne paints. These solvent-borne paints might have been purchased years ago, before the lower VOC limits for architectural coatings came into effect, or are products in small containers that are exempt from such limits. This exemption allows these coatings to be used and, if necessary, allowed to be thinned by the consumer, rather than having the coatings become unusable and discarded. Discarded coatings could cause environmental impacts such as contaminated groundwater, or increased landfill load.

D. LABELING REQUIREMENTS FOR MULTI-PURPOSE SOLVENT AND PAINT THINNER – PROPOSED NEW SUBSECTION 94512(e)

As proposed in new subsection 94512(e)(1)(A), Multi-purpose Solvent and Paint Thinner products would be required to clearly display on the product container, the total VOC content as a percent by weight contained in the product formulation. This proposal would aid with the enforceability of the VOC limits for these categories and provide the consumer the information they need to purchase the product with the lowest VOC content.

We have also proposed in subsection 94512(e)(2) that Multi-purpose Solvent and Paint Thinner products manufactured after December 31, 2010 until December 31, 2015, and labeled "Flammable" or "Extremely Flammable" per federal laws, would not be able to display a general name on the principle display panel, such as "Paint Thinner," "Multi-purpose Solvent," "Clean-up Solvent," or "Paint Clean-up." Manufacturers may choose to sell a "Flammable" or "Extremely Flammable" product with one of these general names if they do one of the following: provide an attached hang tag or sticker that includes the statement "Formulated to meet California VOC limits, see warnings on label," or display on the principle display panel in a font size as large as or larger than any other words on the panel, the common name of the chemical compound that results in the product meeting the criteria for "Flammable" or "Extremely Flammable."

Specific federal definitions exist for Combustible, Flammable, and Extremely Flammable products that are determined by the liquid's flashpoint, or the lowest temperature at which the vapor of a combustible liquid can be ignited in air. Flammable and Extremely Flammable liquids have a lower flashpoint than Combustible liquids and, therefore, ignite or burn easier than combustible liquids, making them more hazardous. The above proposed requirement is a mitigation measure under CEQA because we determined that in response to the new VOC limits, manufacturers may switch a Combustible product with a product that is Flammable or Extremely Flammable. If

consumers were used to a product that is Combustible and, after the implementation of the VOC limits, purchase a Flammable or Extremely Flammable product, they could unknowingly risk injury or fire loss if they misused the product near an open flame or were otherwise careless with the product. It is the intent of this regulatory requirement to alert the consumer that a newly relabeled or newly reformulated product may perform differently or may have an increased fire hazard potential than the previous formulation and should be used with caution.

E. PROPOSED NEW SUBSECTION 94513(g): SPECIAL REPORTING REQUIREMENTS FOR MULTI-PURPOSE SOLVENT AND PAINT THINNER

As specified in a new subsection 94513(g), all responsible parties for Multi-purpose Solvent and Paint Thinner products must report the product formulation and sales information to the ARB prior to June 30, 2012. These special reporting requirements are necessary to perform a technical assessment of each category prior to the implementation of the second tier VOC limits. The technical assessment will include an analysis of manufacturers' progress in developing low flammability and low VOC Multi-purpose Solvent and Paint Thinner products to meet the 3 percent VOC limit, effective on December 31, 2013. In addition, the data collected will enable ARB staff to determine whether a reactivity based approach to regulating these products would be more appropriate than a mass based approach, and if compounds to be used in the new formulations present any unforeseen potential hazards.

F. PROPOSED AMENDMENTS TO SECTION 94515, TEST METHODS: VOC AROMATIC COMPOUND CONTENT

We are proposing to limit the VOC aromatic compound content of Multi-purpose Solvent and Paint Thinner products to no more than 1 percent by weight. First, in section 94515(h)(1) we are proposing to specify that the VOC content for Multi-purpose Solvent and Paint Thinner is to be determined by Method 310, or an alternative method approved by the Executive Officer. To enforce the VOC aromatic compound content limit provision, we are proposing in subsection 94515(h)(2) that specific formulation information be provided to ARB. Upon receipt of written notice, responsible parties would have ten days to supply formulation data to guide the analytical testing.

In section 94515(h)(2)(A)(i), the formulation data to be provided would include the weight fraction to the nearest 0.1 percent of each ingredient including: water; VOC; low vapor pressure (LVP)-VOC; total inorganic compounds; and exempt compounds specified in section 94508(a). For hydrocarbon solvents, the bin number as listed in the Tables of Maximum Incremental Reactivity (MIR) Values in section 94701 (a) or (b), and the initial boiling point and dry point of the solvent would be required to be provided.

To ensure that the notification letter is delivered to the correct responsible party, we are proposing in section 94515(h)(2)(A)(ii) that by March 1, 2010, and each year thereafter, the responsible party would provide to the Executive Officer contact information for the person who is to receive the notification letter. We are also clarifying in

section 94515(h)(2)(A)(iii) that a Material Safety Data Sheet (MSDS) does not meet the requirement for formulation data because the information is not detailed enough to guide analytical testing.

Finally, we are proposing in section 94515(h)(2)(B)(i) and (ii) to clarify that a violation is established if the formulation data supplied by the responsible party shows that the product does not meet the applicable VOC or aromatic content standard; and/or the manufacturer fails to respond to the notice and provide formulation data within the ten day specified time frame.

G. "DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOC) IN CONSUMER PRODUCTS AND REACTIVE ORGANIC COMPOUNDS IN AEROSOL COATING PRODUCTS" (METHOD 310)

Method 310 is the analytical test method utilized to determine compliance with the VOC limits and other prohibitions in the Consumer Products Regulation.

The proposed changes to Method 310 are clarifications to specify the analytical approach to be used in instances where a product's VOC content is below 1 percent. These methods are already being used and/or are needed to enhance the enforceability of the new, lower VOC limits that will become effective by 2010. The proposed changes also include new VOC content calculations for products with high water content or low VOC content.

New section 3.3.7 is proposed to specify the methods to be utilized for low level VOC content samples; new section 4.3 is proposed to clarify that products subject to VOC limits below 5 percent by weight will have their VOC content determined by a low level direct determination; new section 4.3.1 is proposed to specify the equation used to determine the VOC content for aerosol products; and new section 4.3.2 is proposed to specify the equation used to determine the VOC content of non-aerosol products.

Previously in section B, number 2 (Proposed Aromatic Compound Content Limit Section 94509(u)), we describe the proposed aromatic compound content limit for Multi-purpose Solvent and Paint Thinner products. Under the procedures and testing methods specified under Method 310, laboratory staff routinely quantifies the percent by weight of many common aromatic compounds that are expected to be found in Multi-purpose Solvent and Paint Thinner products. These aromatic compounds include, but are not limited to, benzene, xylenes, toluene, and ethyl benzene. Further method development may be needed and additional amendments specified in Method 310 may be necessary in order to identify and quantify additional aromatic compounds that may be found in Multi-purpose Solvent and Paint Thinner products. Work on additional method development is currently underway. If further modifications to Method 310 or the Consumer Products Regulations are needed to address the aromatic compound content limit requirements, they would be included in the next round of regulation amendments, which are anticipated to occur in 2010.

REFERENCES

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2. Air Resources Board. 2006 Consumer and Commercial Products Survey. July 24, 2007. (ARB, 2007f)
3. Air Resources Board. Initial Statement of Reasons for Proposed Amendments to the California Consumer Products Regulation and the Aerosol Coatings Regulation. September 29, 2006. (ARB, 2006a)
4. Air Resources Board. Initial Statement of Reasons for Proposed Amendments to the California Aerosol Coating Products, Antiperspirants and Deodorants, and Consumer Products Regulations, Test Method 310, and Airborne Toxic Control Measure for para-Dichlorobenzene Solid Air Fresheners and Toilet/Urinal Care Products. May 7, 2004. (ARB, 2004b)
5. Air Resources Board. Initial Statement of Reasons for Proposed Amendments to the California Consumer Products Regulation: Mid-term Measures II. September 10, 1999. (ARB, 1999)
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7. Air Resources Board. Proposed Amendments to the Statewide Regulation to Reduce Volatile Organic Compound Emissions from Consumer Products – Phase II – Technical Support Document. October, 1991. (ARB, 1991a)
8. Air Resources Board. Proposed Regulation to Reduce Volatile Organic Compound Emissions from Consumer Products – Technical Support Document. August, 1990. (ARB, 1990c)
9. ASTM International. D 4236 – 94 Standard Practice for Labeling Art Materials for Chronic Health Hazards. March 1, 2005. (ASTM, 2005)

VI. DESCRIPTION OF PRODUCT CATEGORIES

In this chapter, we provide the technical basis for the proposed limits for each category proposed for regulation. The following information is described for each of the product categories:

- a product category description;
- information on product use and marketing;
- information on the product formulations;
- a discussion of the proposed volatile organic compound (VOC) and/or global warming potential (GWP) limit, our rationale for the proposed limit, and the options for compliance; and
- a discussion of outstanding issues associated with the proposal.

A. **AIR FRESHENER: DOUBLE PHASE AEROSOL**

Product Category Description:

Air Fresheners are currently regulated under the CARB Consumer Products Regulation in five subcategories: Double Phase Aerosols; Single Phase Aerosols; Dual Purpose Air Fresheners/Disinfectant aerosols; liquid/pump sprays; and solids/semisolid (ARB, 2007a). The proposal described here relates solely to Double Phase Aerosol Air Fresheners.

The definition for an Air Freshener is the following: "Air Freshener" means any product including, but not limited to, sprays, wicks, wipes, diffusers, powders, and crystals, designed or labeled for the purpose of masking odors, or freshening, cleaning, scenting, or deodorizing the air. "Air Freshener" includes dual purpose air freshener/disinfectant products. "Air Freshener" does not include products that are used on the human body, products that function primarily as cleaning products as indicated on a product label, Odor Remover/Eliminator," or "Toilet/Urinal Care Product."

A Double Phase Aerosol Air Freshener is defined as an aerosol air freshener with the liquid contents in two or more distinct phases that require the product container be shaken before use to mix the phases, producing an emulsion (ARB, 2007a). An aerosol product is a pressurized spray system that dispenses product ingredients by means of a propellant contained in a product or a product's container or a mechanically induced force.

Double Phase Aerosol Air Fresheners were first regulated under "Phase I" of the Consumer Products Regulation adopted in October 1990. A description of these products is included in the Technical Support Document for that rulemaking (ARB, 1990b). Products were required to meet a VOC limit of 30 percent by weight, effective January 1, 1993. In an effort to obtain further emission reductions, the Board adopted in October 1999, as part of "Midterm Measures II" of the Consumer Products

rulemaking, a VOC limit of 25 percent by weight effective December 31, 2004 (ARB, 1999a; ARB 1999b). In this rulemaking, we are proposing to further reduce the VOC limit for Double Phase Aerosol Air Fresheners and add a limit on the GWP of chemical compounds used in the products.

Product Use and Marketing:

According to ARB's 2006 Consumer and Commercial Products Survey (2006 Survey) and product labels, aerosol air fresheners are generally used in household, institutional and commercial settings, and automobiles (ARB, 2007f). These products are used to treat unpleasant odors and fragrance the air in bathrooms, laundry areas, food preparation areas, and institutional settings. According to recent articles in industry journals and Internet sites, home fragrance retail sales in the United States in 2007 were over \$5 billion (Esposito, 2008; Euromonitor, 2008). Aerosol air fresheners were reported to be the fastest growing home fragrance product category in 2007 with sales of almost \$500 million.

Double Phase Aerosol Air Fresheners are "instant action" products that produce a fine mist when sprayed. The amount of product emitted, or fragrance released, is controlled by the user by depressing the actuator button (nozzle) on the product container. According to the 2006 Survey, Double Phase Aerosol Air Freshener products are sold predominantly to household consumers (ARB, 2007f). These products can be purchased through supermarkets; grocery stores; discount stores; mass merchandisers; hardware stores; automotive parts stores; warehouse stores; and home centers. Consumers may also purchase products through home sales, catalog sales, and the Internet.

Table VI-1 summarizes the sales and emissions from Double Phase Aerosol Air Freshener products, based on the 2006 Survey (ARB, 2007f). Sixty products or product groups were reported in the 2006 Survey by about two dozen companies. Each product group may have multiple fragrance variants or product sizes, or a combination of both. Considering fragrance variants, 231 total individual products were reported for this category. The data have been grown to the 2009 calendar year. Total category sales are about 82,912 pounds per day with estimated VOC emissions of 20,309 pounds (ten tons) per day in California. Although not shown in Table VI-1, the sales-weighted average VOC content for this category is 24.5 percent by weight, excluding fragrance. This indicates most of the product formulations have VOC content very near the maximum allowed by the current 25 percent by weight VOC limit (ARB, 2007f).

Table VI-1
Double Phase Aerosol Air Freshener*

| Product Form | Number of Products/Product Groups | 2009 Category Sales (lbs/day)** | 2009 Adjusted VOC Emissions (lbs/day)** |
|---------------------|--|--|--|
| Aerosol | 60 | 82,912 | 20,309 |

* Based on 2006 Consumer and Commercial Products Survey (ARB, 2007f).

** Survey data adjusted for complete market coverage and grown by population to 2009 (see Chapter IV, Emissions).

Product Formulation:

The main ingredients found in Double Phase Aerosol Air Freshener products are water, propellants, and fragrance mixtures. Other ingredients in the product formulation may include solvents; co-solvents; emulsifiers; surfactants; and corrosion inhibitors.

Double Phase Aerosol Air Freshener ingredients contain liquid contents in two or more distinct phases that require the product container to be shaken before use to mix the phases, producing an emulsion. The top phase consists of hydrocarbon propellant and some fragrance or emulsifier. The bottom phase consists of water, which may be as high as 80 percent of the product by weight according to the 2006 Survey, and some fragrance or emulsifier (CSPA, 2009; ARB, 2007f).

The propellants used are typically hydrocarbon blends of n-butane, isobutane and propane. However, products formulated with dimethyl ether as a propellant were also reported in the 2006 Survey (ARB, 2007f). Blends used may vary depending on the desired pressure, container and components used. According to the 2006 Survey, propellant content in the Double Phase Aerosol Air Freshener category ranged from 15 percent to about 27 percent of product weight (ARB, 2007f).¹

As in most aerosol products, the propellants in aerosol air fresheners are present in both liquid and gas phases. The liquid propellant sits atop the denser liquid phase(s) and functions as a reservoir to replenish the propellant in the gas phase. The gas phase provides the pressure that discharges the product. When the product is shaken, the fragrance and, if present, solvents, emulsifiers and surfactants, produce a homogenous oil-in-water emulsion that allows the product to be uniformly sprayed (ARB, 1999a).

Fragrance mixtures typically constitute less than 2 percent of product weight, according to the 2006 Survey. Fragrance mixtures contain aroma and other ingredients that scent

¹ Products with VOC content greater than 25 percent by weight reported in the 2006 Survey were assumed to qualify for the "sell-through of products" provision of the Consumer Products Regulations in section 94509(c) (ARB, 2007a). Since there was a December 31, 2004, effective date for the 25 percent by weight VOC limit, the sell-through period for Double Phase Aerosol Air Freshener products did not end until December 31, 2007. For evaluations of VOC reductions achieved by this proposal, we assumed that such products had been reformulated to comply with the 25 percent by weight VOC limit.

the air, or mask odors. Fragrance mixtures are typically composed of many ingredients, including VOC and low vapor pressure-VOC (LVP-VOC) ingredients (FMA, 2006). The Consumer Products Regulation allows an exemption from the VOC limits in the Table of Standards for fragrance up to 2 percent by weight of the product. Fragrance is defined as a substance or complex mixture of aroma chemicals, natural essential oils, and other functional components with a combined vapor pressure not in excess of 2 millimeters mercury (mm Hg) at 20 degrees Celsius (ARB, 2007a).

Solvents; co-solvents; emulsifiers; surfactants; and corrosion inhibitors may be used in the product formulation and are typically present in small amounts. Some ingredients may be present to solubilize fragrance, aid mixing of fragrance to create a homogeneous liquid that can be sprayed, and control volatilization of the air freshener mist droplets. Solvent and other ingredients may be present to increase the vapor pressure in a product, and, along with the product valve and nozzle, serve to control mist droplet or particle size. VOC solvents reported in the 2006 Survey include ethanol and isopropanol. Acetone and Isopar M are examples of exempt and LVP-VOC solvents, respectively, that were reported. Emulsifiers and surfactant materials are typically LVP-VOC materials (ARB, 2007f; ARB, 1999a).

LVP-VOC glycols, such as dipropylene glycol and propylene glycol, were reported in the 2006 Survey for some of the Double Phase Aerosol Air Freshener products (ARB, 2007f). Double Phase Aerosol Air Freshener products that contained these glycols generally made "Deodorizer" and "Odor Eliminator" claims on their labels (ARB, 2007f).

Proposed VOC Limit and Compliance:

The proposed VOC limit for Double Phase Aerosol Air Freshener is 20 percent by weight with an effective date of December 31, 2012. As shown in Table VI-2, the proposal would result in emission reductions of 3,900 pounds per day, or about 2.0 tons per day, statewide in 2012. As indicated previously, adjusted VOC emissions from Double Phase Aerosol Air Freshener products are about 20,300 pounds per day, or about 10.2 tons per day. The sales weighted average VOC content is 24.5 percent by weight, excluding fragrance. A limited number of products with VOC content equal to or lower than 20 percent by weight were reported in the 2006 Survey, indicating that further reductions can be achieved from this category and that the proposed limit, while challenging, is both technologically and commercially feasible (ARB, 2007f). However, the complying products represent less than 1 percent of the category sales.

Recognizing that the 20 percent by weight VOC limit is challenging for manufacturers to meet, this proposal provides an extended period of over three years, until December 31, 2012, for manufacturers to produce complying products. The extended time is proposed to accommodate the complex and lengthy product development process necessary for reformulating approximately 200 non-complying products and fragrance variants.

Table VI-2
Double Phase Aerosol Air Freshener Proposal*

| Product Form | Proposed VOC Limit (wt. %) | Complying Products/ Product Groups | Complying Market Share (%) | 2009 Adjusted Emission Reductions (lbs/day)** | 2012 Adjusted Emission Reductions (lbs/day)+ |
|---------------------|-----------------------------------|---|-----------------------------------|--|---|
| Aerosol | 20 | <10 | <1 | 3,750 | 3,900 |

* Based on 2006 Consumer and Commercial Products Survey (ARB, 2007f).

** Emission reductions adjusted for complete market coverage, grown by population to 2009, and rounded (see Chapter IV, Emissions).

+ Emission reductions adjusted for complete market coverage, grown by population to 2012, and rounded (see Chapter IV, Emissions).

As described earlier, Double Phase Aerosol Air Freshener ingredients include water, emulsifiers, surfactants, glycols, solvents, hydrocarbon propellants, and fragrance mixtures. The emulsifiers, surfactants and glycols typically used are LVP- VOCs which are exempt from applicable VOC limits. Materials such as acetone and Isopar M are also exempt from applicable VOC limits. In general, other than the fragrance mixtures and VOC solvents such as ethanol or isopropanol, which are found in small amounts, the predominant VOC ingredients are the hydrocarbon propellants (ARB, 2007f). For most Double Phase Aerosol Air Fresheners, reformulation to meet the proposed VOC limit of 20 percent by weight will involve replacing some of the hydrocarbon propellant or VOC solvent with water or a VOC exempt solvent. Changes to product components such as valves and actuators may be necessary to retain acceptable product performance characteristics such as spray mist size and pattern.

According to the 2006 Survey, exempt compounds, acetone and Isopar M, are used in some Double Phase Aerosol Air Fresheners (ARB, 2007f). Acetone is an exempt VOC solvent that is fast drying and is completely miscible with water. The use of acetone increases the vapor pressure in the product, reducing the amount of propellant needed to discharge the product. An example formulation that may include acetone would use water along with the higher pressure propellants propane and dimethyl ether (ARB, 1999a). Another example would be to use a LVP-VOC hydrocarbon solvent, such as Isopar M, in place of a solvent containing VOCs.

During discussions with industry representatives in January and March 2009, we learned that it would be challenging to reformulate large numbers of non-complying products and the removal of propellant would affect product performance. Industry representatives stated that lowering the propellant content to comply with the proposed 20 percent by weight VOC limit would most likely require adjustments to other product ingredients, and/or addition of ingredients to ensure acceptable product performance, stability, and consumer acceptance of fragrance (CSPA, 2009; S.C. Johnson, 2009b; Reckitt Benckiser, 2009). It was indicated that changes in the valve, actuator and propellant would likely need to take place to accommodate the formulation adjustments. As a result of these changes, additional consumer usage and fragrance preference studies would also need to be conducted.

In light of the potential technical modifications needed to the aerosol spray dispensing system, we acknowledge that the reformulation effort will be challenging for manufacturers. However, we also believe that products with less propellant can be developed. Given these challenges, we determined that an implementation date of December 31, 2012, would allow for the necessary modifications and additional testing of products to comply with the proposed 20 percent by weight VOC limit. Discussions with industry representatives, evaluation of products reported in the 2006 Survey for Double Phase Aerosol Air Fresheners, and our research demonstrate that the proposal for a 20 percent by weight VOC limit, effective December 31, 2012, although challenging, is both technologically and commercially feasible (ARB, 2007f; CSPA, 2009a).

Proposed Global Warming Potential (GWP) Limit and Compliance:

Pursuant to ARB's responsibilities under Assembly Bill 32, reductions of greenhouse gases (GHGs) from consumer products are necessary (ARB, 2008e). Consumer products use various GHGs, mostly as propellants. Although the GHG emissions contribution from consumer products can be relatively low, the severity of the climate change problem requires reductions from any source where it is feasible. In this rulemaking, we are proposing a GWP value² limit of 150 for Double Phase Aerosol Air Fresheners. No high GWP chemical compounds, such as HFC-152a or HFC-134a, were reported in the product formulations in the 2006 Survey (ARB, 2007f). However, to ensure that there is no significant increase in GHG emissions from products reformulated to comply with the proposed 20 percent by weight VOC limit, we are proposing, as a mitigation measure, a limit on the GWP for any chemical compound used in Double Phase Aerosol Air Freshener products, effective December 31, 2012. The GWP limit of 150 does not apply to any chemicals present as contaminants, which in aggregate are 0.1 percent by weight or less.

The VOC exempt propellants, HFC-134a and HFC-152a, are the predominant GHGs used in consumer products today. When flammability is a concern, HFC-134a is used because it is a non-flammable propellant. HFC-152a is minimally flammable. HFC-152a has a GWP value of 140, which is one hundred and forty times greater than the GWP value of CO₂. HFC-134a has a GWP value of 1300, which is approximately ten times greater than the GWP value of HFC-152a and 1300 times greater than CO₂ (ARB, 2008e).

² We are using the GWP definition of the Intergovernmental Panel on Climate Change (IPCC). GWP provides a measure of a compound's impact on global warming compared to carbon dioxide (CO₂). The GWP value definition specifies that the 100-year GWP values in the Second Assessment Report (SAR) of IPCC would be used to determine compliance (IPCC, 1996). The definition further specifies that, if the SAR does not contain a GWP value for a specific chemical or compound, then the IPCC, Fourth Assessment Report (FAR) GWP value for that chemical or compound can be used (IPCC, 2007). If there is no GWP value listed for a specific chemical or compound in the SAR or the FAR, then the GWP value is assumed to be equal to the applicable GWP value standard.

According to the 2006 Survey, hydrocarbon propellants such as n-butane, isobutane and propane are the 'propellant of choice' for Double Phase Aerosol Air Freshener products (ARB, 2007f). As stated previously, HFC-152a and HFC-134a were not present in the products reported, which demonstrates that these VOC exempt propellants are not critical to the formulation of Double Phase Aerosol Air Freshener products. The hydrocarbon propellants and other materials reported in the 2006 Survey, such as dimethyl ether, acetone and ethanol have GWP values that are less than ten or are not listed by the IPCC. In the case where the IPCC does not list a GWP value for ingredients used, then the GWP value is assumed to be equal to the emission standard.

Manufacturers can reformulate their products to comply with the proposed 20 percent by weight VOC limit without the use of VOC exempt propellants such as HFC-152a or HFC-134a. If a manufacturer finds it necessary to formulate a product with a VOC exempt propellant, the GWP limit of 150 allows the option of using HFC-152a, but not HFC-134a with its higher GWP value of 1300. Incorporating HFC-152a or HFC-134a would take considerable product development resources and increase propellant costs by as much as 350 percent over hydrocarbon propellants currently in use (ARB, 2008e). Because of the additional cost, if a manufacturer were to use a VOC exempt propellant to comply with the proposed VOC limit, we would expect small amounts of HFC-152a to be blended with less expensive hydrocarbon propellants.

As previously stated, the proposed GWP limit of 150, effective December 31, 2012, is a mitigation measure designed to cap, or limit, the potential for GHG emissions increases from Double Phase Aerosol Air Fresheners reformulated to meet the proposed 20 percent by weight VOC limit. The GWP limit allows the use of a VOC exempt propellant, if necessary. However, no increase in GHG emissions from Double Phase Aerosol Air Fresheners is expected as products are most likely to be reformulated to meet both the 20 percent by weight VOC limit and the GWP limit of 150 without the use of HFC-152a (ARB, 2007f; Reckitt Benckiser, 2009; SC Johnson, 2009b).

Issues:

- a. **Issue:** A 20 percent by weight VOC limit for Double Phase Aerosol Air Fresheners does not seem realistic; especially when there is very little complying market share and very few products that comply with the proposed limit.

Response: We acknowledge that only a limited number of products with VOC content equal to or lower than 20 percent by weight, representing less than 1 percent of the category sales, were reported in the 2006 Survey. However, our evaluation of the Double Phase Aerosol Air Freshener products reported in the 2006 Survey and discussions with industry representatives demonstrate that our proposal of 20 percent by weight VOC limit, effective December 31, 2012, for this category, while challenging, is both technologically and commercially feasible.

- b. **Issue:** The 20 percent by weight VOC limit for Double Phase Aerosol Air Fresheners will be a challenge to meet. December 31, 2011, the effective date in

the original proposal published in August 2008, does not provide sufficient time for manufacturers to reformulate all their products to meet the proposed VOC limit. More time is needed to evaluate propellants and valve/actuator combinations, conduct laboratory tests, and conduct consumer fragrance acceptance and use studies.

Response: Recognizing that the 20 percent by weight VOC limit may be challenging for manufacturers to meet, we agree that an additional year should be added to the effective date primarily due to the large number of products predicted to be reformulated. An effective date of December 31, 2012, will provide manufacturers with additional time that will accommodate the complex and lengthy product development process necessary for reformulating approximately 200 products and fragrance variants.

- c. **Issue:** A study funded by a prominent environmental group indicated that several different types of air fresheners contain high levels of a number of phthalates. ARB should consider banning the use of phthalates in air fresheners.

Response: The most commonly used phthalate in cosmetics and personal care products according to the literature is diethyl phthalate (DEP). When present in fragrances, perfumes and other products, it is used as a solvent to help blend fragrance ingredients and as a fixative to make fragrances last longer (CI, 2009). No phthalates were specifically reported for any Double Phase Aerosol Air Freshener product in the 2006 Survey.

We understand, however, that the air freshener industry has taken voluntary action to reduce the use of phthalates. The United States fragrance industry has instructed its members to use DEP in fragrances and not to use dibutyl phthalate (DBP) and diethyl hexyl phthalate (DEHP) (FMA, 2007). Additionally, major manufacturers of air fresheners have taken proactive positions and have adopted, or are in the process of adopting, a "no-phthalates" policy for their products (SC Johnson, 2009a; SC Johnson, 2009b; Reckitt Benckiser, 2009). As reported in the 2006 Survey, fragrance in Double Phase Aerosol Air Freshener products ranged from 0.1 to about 2 percent by weight of total product formulation. Therefore, DEP, if used in the fragrance mixtures at all, would most likely be present in minimal amounts. We would not expect DBP or DEHP to be used in Double Phase Aerosol Air Fresheners because of their chemical properties and industry policies. Considering the industry policies, and the limited use, exposure to phthalates in Double Phase Aerosol Air Fresheners, if any, would be negligible. Therefore, we believe that mitigation measures related to the use of phthalates in Double Phase Aerosol Air Fresheners cannot be justified without additional data.

- d. **Issue:** Industry representatives recommend that no GWP limit be adopted by ARB to allow for the formulation of products with HFC-134a for certain critical uses requiring total non-flammability.

Response: Industry representatives have not indicated that they are aware of products containing HFC-134a currently in commerce and have not identified any specific critical uses (CSPA, 2009a). Additionally, no non-flammable products were reported in the 2006 Survey. Therefore, prohibiting the use of HFC-134a (GWP value of 1300) while allowing the use of HFC-152a (GWP value of 140), is an appropriate mitigation measure to limit GHG emissions increases from Double Phase Aerosol Air Fresheners reformulated to meet the proposed 20 percent by weight VOC limit.

B. MULTI-PURPOSE SOLVENT AND PAINT THINNER

This section provides information on two proposals that are related, one for the category "Multi-purpose Solvent," and another for "Paint Thinner." The information in this section is presented in the following parts, first, a product category description for Multi-purpose Solvent followed by a product category description for Paint Thinner. These descriptions will be followed by a discussion of "Thinners and Solvents" combined.

Product Category Descriptions:

Multi-purpose Solvent:

Multi-purpose Solvent (MPS) products are liquid products designed or labeled to be used for dispersing, dissolving, or removing contaminants or other organic materials. The category also includes products that do not display specific use instructions or a specific end-use function on the product container or packaging. MPS also includes "Paint Clean-up" products, products labeled to prepare surfaces for painting, and solvents used in institutional facilities, except for laboratory reagents used in analytical; educational; research; scientific; or other laboratories.

MPS does not include solvents used in cold cleaners, vapor degreasers, conveyORIZED degreasers or film cleaning machines; solvents labeled for the clean-up of application equipment used for polyaspartic and polyurea coatings; or solvents that are incorporated into, or used exclusively in the manufacture or construction of, the goods or commodities at the site of the establishment.

The category also does not include any product making any representation that the product may be used as, or is suitable for use as, a consumer product which qualifies under another definition in section 94508 (the "definitions" section of the general consumer products regulation). Such products are not MPS and are subject to the "Most Restrictive Limit" provision of section 94512. For example, adhesive removers which can technically meet the definition of Multi-purpose Solvent, are not MPS because they are defined in section 94508 as "Adhesive Remover."

"Multi-Purpose Solvent" was originally defined as an exclusion to the definition of "Spot Remover" in the Consumer Products Regulation Amendments of July 1997 (ARB,

1997). In the November 2006 Consumer Products Regulation Amendments, the definition was modified to clearly exclude multi-function products (products that make multiple regulated claims on the label) and clearly include packaged solvents (organic solvents without specific use claims, such as mineral spirits or methyl ethyl ketone) (ARB, 2006). The above description for MPS, includes new proposed language to the existing regulatory definition that will clarify products that are included in the category and products that are not included in the category.

Paint Thinner:

Paint Thinner products are liquid products used for reducing the viscosity of coating compositions or components, that prominently display the term "Paint Thinner," "Lacquer Thinner," "Thinner," or "Reducer" on the front panel of its packaging.

The Board originally approved a definition for "Paint Thinner" in the Consumer Products Regulation Amendments of June 2004. We are proposing the following new language to the existing regulatory definition that will clarify products that are not included in the category. Paint Thinner does not include thinners labeled for the thinning of Industrial Maintenance Coatings, Zinc-Rich Primers, and High Temperature Coatings. This category also does not include products labeled and used exclusively as a component in a specific coating or "Artist's Solvent/Thinner."

Thinners and Solvents:

We conducted shelf surveys at more than 100 home improvement and mass market retail stores throughout California and always found Multi-purpose Solvent and Paint Thinner products sold adjacently on store shelves (ARB, 2009). Based on market research and consultations with industry experts, we concluded that these products are often used interchangeably by consumers to thin solvent-borne paint, clean application equipment, and remove contaminants from a variety of surfaces. Therefore, we consider it appropriate to present the remaining information in this section for Multi-purpose Solvent and Paint Thinner, in one combined discussion, referred to as "Thinners and Solvents."

Table VI-3 below summarizes the sales and emissions from Thinners and Solvents based on the results of the ARB's Paint Thinner and Multi-purpose Solvent Survey Update (ARB, 2008f). In November 2008, we conducted a Paint Thinner and Multi-purpose Solvent Survey Update for the 12-month period, October 1, 2007 through September 30, 2008, because of recent, significant changes to the Thinner and Solvent market. Previous to the survey update, we used data from the 2003 Consumer and Commercial Products Survey to evaluate these categories (ARB, 2004). We have held multiple meetings throughout the development of this proposal. Stakeholders requested an update to the 2003 survey data. We conducted the survey update and posted updated Thinners and Solvents data to the Consumer Products Program website in early March 2009.

**Table VI-3
Thinners and Solvents***

| Product Form | Number of Products | Jurisdiction | 2009 Category Sales (lbs/day) | 2009 Adjusted VOC Emissions (lbs/day)** |
|---------------------|---------------------------|---------------------|--------------------------------------|--|
| Liquid | 165 | Statewide | 54,380 | 43,620 |
| | | SCAQMD | 23,320 | 18,700 |
| | | Total*** | 31,060* | 24,920* |

* Based on Paint Thinner and Multi-purpose Solvent Survey Update. (ARB, 2008f)

** Survey emissions adjusted for complete market coverage and rounded (see Chapter IV, Emissions).

* Does not include Rule 1143 sales or VOC emissions.

On March 6, 2009, the South Coast Air Quality Management District (SCAQMD) adopted Rule 1143, "Consumer Paint Thinners and Multi-Purpose Solvents" (Rule 1143) which, upon the effective date, will achieve VOC emissions reductions from consumer Multi-purpose Solvents and Paint Thinners used in the South Coast Air Basin.

In order to avoid double-counting category sales and VOC emissions, we have subtracted from the statewide values in Table VI-3, the portion that can be attributed to the South Coast Air Basin based on population (DOF, 2008). Table VI-3 above (see "Total" row) shows that Thinners and Solvents have estimated VOC emissions of about 12.5 tons per day (24,920 pounds per day) in California, excluding the South Coast Air Basin.

Product Uses and Marketing:

Thinners and Solvents are used by individual consumers, commercial services, and institutional users to thin paint prior to applying to surfaces. They are also used to remove general contaminants and organic material, other than those contaminants removed by products in currently defined categories. These products are used on a variety of solvent resistant substrates such as cement and paint application equipment.

Thinners and Solvents are typically sold to household consumers and paint contractors in one quart or one gallon metal containers, and are sold primarily in home improvement stores; retail paint stores; general mass market stores; discount stores; and automotive aftermarket retail stores. These products are also sold to industrial or institutional users through distributors.

Product Formulations:

Thinners and Solvents are comprised of chemical compounds such as ethyl alcohol, methyl ethyl ketone, toluene, xylene isomers, or acetone; a mixture of these or similar chemical compounds; or packaged as hydrocarbon solvents labeled "mineral spirits."

Some products may contain LVP-VOC or VOC exempt compounds, though most products are nearly 100 percent VOC.

Proposed VOC Limits and Compliance:

We are proposing two tiers of VOC limits for Multi-purpose Solvent and Paint Thinner. The first tier VOC limit is 30 percent by weight, effective December 31, 2010. As shown in Table VI-4, using adjusted emissions, the proposed 30 percent limit will result in an estimated VOC emission reduction of about 17,000 pounds per day, or about 8.4 tons per day, in 2010. As stated previously, the VOC emission reductions shown in Table VI-4 do not include the reductions achieved by Rule 1143.

**Table VI-4
Multi-purpose Solvent and Paint Thinner Proposal***

| Product Form | Proposed VOC Limit (wt. %) | Complying Products | Complying Market Share (%) | Jurisdiction | 2009 Emissions Reductions (lbs/day)** | Emissions Reductions (lbs/day)* |
|--------------|----------------------------|--------------------|----------------------------|-----------------|---------------------------------------|---------------------------------|
| Liquid | 30 | 18 | 11.3 | Statewide | 29,140 | 29,510 |
| | | | | SCAQMD | 12,500 | 12,640 |
| | | | | Total*** | 16,640*** | 16,870*** |
| Liquid | 3 | 15 | 11.2 | Statewide | 13,030 | 13,710 |
| | | | | SCAQMD | 5,590 | 5,850 |
| | | | | Total*** | 7,440*** | 7,860*** |

* Based on Paint Thinner and Multi-purpose Solvent Survey Update. (ARB, 2008f)

** Survey emissions adjusted for complete market coverage, grown by population to 2009, and rounded (see Chapter IV, Emissions).

*** Does not include Rule 1143 reductions.

* Emissions reductions adjusted for complete market coverage, grown by population to 2010 for the 30 percent VOC limit; and to 2013 for the 3 percent VOC limit; and rounded (see Chapter IV, Emissions).

Table VI-4 also shows that 18 products, representing approximately 11.3 percent of the total Thinners and Solvents market on a sales basis, currently comply with the proposed 30 percent VOC limit. There are also a number of water/hydrocarbon solvent emulsions, currently in commerce, that are formulated slightly above 30 percent VOC. These products will only need a modest reformulation to comply with the 30 percent VOC standard. It should be noted that the 11.3 percent complying marketshare, in Table VI-4, would be significantly higher if these products already complied with the proposed 30 percent VOC limit. We believe this demonstrates that the first tier VOC limit of 30 percent by weight can be met using existing technology.

A technology forcing second tier limit of 3 percent VOC by weight, effective December 31, 2013, is also proposed. As shown in Table VI-4, the 3 percent limit would reduce emissions by nearly 8,000 additional pounds per day VOC or 3.9 tons per day. Table VI-4 also shows that 15 products, representing 11.2 percent of the market, currently comply with the proposed 3 percent limit.

The overwhelming majority of existing products that meet the 3 percent VOC limit are formulated with pure acetone. We believe that the 3 percent VOC limit is challenging because products formulated with pure acetone have not been demonstrated to adequately thin all types of coatings. In addition, concerns regarding the flammability of acetone have been raised. Later in this section, we discuss our response to this concern. Chapter VIII, Environmental Impacts, also contains a discussion regarding flammability. When fully effective, these two limits would reduce VOC emissions from Thinners and Solvents by about 12.7 tons per day in the State, outside of the South Coast Air Basin.

The proposed VOC limits are designed to reduce the use of VOCs in Thinner and Solvent formulations, resulting in a reduction of ambient ozone formation. For the 30 percent limit, reformulation options include increasing production of existing complying products, switching to water-based formulations, or replacing VOC solvents with VOC exempt ingredients. Reformulation options to meet the proposed 3 percent limit include emerging technologies such as soy-based products, in addition to the methods listed previously with the 30 percent limit.

Upon approval of the proposed VOC limits, and implementation of SCAQMD Rule 1143, manufacturers of Multi-purpose Solvent and Paint Thinner products will be required to meet the Rule 1143 limits for products sold or supplied for use in the South Coast Air Basin, and the statewide limits for products sold to all areas of California, outside the South Coast Air Basin. The VOC limits we are proposing are virtually equivalent to those adopted by SCAQMD, however, the effective dates are different. The effective dates for Rule 1143 are January 1, 2010, and January 1, 2011 for the first and second tier VOC limits respectively, while our proposed effective dates are December 31, 2010 and December 31, 2013.

To ensure the ozone forming potential of Multi-purpose Solvent and Paint Thinner products does not increase as a result of the implementation of the proposed VOC limits, we are proposing to limit the use of VOC aromatic compounds to no more than 1 percent by weight, effective December 31, 2010. We are proposing that Thinners and Solvents available Statewide meet this requirement. The proposed limitation on the use of VOC aromatic compounds is unique to the State regulation, and is not required by SCAQMD Rule 1143. Therefore, this provision would apply statewide and result in an additional ozone reduction benefit in the SCAQMD. Additional discussion regarding the need for limiting the use of these highly reactive ingredients can be found in Chapter VIII, Environmental Impacts.

While we believe that there are several products and reformulation pathways currently available to meet the 30 percent VOC limit, we acknowledge that technology advances are necessary to meet the future 3 percent limit. To that end, we are proposing to work with industry to assess progress as the December 31, 2013, compliance date approaches. We are proposing a technology assessment in 2012, to evaluate manufacturers' progress toward meeting the 3 percent limit.

Proposed Global Warming Potential (GWP) Limit and Compliance:

Pursuant to ARB's responsibilities under Assembly Bill 32, reductions of GHGs from consumer products are necessary (ARB, 2008e). Consumer products use various GHGs, mostly as propellants and to a limited extent as solvents. Although the GHG emissions contribution from consumer products can be relatively low, the severity of the climate change problem requires reductions or limitations from any source where it is feasible. No solvents with high GWP values were reported in the Paint Thinner and Multi-purpose Solvent Survey Update (ARB, 2008f). However, to ensure that there is no significant increase in GHG emissions from products reformulated to comply with the proposed VOC limits, we are proposing, as a Statewide mitigation measure, a GWP limit of 150 for any chemical compound used in Thinner and Solvent products, effective December 31, 2010. The proposed GWP limit is unique to the State regulation, and is not required by SCAQMD Rule 1143. Therefore, this provision would apply statewide and result in an additional GHG reduction benefit in the SCAQMD.

Proposed Toxics Prohibition:

None of the products reported in the survey update, including products that comply with the proposed VOC limits, are currently formulated with methylene chloride, perchloroethylene, or trichloroethylene. To prevent the potential use of these Toxic Air Contaminants as manufacturers reformulate products to comply with the proposed limits, we are proposing to prohibit their use in the Multi-purpose Solvent and Paint Thinner categories effective December 31, 2010. Methylene chloride and perchloroethylene are exempt VOC solvents, therefore, without the prohibition, high concentrations of these solvents could be used as reformulation options. While trichloroethylene meets the definition of VOC, without the prohibition, it could be used in Thinner and Solvent formulations that meet the proposed VOC limits. The health effects associated with exposure to perchloroethylene, methylene chloride and trichloroethylene, are well established. More information on the health effects of these solvents can be found in Chapter VIII of the Technical Support Document for the June 2008 Consumer Products Regulation Amendments (ARB, 2008e). In Rule 1143, SCAQMD has prohibited from consumer paint thinners and multi-purpose solvents, greater than 0.1 percent by weight of "Group II exempt compounds listed in Rule 102." Group II exempt compounds include methylene chloride and perchloroethylene. Therefore, the statewide toxics prohibition differs slightly from SCAQMD Rule 1143 in that it prohibits one additional toxic compound, trichloroethylene.

Photochemical Reactivity:

As mentioned previously, we are proposing in section 94509(u), to limit the use of aromatic compounds in products in the Multi-Purpose Solvent and Paint Thinner categories to 1 percent by weight, effective December 31, 2010. This Statewide requirement is intended to mitigate the possibility that manufacturers could replace current VOC solvents used in Thinners and Solvents with highly reactive compounds. A

discussion related to this proposal and the potential for the VOC reductions achieved from the proposed limits for Thinners and Solvents to be eroded without this measure, is provided in Chapter VIII, Environmental Impacts. The proposed limitation on the use of VOC aromatic compounds is unique to the State regulation, and is not required by SCAQMD Rule 1143. Therefore, this provision would apply statewide and result in an additional ozone reduction benefit in the SCAQMD.

Small Size Exemption:

We are proposing to temporarily exempt very small (8 fluid ounces or less) containers of Paint Thinner from compliance with the VOC limits until December 31, 2013. This exemption is designed to allow consumers to continue to be able to purchase typical Paint Thinners to be used with paints where the established VOC limit allows for fairly high concentrations of solvents. In addition, there is an existing exemption from the VOC limits for architectural coatings packaged in containers with a volume of one liter (1.057 quart) or less. Therefore, we believe a limited, temporary small container exemption is appropriate for Paint Thinner. Absent this provision, these solvent-borne paint products may be discarded, resulting in increasing the solid or hazardous waste stream or affecting water quality. This proposal should mitigate these potential consequences. We expect the emissions impacts of this small size exemption will be minimal. The proposed small size exemption is unique to the State regulation, therefore, this provision would only apply to areas of California outside the South Coast Air Basin.

Proposed Labeling Requirements:

To enhance the enforceability of the regulation, we are proposing that Thinners and Solvents would be subject to labeling requirements as specified in proposed new subsection 94512(e) of the Consumer Products Regulation. This proposed requirement would ensure that all products clearly display the VOC content of the product, in percent by weight, as determined from actual formulation data. This information would be required to be displayed on the product container such that it is readily observable without removing or disassembling any portion of the product container or packaging. This requirement would only apply to areas of California outside the South Coast Air Basin because SCAQMD has a well established labeling rule, Rule 443.1, Labeling of Materials Containing Organic Solvents (SCAQMD, 1986). SCAQMD Rule 443.1 specifies that within the South Coast Air Basin, products in containers of 0.94 liter (one quart) capacity or larger and containing any VOC or material containing VOC manufactured after July 1, 1987, must display on the product container, the maximum VOC expressed in grams of VOC per liter of material.

Proposal to Address Product Flammability:

During the development of the Thinners and Solvents regulation proposal, numerous stakeholders expressed concern with the flammability of low-VOC products such as those containing acetone. It was brought to our attention by staff of California's Office

of the State Fire Marshal (OSFM) and some local fire department representatives, that an increased availability of flammable or extremely flammable Thinners and Solvents may contribute to additional fire losses. The fire officials believe that consumers may not realize that characteristics of products named with general terms such as "Paint Thinner" have changed as a result of the proposed VOC limits. Thus, without clear notification of this change, they contend the potential for additional fire losses is possible.

The United States Consumer Product Safety Commission (CPSC) regulations require precautionary labeling of hazardous household products, including combustible, flammable, and extremely flammable thinners and solvents (USCPSC, 2009a). CPSC labeling requirements for hazardous household products are intended to help the consumer safely use and store hazardous products and provide information that may be necessary in the event of an accident.

Many products currently in commerce, such as "Paint Thinner" and "Mineral Spirits" are combustible products per CPSC because they have "a flashpoint at or above 100°F (37.8°C) to and including 150°F (65.6°C)" (USCPSC, 2009a). "Acetone" and many currently available "Lacquer Thinner" products are considered extremely flammable per federal law because they have "a flashpoint at or below 20°F (-6.7°C)" (USCPSC, 2009a). The lower the flash point, the more likely the material will ignite.

As described earlier, we believe manufacturers will meet the proposed VOC limits by increasing production of existing complying products, using water-based formulations, or replacing VOC solvents with VOC exempt ingredients. Based on market research and data we received in the Paint Thinner and Multi-purpose Solvent Survey Update, an overwhelming majority of products that currently comply with the proposed VOC limits include products labeled as "Acetone" and acetone-based formulations (ARB, 2008f).

It should be mentioned that water-based Thinners and Solvents, which comply with the proposed limits, also have a presence in the market. While water-based Thinners and Solvents meet the CPSC definition of a hazardous substance and require precautionary labeling, most do not meet the combustible, flammable, or extremely flammable definitions; they have flashpoints above 150°F (65.6°C) (ARB, 2008f). A flashpoint above 150°F (65.6°C) can be attributed to the use of water in the product.

Because we believe some manufacturers may replace some of their high VOC, combustible Thinners and Solvents with lower VOC, flammable or extremely flammable products, we are proposing to prohibit manufacturers from placing general product names on the principle display panel of "Flammable," or "Extremely Flammable" Multi-purpose Solvent and Paint Thinner products. The general product names used on products currently in commerce include, "Paint Thinner," "Multi-purpose Solvent," "Clean-up Solvent," "Paint Clean-up." The proposed prohibition includes two alternatives that manufacturers may choose from to continue selling generally named "Flammable," or "Extremely Flammable" Multi-purpose Solvents and Paint Thinners. The first alternative includes providing a "hang tag" or "sticker" affixed to the product

that includes the statement "Formulated to meet California VOC limits, see warnings on label." Manufacturers may also choose to display the common name of the chemical that results in the product meeting the criteria for "Flammable" or "Extremely Flammable," in a font as large as or larger, than any of the words on the principle display panel.

The proposed prohibition does not apply to products named "Lacquer Thinner." Many currently available Lacquer Thinners are "Extremely Flammable" because they contain greater than 1 percent acetone.

The proposed Statewide requirement would complement and be in addition to CPSC's labeling requirement for hazardous Thinners and Solvents. Essentially, upon approval of the proposed requirement, California will have more stringent labeling requirements for hazardous Thinners and Solvents, as a result of stakeholders' concern. We believe additional labeling is necessary to alert the consumer of a potential change in formulation of these products which could present a fire hazard if used improperly.

Additionally, to potentially minimize the increased fire hazard from the use of Thinners and Solvents, we have proposed an effective date for the 3 percent VOC limit of December 31, 2013. This additional compliance time allows for development of less flammable products. The reporting requirement mentioned previously will also allow us to evaluate potential reformulations to determine availability of less flammable products.

Proposed Technology Assessment:

As proposed in new subsection 94513(g), Thinner and Solvent manufacturers of products available Statewide would be required to supply detailed written updates on research and development efforts undertaken to achieve future compliance with the 3 percent VOC limit. The reports would include sales and formulation data for products, as well as detailed information on the raw materials evaluated for use; maximum incremental reactivity (MIR) values for any VOC or LVP-VOC used or evaluated; the function of the raw material evaluated; testing protocols used; the results of the testing; and the cost of reformulation efforts. The report would be due on June 30, 2012, and would provide data for the 2011 calendar year.

Issues:

- a. **Issue:** The effective date of the proposed 3 percent VOC limit for Multi-purpose Solvents should be earlier than December 31, 2013.

Response: As described earlier, Multi-purpose Solvent and Paint Thinner products are used interchangeably by consumers. An earlier effective date for the proposed 3 percent VOC limit for Multi-purpose Solvent would provide an opportunity for manufacturers to circumvent the limit by adding Paint Thinner claims to the product label. We believe the emission reductions attained from an

earlier implementation of the 3 percent VOC limit for Multi-purpose Solvent would not be achieved.

- b. **Issue:** ARB's proposed VOC limits will likely be met with an increase of acetone or acetone-based products because acetone is exempt as a VOC. Acetone is an extremely flammable solvent that cannot be used in the same manner as a combustible product, such as Odorless Mineral Spirits. For a limited time, ARB should educate the public to prevent any additional fire losses as a result of the proposed limits.

Response: We agree that the availability of acetone and acetone-based products will likely increase as a result of the proposed VOC limits. We also agree that an education effort is necessary to alert people to the additional hazards of using a flammable or extremely flammable product compared to a combustible product such as Odorless Mineral Spirits. We are proposing to prohibit manufacturers from placing general product names on the principle display panel of "Flammable" or "Extremely Flammable" Multi-purpose Solvent and Paint Thinner products. Manufacturers may choose to continue selling generally named "Flammable" or "Extremely Flammable" Multi-purpose Solvents and Paint Thinners as long as they either: provide a "hang tag" or "sticker" affixed to the product that includes the statement "Formulated to meet California VOC limits, see warnings on label;" or display the common name of the chemical that results in the product meeting the criteria for "Flammable" or "Extremely Flammable," in a font as large as or larger, than any of the words on the principle display panel. We believe the proposed requirement will alert the consumer of a potential change in formulation of these products which could present a fire hazard if used improperly.

- c. **Issue:** ARB should consider MIR standards for the Multi-purpose Solvent and Paint Thinner categories. Reactivity-based regulations will provide manufacturers more flexibility in reformulation options and may achieve greater ozone reductions.

Response: We have maintained that a mass-based VOC strategy would be the primary focus of this regulatory effort and that a reactivity strategy would only be employed if the mass-based strategies did not provide the necessary reductions. We believe the proposed mass-based limits are feasible and will achieve significant emissions reductions. Notwithstanding the above, we acknowledge that it is possible that some existing products that are 100 percent VOC could have a lower reactivity compared to some complying 30 percent products. In addition, some complying 30 percent products could have lower reactivity compared to some technologies available to meet the 3 percent limit, thus achieving no additional air quality benefit. As such, we are proposing to limit the aromatic content of Multi-purpose Solvent and Paint Thinner to 1 percent by weight, effective December 31, 2010.

We believe that limiting the aromatic compound content of these products will ensure that the ozone forming potential of reformulated products does not increase and the maximum air quality benefits are achieved. We are also proposing to conduct a technology assessment on or before June 30, 2012, to assess manufacturers' progress towards developing products that meet the proposed 3 percent VOC limit. We also intend to evaluate whether a reactivity-based regulation would achieve greater ozone reductions as opposed to the mass-based 3 percent VOC limit.

- d. **Issue:** ARB should consider exempting Tertiary Butyl Acetate (TBAC) from the definition of VOC.

Response: The Office of Environmental Health Hazard Assessment considers TBAC a possible human carcinogen, therefore we are not considering exempting it as a VOC at this time. However, because we are proposing to exempt Paint Thinner products labeled to be used exclusively for Industrial Maintenance Coatings, TBAC could be used in those specific instances, if necessary.

- e. **Issue:** ARB should consider a permanent small container exemption for Paint Thinner products intended for use with the solvent-borne paint. Without a small container exemption, consumers may resort to gasoline to thin their solvent-borne paint.

Response: We acknowledge that there continues to be a limited need for thinning small quantities of solvent-borne paint. Based on discussions with ARB's Architectural Coatings Program staff, there are several categories of architectural paints with VOC limits that allow for fairly high concentrations of solvents. In addition, there is an existing exemption from the VOC limits for architectural coatings packaged in containers with a volume of one liter (1.057 quart) or less. Therefore, we believe a limited, temporary small container exemption is appropriate for Paint Thinner. Additionally, this will give manufacturers time to develop low VOC thinners that are compatible with solvent-borne coatings. We are proposing an exemption for Paint Thinner products, packaged in containers with a capacity less than or equal to 8 fluid ounces, until December 31, 2013.

- f. **Issue:** ARB may be preempted by federal law from requiring additional labeling on flammable and extremely flammable Multi-purpose Solvent and Paint Thinner products.

Response: We have consulted with staff from the United States Consumer Product Safety Commission (CPSC) who have explained the federal preemption clause as it pertains to federal labeling for hazardous consumer products. Based on discussions with CPSC staff, we have written a proposal that does not conflict with federal requirements.

- g. **Issue:** The proposed 3 percent VOC limit for Paint Thinners will not allow for products that will effectively thin all paints, including solvent-borne paint.

Response: As described earlier, we are proposing to conduct a technology assessment on or before June 30, 2012, to assess manufacturers' progress towards developing products that can meet the proposed 3 percent VOC limit. We are aware that currently, there are only a few reformulation pathways that meet the 3 percent limit. However, there is information that indicates that new technologies are under development. We will evaluate progress toward meeting the 3 percent limit in the technology assessment.

- h. **Issue:** ARB should consider exempting natural solvents, such as d-limonene, because of its carbon neutral attributes.

Response: D-limonene is a highly reactive VOC that contributes significantly to ground level ozone formation. Also, none of the products reported in the Survey Update were formulated with d-limonene. The commenter did not provide a definition for natural solvent or any data about the attributes of natural solvents. Therefore, we do not believe it is appropriate at this time to consider this exemption.

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VII. ECONOMIC IMPACTS

This chapter provides our analysis of the estimated economic and fiscal impacts of the proposed amendments. The analysis focuses on costs to comply with the proposed VOC limits. We expect the other proposals to result in negligible or no costs.

Businesses that manufacture air fresheners, multi-purpose solvents and paint thinners with VOC contents above the proposed VOC limits would incur costs to reformulate their products. Potential fiscal impacts would be costs incurred by State agencies to administer, enforce, or comply with the proposal.

Economic impact analyses are inherently imprecise, given the unpredictable behavior of companies in a highly competitive market such as consumer products. While staff has quantified the economic impacts to the extent feasible, some projections are necessarily qualitative, and based on general observations and facts known about the consumer products industry. This analysis, therefore, serves to provide a general picture of the economic impacts typical businesses might encounter. Individual companies may experience different impacts than projected.

The summary of economic impacts of the proposed limits is presented in Section A. Other possible economic impacts and mitigation paths are provided in the following sections:

- B. Costs of Compliance
- C. Return on Owners' Equity
- D. Impacts on California Businesses, Consumers, and State and Local Agencies
- E. Other Possible Economic Impacts of Regulatory Changes
- F. Mitigation of Potential Impacts through Additional Regulatory Flexibility

This economic impacts analysis was conducted in accordance with the current legal requirements under the Administrative Procedure Act (APA). This analysis uses similar methodologies and assumptions as were used in the last consumer products rulemakings (ARB, 2004b; ARB, 2006a; ARB, 2008e).

A. SUMMARY OF ECONOMIC IMPACTS

Staff has estimated that the overall cost to comply with the proposed VOC limits is about \$3.1 million per year for ten years (\$31 million in total). This amount includes both recurring (e.g., raw materials) and nonrecurring (e.g., research and development) costs and is estimated based on assumptions specific to each category. The cost represents the average of low and high cost estimates and represents staff's prediction of the costs businesses would most likely incur.

Another measure of the economic impacts of the proposal is to determine the "dollars to be spent per pound of VOC reduced," or cost effectiveness. The cost effectiveness of the proposed amendments has been calculated to be about \$0.29 per pound of VOC

reduced. This is based on expected emission reductions of about 14.7 tons per day. This cost effectiveness is comparatively less costly than some other recent consumer products rulemakings.

The impacts of the proposed amendments on manufacturers are estimated by determining the "return on owner's equity" (ROE). ROE is a calculation which compares a company's percentage reduction in profitability before and after incurring the costs associated with the proposed amendments. The analysis found that the overall reduction in profitability ranges from 5.4 percent for Double Phase Aerosol Air Freshener to about 24 percent for reformulation costs incurred for both the first tier and second tier limits for Multi-purpose Solvent and Paint Thinner products. Thus, the potential exists that some manufacturers of Multi-purpose Solvent and Paint Thinner products may experience a significant impact in their profitability. In light of this, the assessment of ROE requires further explanation.

Our analysis of ROE found that sample businesses in the affected industries complying with the proposed first tier limit for Multi-purpose Solvent and Paint Thinner, declined by about 9.5 percent. When the second tier limit for Multi-purpose Solvent and Paint Thinner is calculated, the ROE of the affected industries is estimated to decline by up to 24 percent. This analysis assumes that all compliance costs will be absorbed by the affected industry. However, it is most likely that affected businesses will be able to pass on at least part of the cost increase to consumers. Since consumers spend only a small portion of their annual budget on affected products, they are not expected to be sensitive to a small increase in the prices of those products. To the extent that the projected costs are passed on to consumers, the impact on business profitability is likely to be much less than estimated in our projection.

Because we expect businesses will pass on compliance costs to the consumer, we estimated the increased cost the consumer may experience. If all assumed compliance costs are passed on to the consumer, without consideration of typical retail mark-up, we estimate the cost per unit increase would range from negligible cost (net savings or no cost) for a Double Phase Aerosol Air Freshener product to about \$0.75 for a Multi-purpose Solvent and Paint Thinner product reformulated to meet the proposed second tier limit unit of 3 percent VOC by weight. The value of \$0.75 represents the summed per-unit cost increase for a one gallon of product reformulated to meet the first tier limits and reformulated a second time to meet the second tier limits. By apportioning annual sales of Multi-purpose Solvent and Paint Thinner products to the California population, we estimated that residents purchase less than one container of Multi-purpose Solvent and Paint Thinner per year. Thus, considering normal retail mark-up of 100 percent, the consumer's cost increase to purchase Multi-purpose Solvent and Paint Thinner would increase by about \$1.50 per gallon.

We also estimated costs to contractors because they commonly purchase Multi-purpose Solvent and Paint Thinner products. If we apportion all sales of Multi-purpose Solvent and Paint Thinner products to licensed contractors, we estimate purchases of approximately five gallons per year. Considering normal retail mark-up and using our

high cost estimate, the cost increase to licensed contractors purchasing Multi-purpose Solvent/Paint Thinner products would be about \$8 per year (CDCA, 2009).

Based on our ROE calculations, we believe that overall, most affected businesses will be able to absorb the costs, or will pass through some of the costs to the consumer, such that there will be no significant adverse impacts on their profitability. Therefore, we do not expect a noticeable change in employment; business creation, elimination or expansion; or business competitiveness in California. However, the proposed amendments may impose economic hardship on some businesses with very little or no margin of profitability.

We determined that there would be no significant adverse fiscal impacts to any local or State agencies.

Staff believes that the regulation cost and CE determination methodologies are conservative. For example, the average cost scenario of low and high determines the overall cost and cost effectiveness of the regulation. The low cost scenario assumes that companies would choose the lowest cost reformulation pathway, making minor adjustments to a product's formulation, or simply ceasing sale of some non-complying products. We believe that most manufacturers would choose the lowest cost reformulation option. For the high cost scenario, it is assumed that there is significant research and development, and new equipment is needed to reformulate the product. We believe that few manufacturers would need to take the high cost reformulation approach.

Details of our cost analysis are in the following sections. Additional information as to how recurring and nonrecurring costs were estimated is contained in Appendices D and E.

B. COSTS OF COMPLIANCE

The total cost of compliance of the proposal requires an estimation of the recurring and nonrecurring costs that would be expended to reformulate and bring a product to market. Recurring costs for this analysis are those associated with the cost of the raw materials. Nonrecurring costs are assumed to be one time costs and are those associated with research, development, and plant changes that may be necessary to develop a reformulated complying product. Our analysis further assumes that nonrecurring costs will be amortized over a project horizon of ten years. Summing the recurring and amortized nonrecurring costs represents the total cost to reformulate a product. We then use the total cost to estimate the potential cost per unit increase to the consumer, the cost effectiveness (CE) of the proposed amendments, and the ROE.

There are many variables in producing a product for market, and assumptions about those variables will greatly affect the outcome of any cost analysis. For each assumption, staff applied a test of "reasonableness" to determine if this was a likely approach to take, or if the event had a high probability of occurring. The following

sections describe our process for arriving at the costs to comply with the proposed amendments.

1. **Recurring Costs**

As part of the economic impact analysis, we evaluated the expected cost impacts from complying with the proposed VOC limits on raw material costs. The change in the cost of raw material costs are expected to be ongoing, *i.e.*, they are recurring costs.

a. Methodology

Using the data from the 2006 Survey for Double Phase Aerosol Air Freshener products and the Survey Update for Multi-purpose Solvent and Paint Thinner products, we determined the formulations which most closely reflect the "typical" compliant and non-compliant product contents. For each category staff estimated a "low cost" and "high cost" by varying costs for ingredients. Information on how raw material costs were estimated, as well as formulations evaluated (with individual weight fractions and unit prices per pound), are shown in Appendix D. While these formulations may not reflect the exact composition of existing non-compliant products and compliant products that will be marketed, we believe they are reasonably representative for the purposes of this analysis.

In this rulemaking, we used the same raw material costs as were used in the June 2008 rulemaking for consumer products (ARB, 2008e). We believe this is reasonable, if not conservative, given the declining price of oil and general economic downturn that has occurred since that rulemaking.

Except for ingredient costs, we assumed changes in packaging, delivery systems, labeling, distribution and other recurring costs would be negligible relative to baseline levels of these costs (ARB, 1997b). We believe this assumption is valid because the proposed limits should not require significant packaging or delivery system modifications. We also believe distribution costs would be the same because we do not expect manufacturers to sell and distribute "California only products." The most likely pathway for reformulation was assumed for non-compliant products. Despite this assumption, alternative formulations may allow lower-cost compliant products than shown in our analysis.

b. Results

The estimated cost of typical non-compliant and compliant formulations for each category is displayed in Table VII-1a. The values are taken from Appendix D. The difference between high and low cost non-compliant and compliant formulations yields the change in ingredient costs. As shown in Table VII-1a, Columns C₁ and C₂, the anticipated raw materials cost change ranges from no cost (net savings or no cost) to about \$0.50 increase per unit (per 8.3 fluid ounces average unit size of Multi-purpose Solvent and Paint Thinner complying with the tier 2 limit). Note that when the cost for

raw materials in the predicted reformulated product are comparable or slightly cheaper to those currently used, rather than assigning a negative cost, we assume there will be no change in the cost of raw materials.

Table VII-1a
Estimated Change in Formula Cost per Unit*

| Category | Formula Cost per Unit | | | | Cost Increase to Comply per Unit | |
|---|-----------------------|----------------|----------------|----------------|---|---|
| | Non-compliant | | Compliant | | Low | High |
| | Low | High | Low | High | | |
| | A ₁ | A ₂ | B ₁ | B ₂ | C ₁ = B ₁ - A ₁ | C ₂ = B ₂ - A ₂ |
| Air Freshener - Double Phase (aerosol) | \$0.10 | \$0.20 | \$0.10 | \$0.20 | \$0.00 ⁺ | \$0.00 ⁺ |
| Multi-purpose Solvent & Paint Thinner tier 1 | \$3.20 | \$4.70 | \$2.90 | \$4.30 | \$0.00 ⁺ | \$0.00 ⁺ |
| tier 2 | \$2.90 | \$4.30 | \$2.80 | \$4.80 | \$0.00 ⁺ | \$0.50 ⁺ |

* Raw material costs are assumed to be \$0.00 when staff estimates that materials used to reformulate are comparably priced to current materials or are less expensive than currently used.

+ Numbers have been rounded in tables, however unrounded numbers are used for calculations in subsequent tables.

Using the change in the cost per unit from Table VII-1a, the total recurring costs per category are calculated as shown in Table VII-1b. To arrive at the total cost per category, estimated non-compliant unit sales (Column D) are multiplied by the recurring costs per unit taken from Table VII-1a. As shown in Table VII-1b, Column E₃ the average total recurring cost per category ranges from no cost to about \$850,000 for the Multi-purpose Solvent and Paint Thinner products reformulated to comply with the tier 2 VOC limit.

Table VII-1b
Total Estimated Recurring Cost

| Category | Annual California Noncomplying Unit Sales* | Total Annual Recurring Cost per Category* | | |
|---|---|---|----------------------|-----------------------|
| | | Low Cost | High Cost | Average |
| | D | $E_1 = D \times C_1$ | $E_2 = D \times C_2$ | $E_3 = (E_1 + E_2)/2$ |
| Air Freshener – Double Phase (aerosol) | 53,748,100 | \$0.00 | \$0.00 | \$0.00 |
| Multi-purpose Solvent & Paint Thinner tier 1 | 1,723,300 | \$0.00 | \$0.00 | \$0.00 |
| tier 2 | 1,699,000 | \$0.00 | \$854,000 | \$427,000 |

* Assumes "typical" unit size as shown in Appendix D.

* See Table VII-1a footnote about the use of unrounded numbers in calculations.

2. Nonrecurring Costs

In this portion of the analysis, we evaluated the impacts of nonrecurring costs likely to be expended to comply with the proposed limits. These are assumed to be costs incurred once to conduct the necessary research and development to produce a complying product. Technical literature and industry trade journals provide little information to estimate nonrecurring costs directly. This is not surprising because the consumer products industry is very competitive, and production cost data specific to a company are closely guarded trade secrets. Stakeholders have generally concurred that our assumptions for nonrecurring costs are reasonable. Appendix E displays the various phases of product development and the costs that are assigned to each phase.

a. Methodology

To estimate nonrecurring costs, we used two approaches for each product category, one for low cost, and one for high cost, with a different set of assumptions for each approach. The categories proposed for regulation are considered "household care" products. Appendix E displays how nonrecurring costs were apportioned for both high and low cost scenarios. For each category only new or additional costs were considered. Costs were not considered that would have been expected in the normal course of business if the regulation had not been in effect.

b. Results

Table VII-2, Columns A₁ and A₂, display the results of our assessment of the nonrecurring costs to be incurred for each category. These costs are taken from Appendix E. Estimated nonrecurring costs for the low cost scenario for the categories range from about \$11,200 to \$15,100 per product. Note also that nonrecurring costs for the high cost scenario range from about \$50,000 to \$75,000 per product.

Table VII-2
Estimated Nonrecurring per Product Costs to Comply with the Proposed Limits

| Category | Cost Per Product | | Amortized Cost Per Product | |
|---|------------------|----------------|---|---|
| | Low | High | Low | High |
| | A ₁ | A ₂ | B ₁ = A ₁ X CRF* | B ₂ = A ₂ X CRF* |
| Air Freshener – Double Phase (aerosol) | \$11,200 | \$50,100 | \$1,800 | \$8,200 |
| Multi-purpose Solvent & Paint Thinner tier 1 | \$15,100 | \$74,600 | \$2,500 | \$12,100 |
| tier 2 | \$15,100 | \$74,600 | \$2,500 | \$12,100 |

*CRF = Capital Recovery Factor of 0.16275

c. Amortizing Nonrecurring Costs

The next part of our analysis assumes that nonrecurring costs will not be incurred in a single year, but would instead be amortized over ten years. To amortize nonrecurring costs, the costs shown in Columns A₁ and A₂ are then amortized using the Capital Recovery Method. This is a standard methodology and it is recommended under guidelines issued by the California Environmental Protection Agency (Cal/EPA).

The equation below shows that the estimated total nonrecurring costs per product is multiplied by the Capital Recovery Factor (CRF) to convert these costs into equal annual payments over a project horizon (i.e., the projected useful life of the investment) at a discount rate.

$$\text{Annualized nonrecurring costs} = (\text{Nonrecurring Costs}) \times [i(1+i)^n / ((1+i)^n - 1)]$$

Where:

$$\begin{aligned} i(1+i)^n / ((1+i)^n - 1) &= \text{Capital Recovery Factor (CRF)} \\ i &= \text{discount interest rate over project horizon, \%} \\ n &= \text{number of years in project horizon} \\ \text{Nonrecurring Costs} &= \text{total nonrecurring cost per product} \end{aligned}$$

We assumed a project horizon of ten years, a commonly cited period for an investment's useful lifetime in the chemical processing industry. We also assumed a fixed interest rate of 10 percent throughout the project horizon. These assumptions are conservative and constitute standard practice in analyses of consumer products regulations, including previous consumer product rulemakings. Based on these assumptions, the Capital Recovery Factor (CRF), as shown below, is 0.16275.

$$\begin{aligned}\text{CRF} &= 0.1(1+0.1)^{10}/((1+0.1)^{10}-1) \\ &= 0.1(2.59)/1.59 \\ &= 0.259/1.59 \\ &= 0.163 \text{ (rounded)}\end{aligned}$$

Using the low cost estimate for Double Phase Aerosol Air Fresheners from Table VII-2, Column A₁, then the amortized cost is:

$$\text{Amortized Cost: } \$11,200 \times 0.16275 = \$1,822.80$$

For the low cost scenario, as shown in Column B₁, of Table VII-2, we project per-product annualized nonrecurring costs to be about \$1,800 to \$2,500 for each of ten years. For the high cost scenario (Column B₂), we project per-product annualized nonrecurring costs to range from about \$8,200 to \$12,100 for ten years.

Next, nonrecurring costs for all non-compliant products per category are calculated by using the low and high amortized costs from Table VII-2. To arrive at the range of total nonrecurring cost per category, two different scenarios are calculated. In the low cost scenario, we assume that manufacturers will conduct research and other product development once for a given product category, and use these efforts as a basis to reformulate all their other non-complying products in the same category. As shown in Table VII-3, the low cost incurred by all businesses is the product of the low product cost (Column C) and number of companies (Column B) that have non-complying products within the given category.

In the total nonrecurring high cost scenario, we assume that reformulation costs would be incurred per product. This means that companies that have multiple non-complying products in a given category would conduct separate research and development efforts for each product in their respective product lines. Thus in this case, the high amortized cost (Column D) is multiplied by the number of non-compliant products (Column A).

As shown in Table VII-3, total category annualized nonrecurring costs range from about \$43,000 to about \$50,000 for the low cost scenario, and from \$1.7 million to \$1.8 million for the high cost scenario. Also as shown in Table VII-3, the total nonrecurring cost to industry is projected to range from about \$143,000 to just over \$5 million dollars per year for ten years.

Table VII-3
Estimated Total Nonrecurring Cost per Category

| Category | # Non-complying Products* | # Companies | Low Cost Per Unit | High Cost Per Unit | Total Nonrecurring Cost per Category** | |
|--|---------------------------|-----------------------|-------------------|--------------------|--|----------------------------|
| | A | B | C | D | Low $E_1 = B \times C$ | High $E_2 = D \times A$ |
| Air Freshener Double Phase (aerosol) | 218 | 24 | \$1,800 | \$8,200 | \$43,200 | \$1,787,600 |
| Multi-purpose Solvent & Paint Thinner tier 1 | 137 | 20 | \$2,500 | \$12,100 | \$50,000 | \$1,657,700 |
| tier 2 | 140 | 20 | \$2,500 | \$12,100 | \$50,000 | \$1,694,000 |
| Total: | 495⁺ | 44⁺ | | | \$143,200 | \$5,139,300 |

* Adjusted for market covered in survey. Assume 90% for all categories.

⁺ Tier 1 and 2 Multi-purpose Solvent & Paint Thinner products are counted twice because they will be reformulated twice. Number of Multi-purpose Solvent & Paint Thinner companies are not counted twice.

** See Table VII-1a footnote about the use of unrounded numbers in calculations.

3. Total Costs

For each category, the total cost of reformulation is estimated by summing recurring costs (see Table VII-1b) with nonrecurring amortized costs (see Table VII-3).

Table VII-4 displays the total low and high cost to reformulate all non-complying products for each category. We estimate the industry compliance costs to range from a low of about \$43,000 per year for aerosol Double Phase Air Freshener products, to a high of about \$2.5 million per year to comply with the second tier 2 VOC limit for Multi-purpose Solvent and Paint Thinner products. Table VII-4 (Column C₃) also shows the average cost estimate to range from about \$854,000 to \$1.3 million. As shown in Column C₃, the overall average cost to reformulate all non-compliant products for all categories is about \$3.1 million.

Table VII-4
Estimated Total Costs to Comply with the Proposed VOC Limits

| | Nonrecurring Costs | | Recurring Costs* | |
|---|---|---|--|----------------|
| | Low | High | Low | High |
| | A ₁ | A ₂ | B ₁ | B ₂ |
| Air Freshener – Double Phase (aerosol) | \$43,200 | \$1,787,600 | \$0 | \$0 |
| Multi-purpose Solvent & Paint Thinner tier 1 | \$50,000 | \$1,657,700 | \$0 | \$0 |
| tier 2 | \$50,000 | \$1,694,000 | \$0 | \$845,000 |
| | Nonrecurring and Recurring Costs† | | | |
| | Low | High | Average | |
| | C ₁ = A ₁ + B ₁ | C ₂ = A ₂ + B ₂ | C ₃ = (C ₁ + C ₂)/2 | |
| Air Freshener – Double Phase (aerosol) | \$43,200 | \$1,787,600 | \$915,400 | |
| Multi-purpose Solvent & Paint Thinner tier 1 | \$50,000 | \$1,657,700 | \$853,900 | |
| tier 2 | \$50,000 | \$2,548,000 | \$1,299,000 | |
| TOTAL: | \$143,200 | \$5,993,300 | \$3,068,300 | |

* A cost of \$0 may indicate a per unit cost of less than one-half of one cent.

† See Table VII-1a footnote about the use of unrounded numbers in calculations.

4. Cost per Unit

We also evaluated the potential increased cost the consumer would pay if all costs of compliance were passed onto the consumer (not including retail mark-up). For this estimate, we assumed that all recurring and nonrecurring costs are assessed only to the number of non-complying units in each category. Table VII-5 displays the result of this analysis.

For this rulemaking, as with others, we assumed products reformulated to meet the proposed limits will be marketed throughout the United States by national marketers. From our experience, we know that businesses generally formulate and distribute to the entire nation, products complying with California regulations, rather than incurring the additional cost of setting up a California specific product distribution system. This assumption is valid especially considering the number of jurisdictions that have and are continuing to adopt California standards.

Therefore, we assume that the costs of compliance will not be assessed only to products sold in California, but will be spread over products sold across the country. To do this, our analysis used the California-apportioned (by population) high and low nonrecurring costs (Table VII-3). Using this alternative approach, we discounted the nonrecurring cost per unit by the California-apportionment factor (*i.e.*, the current ratio of California to U.S. population, or 12.5 percent (CA DOF, 2007)). To illustrate, using the total tier 1 nonrecurring high cost for Multi-purpose Solvent and Paint Thinner products of \$1,657,700 the nonrecurring portion of cost that would be passed onto the consumer is 12.5 percent of this amount, or \$207,000. The California portion of low and high nonrecurring costs are each divided by the number of non-complying units sold in California per year (see column D of Table VII-1b). The resulting nonrecurring high and low cost per unit is then added to the recurring high and low cost per unit (taken from Table VII-1a) to arrive at the total increase in cost per unit to the consumer.

For Double Phase Aerosol Air Fresheners, the total cost of reformulating one 9 ounce product is estimated to be quite minimal. The recurring raw materials costs to reformulate Double Phase Aerosol Air Fresheners to meet the proposed limit is projected to be zero. This is because the costs of ingredients of a complying product are actually less than the cost of ingredients of a non-complying product. For the purposes of our cost calculations, in this case, as was done in economic analyses for previous rulemakings, we assume that the ingredient costs are zero. As for the recurring (research and development) while the overall costs are significant, the costs are spread over more than 50 million units, resulting in an overall negligible cost per unit.

As shown in Table VII-5, we estimate the average cost per unit increase to the California consumer to range from no cost increase to about \$0.62 for the tier 2 limit for Multi-purpose Solvent and Paint Thinner products. Taken together (summing cost for tier 1 and tier 2), the worst case scenario cost increase would be about \$0.75 per unit.

Because of unpredictable factors such as the highly competitive nature of the consumer products market, it is not possible to accurately predict the final retail price of products that will comply with the proposed limits when they become effective. To the extent the cost impacts are passed on to consumers, the final retail prices may be lower or higher than suggested by this analysis.

Table VII-5
Estimated Per-Unit Cost Increases from Both Annualized Nonrecurring and Annual Recurring Costs

| | Estimated Noncompliant Unit Sales Per Day in CA | Annualized Nonrecurring Low Cost/Unit | Annualized Nonrecurring High Cost/Unit | Annual Recurring Low Cost/Unit | Annual Recurring High Cost/Unit |
|--|--|--|---|---|--|
| Category | A | B ₁ | B ₂ | C ₁ | C ₂ |
| Air Freshener – Double Phase (aerosol) | 147,300 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| Multi-purpose Solvent & Paint Thinner tier 1 | 4,700 | \$0.00 | \$0.12 | \$0.00 | \$0.00 |
| tier 2 | 4,700 | \$0.00 | \$0.12 | \$0.00 | \$0.50 |
| | Total Increase Low/Unit | Total Increase High/Unit | Total Increase Mid/Unit | | |
| | D ₁ | D ₂ | D ₃ | | |
| Air Freshener – Double Phase (aerosol) | \$0.00 | \$0.00 | \$0.00 | | |
| Multi-purpose Solvent & Paint Thinner tier 1 | \$0.00 | \$0.12 | \$0.06 | | |
| tier 2 | \$0.00 | \$0.62 | \$0.31 | | |

A cost of \$0 may indicate a per unit cost of less than one-half of one cent.
* See Table VII-1a footnote about the use of unrounded numbers in calculations.

5. Cost-Effectiveness (CE)

Using the total costs displayed in Table VII-4, we evaluated the anticipated CE of the proposed new limits. Such an evaluation allows us to compare the efficiency of the proposed limits in reducing a pound of VOC relative to other existing regulatory programs.

The CE of a reduction strategy is generally defined as the ratio of total dollars to be spent to comply with the strategy (as an annual cost) to the mass reduction of the

pollutant(s) to be achieved by complying with that strategy (in annual pounds). The CE is calculated as shown by the following general equation:

$$\text{Cost Effectiveness} = \frac{\text{Total Cost to Comply}}{\text{Annual Mass Reduction in VOC}}$$

We estimate that, when fully effective, the proposed VOC limits will result in an emission reduction of about 14.7 tons per day, or 10,731,000 pounds per year. In this chapter, we have calculated that the average total cost to comply with the proposed VOC limits is three million dollars.

The CE of the proposed amendments related to complying with the VOC limits is about \$0.29 per pound of VOC reduced, as shown by the following equation:

$$\frac{\$3,068,300}{10,731,000 \text{ pounds}} = \$0.29 \text{ per pound}$$

Table VII-6 shows a comparison of the CE for the proposed limits relative to other recent ARB consumer product regulations and control measures.

Table VII-6
Comparison of Cost-Effectiveness for ARB Consumer Product Regulations/Measures

| Regulation/Control Measure | Cost-Effectiveness (Dollars per Pound VOC Reduced) |
|--|---|
| 2009 Amendments | \$0.29 |
| 2008 Amendments (ARB, 2008e) | \$6.23 |
| 2006 Amendments (ARB, 2006a) | \$2.35 |
| 2004 Amendments (ARB, 2004b) | \$2.01 to \$2.34 |
| Aerosol Adhesives (ARB, 2000c) | \$6.00 |
| Architectural and Industrial Maintenance Coatings (ARB, 2007i) | \$1.12 |

As shown in Table VII-6, the CE is considerably lower compared to several other recent rulemakings.

C. RETURN ON OWNERS' EQUITY

Typical California businesses are affected by the proposed new limits to the extent that the implementation of these requirements would change their profitability. To estimate reduction in profitability, this portion of the economic impacts analysis compares the Return on Owners' Equity (ROE) for affected businesses before and after inclusion of the cost to comply with the proposed requirements. The data used in this analysis are obtained from Dun and Bradstreet Industry Norms and Key Business Ratio (D&B,

2009), the ARB's 2006 Consumer and Commercial Products Survey (ARB, 2007f), the Survey Update for Paint Thinner and Multi-purpose Solvent products (ARB, 2008f), and the CE analysis described previously in section B.

1. Affected Businesses

Any business which manufactures or markets consumer products subject to the proposed new limits and requirements can be directly affected by this regulation. Also potentially affected are businesses which supply raw materials or equipment to manufacturers or marketers, and those that distribute or sell consumer products in California. The focus of this analysis, however, will be on manufacturers, marketers, and distributors that are most affected by the proposed measures.

The consumer products subject to the proposed measures are manufactured, marketed, or distributed by a large number of companies worldwide. According to our Surveys, there are about 44 companies that market the affected products in California. Many of these companies manufacture, market, and distribute a broad range of solvent, adhesive, household, and personal care products. However, some companies' business is limited to solvent manufacture. All together, there are 495 non-complying products (based on reported figures). Of the companies manufacturing these products, two small-sized firms are located in California.

These 44 companies can be described by the North American Industry Classification System codes (NAICS): 325612, Polish and Other Sanitation Good Manufacturing; and 325510, Paint and Coatings Manufacturing.

2. Analysis Approach

This analysis covers two industries with at least three affected businesses. The approach used in evaluating the potential economic impact of the proposed measures on these businesses is as follows:

- (1) A typical business from each product category was selected from the Surveys respondents.
- (2) A range of compliance costs were estimated for each affected product category. The average cost (see Table VII-4) for each category was used in this analysis.
- (3) Compliance cost to a typical business was then estimated based on a weighted average of all product category costs in the affected industry.
- (4) Estimated cost was adjusted for federal and State taxes.
- (5) The ROE was calculated for each of these businesses by dividing the net profit by the net worth. The adjusted cost was then subtracted from net profit data. The results were used to calculate an adjusted ROE.
- (6) The adjusted ROE was then compared with the ROE before the subtraction of the cost to determine the potential impact on the profitability of the business.

An ROE reduction of more than 10 percent in profitability assuming that all costs are absorbed by the affected company and not passed on to the consumer, is considered to indicate a potential for significant adverse economic impacts. This value has been used consistently by the ARB staff to determine impact severity and is consistent with that used by the U.S. EPA.

3. Assumptions

This analysis uses 2007-2008 Dun and Bradstreet financial data (D&B, 2009) for a nationwide typical business in the Polish and Other Sanitation Good Manufacturing industry (325612 NAICS code) and Paint and Coatings Manufacturing (325510 NAICS code). These data were used to calculate the ROEs before and after the subtraction of the compliance costs for a typical business. The calculations were based on the following assumptions:

- (1) A typical business on a nationwide basis in each industry is representative of a typical California business in that industry;
- (2) All affected businesses were subject to federal and State tax rates of 35 percent and 9.3 percent respectively; and
- (3) Affected businesses are not able to increase the prices of their products, nor can they lower their costs of doing business through short-term cost-cutting measures.

Given the limitation of available data, we believe these assumptions are reasonable for most businesses at least in the short run; however, they may not be applicable to all businesses.

4. Results

Table VII-7 shows the results of our analysis of ROE. The percentage in reduction of profitability ranges from 5.4 percent for Double Phase Aerosol Air Fresheners to about 24.2 percent for Multi-purpose Solvent and Paint Thinner products. The ROE of 24.2 percent combines the ROEs estimated for the tier 1 and tier 2 limits for Multi-purpose Solvent and Paint Thinner products. The average reduction in profitability is about 14.8 percent.

Table VII-7
Summary of Decline in Return on Owners' Equity (ROE)

| NAICS | Company Name | Percent Change in ROE |
|------------------------------------|--|------------------------------|
| 325612 | Polish and Other Sanitation Good Manufacturing | |
| | Double Phase Aerosol Air Freshener | -5.4 |
| 325510 | Paint and Coatings Manufacturing | |
| | Multi-purpose Solvent & Paint Thinner -tier 1 | -9.5 |
| | Multi-purpose Solvent & Paint Thinner -tier 2 | -14.7 |
| | Total tier 1 & tier 2 | -24.2 |
| Average for both industries | | -14.8 |

Because we calculated a reduction in ROE of more than 10 percent for Multi-purpose Solvent and Paint Thinner products, we have determined that there is a potential for significant impact on profitability. In light of this, the assessment of ROE requires further explanation.

The results in Table VII-7 show that our analysis of ROE found that sample businesses in the affected industries, complying with the proposed limit for Double Phase Aerosol Air Freshener, declined in profitability by about 5.4 percent. The ROE for a business affected by the tier 1 limit for Multi-purpose Solvent and Paint Thinner, declined by about 9.5 percent. These ROE values are not considered significant.

Factoring in the tier 2 limit for Multi-purpose Solvent and Paint Thinner products, the ROE is estimated to decline by up to 24.2 percent (combining both limits for Multi-purpose Solvent and Paint Thinner). However, our analysis assumes that all compliance costs will be absorbed by the affected industry. However, it is most likely that affected businesses will be able to pass on at least part of the cost increase to consumers. Since consumers spend only a small portion of their annual budget on affected products, they are not expected to be sensitive to a small increase in the prices of those products. To the extent that the projected costs are passed on to consumers, the impact on business profitability is likely to be much less than estimated in our projection.

We believe that overall, most affected businesses will be able to absorb the costs, or will pass through some of the costs to the consumer, such that there will be no significant adverse impacts on their profitability. However, the proposed amendments may impose economic hardship on some businesses with very little or no margin of profitability.

D. IMPACTS ON CALIFORNIA BUSINESSES, CONSUMERS, AND STATE AND LOCAL AGENCIES

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment must include a consideration of the impact of the proposed regulation on California jobs; business expansion, elimination or creation; and the ability of California business to compete with businesses in other states.

1. Potential Impact on California Businesses

Our profitability analysis shows a significant change in the average profitability of affected businesses that manufacture Multi-purpose Solvent and Paint Thinner products, if they absorbed the entire cost of compliance. We believe that these manufacturers will pass through at least a portion of their compliance costs to maintain profitability. Based on sales of Multi-purpose Solvent and Paint Thinner products, we expect the average California resident to buy no more than one product per year. Therefore, purchase of Multi-purpose Solvent and Paint Thinner products only accounts for a small portion of the consumer's annual budget. Thus, consumers are likely less sensitive to the price changes. For this reason, we believe businesses will be able to pass through compliance costs, and are likely to be able to recover the bulk of the cost increase from consumers. To the extent that businesses are able to pass on the increased cost to consumers, the adverse impact of the proposed measures would be less than projected in this analysis. Furthermore, the projected impact will be less if businesses are able to improve their operational efficiency, thus reducing their costs.

Nonetheless, the proposed measures may impose economic hardship on some businesses with very little or no margin of profitability. These businesses, if hard pressed, can seek relief under the variance provision of the consumer products regulation for extensions to their compliance dates. Such extensions may provide sufficient time to minimize the cost impacts to these businesses. Additional mitigation may be achieved by taking advantage of the compliance flexibility offered by the existing Innovative Product Provision (IPP) and the Alternative Control Plan (ACP) Regulation (see Section F of this chapter).

2. Potential Impact on Business Creation, Elimination or Expansion

The proposed amendments would have no noticeable impact on the status of California businesses. This is because most affected businesses are expected to be able to pass on the bulk of the reformulation cost to consumers in terms of higher prices for their products. However, if either of the two small California businesses that reported sales to us in the Survey Update have little or no margin of profitability, they may lack the financial resources to reformulate their products on a timely basis. Should the proposed measures impose significant hardship on these businesses, temporary relief in the form of a compliance date extension under the variance provision may be warranted.

On the other hand, the proposed measures may provide business opportunities for some California businesses or result in the creation of new businesses. California businesses which supply raw materials and equipment or provide consulting services to affected industries may benefit from increased industry spending on reformulation.

3. Potential Impact on Business Competitiveness

The proposed measures would have no significant impact on the ability of California businesses to compete with businesses in other states. Because the proposed measures would apply to all businesses that manufacture or market certain consumer products regardless of their location, the staff's proposal should not present any economic disadvantages specific to California businesses.

Nonetheless, the proposed amendments may have an adverse impact on the competitive position of some small, marginal businesses in California if these businesses lack resources to develop commercially acceptable products in a timely manner. As stated above, such impacts can be mitigated to a degree with a justified compliance extension under the variance provision of the Consumer Products Regulation, or through additional regulatory flexibility afforded by the IPP or the ACP Regulation (see Section F).

4. Potential Impact on California Employment

The proposed amendments are not expected to cause a noticeable change in California employment and payroll. As shown in Table VII-8, according to the U.S. Department of Commerce, California employment in the industries affected by the proposed amendments was about 4,627 in 2006, or about 7 percent of national employment in the affected industries. This represents less than 1 percent of manufacturing employment in California. Also, as shown in Table VII-8, these employees generated about \$211,541 million in payroll, or about 6.3 percent of national payroll in the affected industries. This also accounts for less than 1 percent of the total California manufacturing payroll in 2006.

Table VII-8
California Employment and Payroll in Affected Industries

| NAICS | Number of Employees | | Payroll | |
|--------|---------------------|-------------------------------------|---------------------------------------|-------------------------------------|
| | California | California Share as Percent of U.S. | California (thousand dollars in 2006) | California Share as Percent of U.S. |
| 325612 | 1,159 | 6.5 | 49,738 | 5.7 |
| 325510 | 3,468 | 7.5 | 161,803 | 6.5 |
| Total | 4,627 | 7.2 | 211,541 | 6.3 |

Source: (U.S. Census, 2006)

5. Impacts on California Consumers

The potential impact of the proposed amendments on consumers depends upon the ability of affected businesses to pass on the cost increases to consumers. For the Double Phase Aerosol Air Freshener proposed VOC limit and proposed tier 1 VOC limit for Multi-purpose Solvent and Paint Thinner, competitive market forces may prevent businesses from passing their cost increases on to consumers. Thus, we do not expect a significant change in retail prices. However, for the proposed tier 2 VOC limit for Multi-purpose Solvent and Paint Thinner products, businesses will likely be unable to absorb their costs of doing business. They will likely pass their cost increases on to consumers.

Assuming the affected industry will pass on the entire compliance costs to consumers in terms of higher prices, we estimate the average price of a product (including typical retail mark-up) would not increase for Double Phase Aerosol Air Fresheners, and would increase by about \$0.75 per unit for Multi-purpose Solvents and Paint Thinners. For Double Phase Aerosol Air Fresheners, while the overall costs to comply with the proposed limit are significant, spreading costs over more than 50 million units, results in an overall negligible cost per product.

For Multi-purpose Solvent and Paint Thinner products, apportioning annual sales of the categories to the California population, we estimated that residents purchase less than one container of Multi-purpose Solvent and Paint Thinner per year. We also estimated in Section B of this chapter that the potential cost increase per unit from compliance with both limits would be about \$0.75. Thus, considering normal retail mark-up, the consumer's cost increase to purchase Multi-purpose Solvent and Paint Thinner would increase by about \$1.50 per gallon.

However, Multi-purpose Solvent and Paint Thinner products are more commonly purchased by contractors. If we apportion all sales of Multi-purpose Solvent and Paint Thinner to licensed contractors we estimate purchases of approximately five gallons per year. Considering normal retail mark-up, the cost increase to licensed contractors purchasing Multi-purpose Solvent and Paint Thinner products would be about \$8 per year.

The proposed amendments may also affect consumers adversely if they result in reduced performance attributes of the products. However, this scenario is unlikely to occur for the following reasons. First, for the proposed limits, there are already complying products with a market presence. Thus, the industry already has the technology to manufacture compliant products that satisfy consumers. Second, marketers are unlikely to introduce a product which does not meet their consumers' expectations. This is because such an introduction would be damaging not only to the product sale, but also to the sale of other products sold under the same brand name (impairing so-called "brand loyalty"). Finally, the Board has provided flexibility, under the existing consumer products program, to businesses whose situations warrant an extension to their compliance dates. For companies that can justify such variances, the

additional time may afford more opportunity to explore different formulation, cost-cutting, performance-enhancing, or other marketing strategies which can help make the transition to new complying products nearly transparent to consumers.

6. Potential Impacts to California State or Local Agencies

State agencies are required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

We have determined that the proposed limits will not create costs or savings, as defined in Government Code section 11346.5(a)(6), to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to Part 7 (commencing with section 17500), Division 4, title 2 of the Government Code, or other non-discretionary savings to local agencies.

E. OTHER POSSIBLE ECONOMIC IMPACTS OF REGULATORY CHANGES

In addition to the proposed VOC limits, there are other proposed amendments to the Consumer Products Regulation, some of which may have a potential economic impact on affected businesses. While we do not expect any significant economic impact from any of the proposals, it is possible that there could be some increased cost to business resulting from proposed changes.

The proposed amendments would require additional labeling for Multi-purpose Solvent and Paint Thinner products. Multi-purpose Solvent and Paint Thinner products would be required to include VOC content information on their labels, as well as a sticker or hanging tag if their product is considered "flammable" or "extremely flammable." It is likely there will be costs associated with this labeling requirement. We considered these costs in determining the total nonrecurring costs. The cost estimates for labeling are shown in Appendix E and range from about \$1,500 to \$7,000.

F. MITIGATION OF POTENTIAL IMPACTS THROUGH ADDITIONAL REGULATORY FLEXIBILITY

If adopted by the Board, the proposed limits will be incorporated in section 94509 of the Consumer Products Regulation (title 17, California Code of Regulations, sections 94507-94517). To complement the mandatory VOC limits, the existing consumer products program provides a very high degree of compliance flexibility, through two voluntary, market-based programs: the IPP and the ACP Regulation. These options could be evaluated to minimize cost impacts. The IPP (section 94511) allows qualified manufacturers to sell products that have VOC contents greater than the applicable VOC limit, provided they demonstrate that such products actually emit less VOCs than representative products that comply with the VOC limit. Using the

emissions averaging approach, the ACP is a voluntary regulation (title 17, CCR, sections 94540-94555) designed to allow multi-product VOC averaging as an alternative means of complying with the VOC limits.

Various manufacturers have formulated technologically-advanced IPP products that are more concentrated, higher in efficacy, or have some other chemical or physical properties that permit users to release less VOCs when using such products. To date, 14 manufacturers have submitted 26 original applications and obtained approval for 25 IPP applications involving 23 products. Based on their participation in the program, it is reasonable to conclude that manufacturers are using this program to provide consumers with products that meet their needs, while lowering costs, improving the "market value" of their products, or otherwise maintaining profit margins.

The potential benefits of emissions averaging or "bubbling" for consumer product manufacturers under the ACP regulation have been documented by ARB staff (ARB, 1994). In general, emissions averaging under approved ACPs allows manufacturers to choose the least cost or other advantageous reformulation options for its product lines. Rather than directly complying with each and every VOC limit, manufacturers can choose to "over-comply" with some reformulations in order to offset the "under-compliance" of other product lines. The ACP regulation requires the net resulting emissions from products under such averaging plans to be no greater than the level which would have resulted had all the products under the ACP bubble directly complied with the applicable limits. In short, the same emission reductions are achieved while providing a high degree of formulation and marketing flexibility to manufacturers. To date, five manufacturers have implemented approved ACP averaging programs, reducing VOC emissions by about 8.2 million pounds more than would have occurred under the mandatory VOC limits. We expect that such emissions averaging will also benefit manufacturers subject to the proposed limits.

Overall, most affected businesses will benefit from the IPP and the ACP Regulation. Both programs are completely voluntary and impose no additional costs to businesses to meet the requirements other than testing and reporting requirements. Manufacturers who take advantage of these market-based programs presumably do so because it costs less than direct compliance with the limits or it provides some other market benefits.

According to previous analyses, the potential cost differential which might result from competition under the ACP between small and large firms would not necessarily cause extreme hardship on small firms. However, inclusion of products subject to the proposed limits in an ACP may affect the level of competition between companies, which could lead to the elimination of some marginal producers for those products. Such competition may also have minor impacts on California employment and payroll. However, the impact is expected to be positive in the long term. Any potential impacts on the ability of California businesses to compete with businesses in other states are also expected to be minimal.

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VIII. ENVIRONMENTAL IMPACTS

In this rulemaking, ARB staff is proposing amendments to the Consumer Products Regulation that are designed to reduce volatile organic compound (VOC) emissions. We have evaluated the environmental impacts of the proposed amendments on atmospheric processes and other media. Overall, we found that the proposed amendments would have beneficial effects by reducing emissions that contribute to the formation of ground-level ozone. Because the pathways for reformulation to comply with the proposed amendments vary, and are only predicted, there may be some, but not significant, potential adverse impacts that could occur as a result of adoption of this proposal. Several potential adverse impacts are identified and discussed in this chapter along with measures to mitigate the potential for adverse impacts to occur.

We conducted a qualitative health risk assessment that concludes that because VOCs are ozone precursors, public health is further protected by reducing VOC emissions. The actual reduction of health risks that would result from reducing VOC emissions, if the staff's proposal were to be adopted, is not quantified in this report. However, it has been estimated that each year about 630 fewer people would die prematurely from exposure to ozone if California was to attain the State ambient air quality standard for ozone (Ostro *et al.*, 2006). About 90 percent of California residents live in areas where ozone levels exceed State and federal air quality standards. Therefore, reducing VOC emissions from these consumer product categories, because of their role as ozone precursors, will result in incremental improvement of the public's health – whether it is in terms of fewer incidences of asthma or hospitalizations, improvement in lung function, or fewer premature deaths.

Our analysis of the reasonably foreseeable environmental impacts of the methods of compliance is presented in subsections C through H below. Regarding reasonably foreseeable mitigation measures, the California Environmental Quality Act (CEQA) requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis. In addition, Senate Bill 97 (SB 97) requires the impact on greenhouse gas (GHG) emissions to be analyzed as part of the analysis under CEQA.

We have evaluated how the proposed amendments would impact ground-level ozone concentrations; particulate matter (particularly secondary organic aerosols); climate change; stratospheric ozone depletion; solid waste disposal; water quality; energy use; public safety; agricultural resources; and air toxic emission exposure.

We also reviewed the South Coast Air Quality Management District's (SCAQMD) Final Environmental Assessment for Rule 1143 – Consumer Paint Thinners and Multi-purpose Solvents, and used the report as part of our evaluation of the impacts of the proposed amendments for Multi-purpose Solvent and Paint Thinner products (SCAQMD, 2009).

A. LEGAL REQUIREMENTS APPLICABLE TO THE ANALYSIS

CEQA and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Because ARB's program involving the adoption of regulations has been certified by the Secretary of Resources (see Public Resources Code section 21080.5), the CEQA environmental analysis requirements are allowed to be included in ARB's Initial Statement of Reasons instead of preparing an environmental impact report or negative declaration. In addition, ARB will respond in writing to all significant environmental points raised by the public during the public review period or at the Board hearing. These responses will be contained in the Final Statement of Reasons for the proposed amendments to the Consumer Products Regulation.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following: (1) an analysis of the reasonably foreseeable environmental impacts of the methods of compliance; (2) an analysis of reasonably foreseeable feasible mitigation measures; and, (3) an analysis of reasonably foreseeable alternative means of compliance with the regulation. For ease of the reader, the proposed amendments are summarized below.

B. SUMMARY OF PROPOSED AMENDMENTS

We are proposing to establish new or lower VOC limits for the categories of Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner. These limits would reduce VOC emissions by about 14.7 tons per day when fully effective and would partially fulfill the consumer products reduction commitment contained in the 2007 Strategy to meet the federal ozone standard. To further reduce the ozone formation potential of emissions from Multi-purpose Solvent and Paint Thinner products, the proposal limits the amount of aromatic VOC solvent to 1 percent by weight. The proposal would also exempt eight fluid ounce containers of Multi-purpose Solvent and Paint Thinner products from compliance with the VOC limits until December 31, 2013. Artists' solvents certified to meet ASTM International's D4236 standard, and that are packaged in containers equal to or less than 32 fluid ounces, would be excluded from compliance with the VOC limits.

Several other regulatory modifications are proposed and necessary to implement the new requirements. These other regulatory proposals include:

- Several new and modified definitions;
- Prohibitions on the use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products;
- Establishing a Global Warming Potential (GWP) limit for compounds used in Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products;
- Specific labeling requirements for Multi-purpose Solvent and Paint Thinner products;

- A special reporting requirement for Multi-purpose Solvent and Paint Thinner products; and
- Other clarifying language.

Amendments to ARB Method 310 are also proposed. The proposed changes are clarifications to analytical methods already being used and/or are needed to enhance the enforceability of lower VOC limits and the aromatic compound content limit.

C. SUMMARY OF IMPACTS ON ATMOSPHERIC PROCESSES

In this section, we evaluate the impacts of the proposed amendments on atmospheric processes. The evaluation includes our assessment as to whether the proposed amendments would have positive, negative, or no impacts on these atmospheric processes.

1. Impacts of Proposed Amendments on Ground-Level Ozone Concentrations

Enhanced ground-level ozone formation involves the interaction between VOCs and oxides of nitrogen (NOx) in the presence of sunlight. The rate of ozone generation is related closely to both the amount and reactivity of VOC emissions as well as the amount of NOx emissions available in the atmosphere (Seinfeld and Pandis, 1998). Ozone is a colorless gas and the chief component of urban smog. It is one of the State's more persistent air quality problems. Ninety-three percent of Californians, or 36 million people, live in areas designated as non-attainment for the federal 8-hour ozone standard. It has been well documented that ozone adversely affects respiratory function of humans and animals. Research has shown that, when inhaled, ozone can cause respiratory problems, aggravate asthma, impair the immune system, and cause increased risk of premature death.

Not only does ozone adversely affect human and animal health, but it also affects vegetation throughout most of California resulting in reduced yield and quality in agricultural crops, disfiguration or unsatisfactory growth in ornamental vegetation, and damage to native plants. More information on the impacts of exposure to ozone can be found in Chapter IV, Emissions.

a. Proposed VOC Standards

The proposed amendments would reduce VOC emissions by about 14.7 tons per day. Therefore, we expect an overall positive impact on the environment because VOCs are precursors to the formation of ground level ozone. Specific to consumer products, ARB committed to reducing consumer product VOC emissions statewide by 30 to 40 tons per day by 2014. The amendments approved at the June 26, 2008, hearing will provide about 4.5 tons per day toward meeting the commitment. Upon approval of this proposal, we will have achieved 19.2 tons per day reduction from consumer products toward the 30 to 40 commitment. In addition, staff is currently evaluating further

reductions from four cleaning products categories which we plan to take to the Board in 2010. We expect to achieve 5 to 10 tons per day reductions from the cleaning products categories. The categories proposed for regulation and the corresponding VOC emission reductions are shown in Table VIII-1.

Table VIII-1
Proposed VOC Limits, Emissions, and Reductions at Effective Date

| Product Category | Product Form | Proposed VOC Limit (percent by weight) | 2009 VOC Emissions* (tons per day) | Effective Date | Reductions Upon Effective Date (tons per day) |
|--|--------------------------|--|------------------------------------|----------------|---|
| Double Phase Aerosol Air Freshener | Aerosol | 20 | 10.2 | 12/31/2012 | 2.0 |
| Multi-purpose Solvent and Paint Thinner | Non-aerosol | tier 1: 30 | 12.5 ⁺ | 12/31/2010 | 8.4 ⁺ |
| | | tier 2: 3 | --- | 12/31/2013 | 3.9 ⁺ |
| Total Emissions 2009 | 22.6 tons per day | | | | |
| Total VOC Reductions by end of 2013 | 14.7 tons per day | | | | |

* Survey emissions adjusted for market coverage, grown to the 2009 calendar year, and rounded.

⁺ Does not include emissions or reductions in the South Coast Air Basin.

As indicated in Table VIII-1, we are proposing to reduce the VOC content of Double Phase Aerosol Air Freshener products to 20 percent by weight, effective December 31, 2012. The proposed limit would reduce VOC emissions by about two tons per day at the effective date.

We are also proposing two tiers of VOC limits for Multi-purpose Solvent and Paint Thinner products. As noted in the table above, emissions and emission reductions are adjusted to account for VOC reductions already claimed via implementation of SCAQMD's Rule 1143. Thus, the VOC limits and effective dates proposed by ARB staff in this rulemaking would only apply to products sold in areas of California outside the South Coast Air Basin.

Discussion Related to First Tier Standard for Multi-purpose Solvent and Paint Thinner:

As proposed, the first tier limit for Multi-purpose Solvent and Paint Thinner products would reduce VOC content to 30 percent by weight, effective December 31, 2010. The second tier limit would further reduce the VOC content of Multi-purpose Solvent and Paint Thinner products to 3 percent by weight, effective December 31, 2013. In combination, these limits would reduce the mass of VOC emissions by about 12.7 tons per day (note that reductions from the first tier limit are grown from the effective date to December 31, 2013). In developing the proposal for Multi-purpose Solvent and Paint Thinner products, we analyzed the tons of ozone that, potentially, would not be formed as a result of reducing VOC emissions by mass limitations. This analysis found that the

first tier limit would likely provide a large reduction in the amount of ground level ozone formed from emissions of Multi-purpose Solvent and Paint Thinner products.

However, the analysis also revealed that, depending on the reformulation option chosen, the expected ozone reduction benefit of the first tier limit could be eroded. Additionally, the analysis found, that reformulations to meet the second tier limit, could result in increasing the ozone forming potential of products, depending on the compliance path chosen. A further discussion of this analysis, and proposals to ensure that the maximum air quality benefit from the limits is achieved, follows. The data used in this analysis are apportioned to account for adoption of SCAQMD's Rule 1143. VOC emissions and sales data are from the 2008 Paint Thinner and Multi-purpose Solvent Survey Update (Survey Update). Reactivity data are derived by using the July 7, 2004, maximum incremental reactivity (MIR) values contained in title 17, California Code of Regulations, sections 94700-94701.

In 2009, sales of 15.5 tons per day of Multi-purpose Solvent and Paint Thinner products result in about 12.5 tons per day VOC emissions. Absent regulation, by 2013 sales and VOC emissions would grow to 16.4 and 13.1 tons per day, respectively. Examples of reported products include products named Paint Thinner; Lacquer Thinners; Mineral Spirits; Acetone; Denatured Alcohol; Methyl Ethyl Ketone (MEK); Xylene; Toluene; and Paint Clean-up or surface preparation products. Although the Multi-purpose Solvent and Paint Thinner categories are defined separately in the regulation, it was apparent in our evaluation of reported Survey Update products that these products are used interchangeably. Thus, to ensure that all reductions are achieved in the shortest timeframe, staff is proposing limits for both categories with the same effective dates. While we believe that Multi-purpose Solvent products could potentially comply with the second tier, 3 percent by weight VOC limit in a shorter timeframe, because of the interchangeability of these products, we expect most manufacturers would simply re-label their Multi-purpose Solvent products as "Paint Thinner," resulting in less reductions than anticipated. Harmonizing the effective dates maximizes the reductions achievable by 2010, using existing technologies. Providing until December 31, 2013, for implementation of the second tier, 3 percent by weight VOC limit, allows time for development of additional reformulation technologies.

In the combined category of Multi-purpose Solvent and Paint Thinner products, the VOC content ranges from 0-100 percent, with a sales-weighted average VOC content of 80 percent. Products reported as containing no VOCs are comprised of solvents that have been excluded from the definition of VOC due to their low propensity to react to form ozone, or are formulated with low vapor pressure (LVP) VOC solvents. The sales-weighted average reactivity of the VOCs in the reported products is about 1.9 grams of ozone per gram of VOC ($\text{g O}_3/\text{g VOC}$). This reactivity value means that, on average, each gram of VOC emitted from these products will react in the atmosphere to form almost two grams of ozone. Therefore, the VOC emissions are estimated to react to lead to formation of about 24 tons per day of ozone. When considering the reactivity of the product (rather than just the reactivity of the VOCs), the product-weighted maximum

incremental reactivity (PWMIR) is about 1.5 grams of ozone per gram of product ($\text{g O}_3/\text{g product}$). The reported PWMIRs range from $< 0.1 - 7.5 \text{ g O}_3/\text{g product}$.

As shown in Table VIII-1, once fully effective, the proposed VOC limits for Multi-purpose Solvent and Paint Thinner products would reduce VOC emissions by about 12.7 tons per day, with the most reductions, 8.4 tons per day, achieved by the first tier, 30 percent by weight limit. Notwithstanding the above, a number of factors, including ambient pollution levels and meteorology, would affect the actual ozone reduction that would be achieved. If we use the sales-weighted average reactivity of the VOCs ($1.9 \text{ g O}_3/\text{g VOC}$), we predict the 8.4 tons of VOC emission reductions from the first tier limit would reduce the formation of ozone by about 16 tons per day. However, the wide range of reported PWMIRs also indicates that reformulation options are available that would significantly erode—if not negate—the predicted benefit of reduced formation of ozone.

Therefore, we are proposing to limit the use of highly reactive VOC aromatic compounds (i.e., xylenes and toluene) to no more than 1 percent by weight in Multi-purpose Solvent and Paint Thinner products, effective December 31, 2010. This provision would not only ensure that the predicted reduction in ozone generation would be preserved, but would increase the ozone reduction benefits of the proposal. By way of example, in combination, the two tons per day reported emissions of xylenes and toluene (MIR values of 7.37 and $3.97 \text{ g O}_3/\text{g VOC}$, respectively) react leading to formation of over ten tons per day of ozone. Thus, about 16 percent of emissions represent about 43 percent of the ozone forming potential of the category. For this example, we assumed that as products reformulate, the species profile remains the same, but the relative amounts are reduced. In other words, the relative proportion of VOCs remains as they were reported in the Survey Update, but the mass of each VOC is reduced by 70 percent to meet the 30 percent by weight limit. Using this approach, we assume that the emissions of xylenes and toluene would be reduced to about 0.6 tons per day, with a resulting ozone forming potential of about three tons per day. If the 0.6 tons per day were to be replaced with an odorless mineral spirit product (MIR value = $0.91 \text{ g O}_3/\text{g VOC}$), the ozone forming potential would be reduced to about 0.5 tons per day, resulting in additional ozone reduction benefits.

The reader is reminded that the analysis only considered reported xylenes and toluene emissions. Other aromatic compounds are contained as fractions of various hydrocarbon solvents but are not speciated. Thus, the proposal would provide an additional air quality benefit than we are able to estimate because these aromatic constituents would be limited as well. The proposed limitation on the use of VOC aromatic compounds is unique to the State regulation, and is not required by SCAQMD Rule 1143. Therefore, this provision would apply statewide and result in an additional ozone reduction benefit in the SCAQMD.

In another scenario, if we further assume that the sales of Multi-purpose Solvent and Paint Thinner products remain about 16 tons of product per day and the PWMIR was about $0.35 \text{ g O}_3/\text{g product}$ (similar to a 30 percent by weight VOC hydrocarbon solvent

emulsion product), we would expect about 6 tons per day of ozone to be generated from complying 30 percent by weight products. If all products were to reformulate to a 30 percent xylenes product with a PWMIR of about 2.0 g O₃/g product, the predicted ozone formation would be about 32 tons per day, a difference of about 26 tons per day. Assuming a similar scenario based on toluene (PWMIR ~ 1.2), the reformulated products would result in ozone generation of about 19 tons per day, over three times more than the ozone generated from the lower reactive emulsion product.

These scenarios do overstate what would likely occur without the proposed limitation on aromatic content. However, we note that there are currently products in commerce with similar formulations to those described here. This analysis is also oversimplified because of a variety of factors including the products reported in the Survey Update; the distribution of emissions; meteorology; and ambient pollution concentrations that affect ozone generation; but serves as an example of why the provision to limit use of highly reactive VOC aromatics in reformulated products is appropriate. Together, these provisions would maximize the air quality benefit of the first tier limit, while preserving a variety of feasible reformulation pathways.

Discussion Related to Second Tier Standard for Multi-purpose Solvent and Paint Thinner:

The ozone reduction benefit from the proposed 30 percent by weight VOC and 1 percent by weight VOC aromatic content limits is clear. However, depending on reformulation options chosen to meet the proposed 3 percent by weight VOC limit, an increase in ozone generation could occur. Products formulated to meet the 3 percent by weight VOC limit, utilizing low reactive exempt VOC solvents could be more reactive than some products formulated at the 30 percent by weight VOC limit. This means potentially more ozone would be generated by the complying 3 percent by weight VOC products. Because we can only postulate the reformulations and reactivities of Multi-purpose Solvent and Paint Thinners products developed to comply with the 30 percent by weight limit, quantifying the potential ozone disbenefit from implementing the 3 percent by weight VOC limit is not possible. We can however, provide some examples of when ozone disbenefits would occur from reformulations.

Based on the Survey Update, the weighted reactivity of products complying with the 3 percent by weight limit ranges from 0–0.83 g O₃/g product. The sales-weighted average reactivity of a 0.38 g O₃/g product is very close to the reactivity of a purely acetone product (0.43 g O₃/g product). We compared the weighted reactivity to some products already in compliance, or near compliance, with the 30 percent by weight limit (products with PWMIR less than 0.83) and discovered that there are at least three technologies that, at a mass limit of 30 percent, would have PWMIRs below those of complying 3 percent by weight products. This demonstrates that reducing VOC content from 30 to 3 percent by weight may not always result in an air quality benefit.

Based on our understanding of the existing market for Multi-purpose Solvent and Paint Thinner products, including products recently introduced into the market, we believe the

most likely reformulation path to meet the 30 percent by weight limit would include hydrocarbon solvent emulsion products. In the case of the hydrocarbon solvent emulsion products, we estimate that these products' PWMIRs would be about 0.3-0.4 g O₃/g product, which is lower than some complying 3 percent by weight products. It is unlikely that products based on this emulsion technology could reformulate to meet a 3 percent by weight limit. Consequently, these products' sales would be replaced, most likely, by the VOC-exempt, but slightly higher reactive solvent, acetone. In this case, the 3 percent by weight limit would either provide no additional air quality improvement, or could result in a slight disbenefit.

However, if products reformulated to meet the 30 percent by weight limit by blending 30 percent MEK with 70 percent acetone, the weighted reactivity would be about 0.7 g O₃/g product. In this scenario, a further ozone benefit would be achieved by implementing the 3 percent by weight limit, if these products' sales were to be replaced with a purely acetone product.

We are also aware of low VOC/exempt solvent products under development. Examples of these include soy methyl ester-based products. While likely to comply with the proposed 3 percent by weight limit, the reactivity of these products is unknown at this time.

While the 3 percent by weight limit is technologically feasible, based on complying products already being sold, and the timeframe proposed for compliance, this analysis demonstrates that to fully assess the impact of the 3 percent by weight limit requires firm knowledge of pathways chosen to reformulate to meet the 30 percent by weight limit. Absent this information, we can only postulate that some reformulations will result in further air quality improvement, while others may not.

Additionally, the 3 percent by weight limit could lead to an increase in sales of extremely flammable products, such as acetone. This type of product named "Paint Thinner" is unlike what the household consumer may be used to. Without enough lead time for manufacturers, we are concerned that acetone products will be the most likely of a limited number of known pathways to compliance. To allow ample time for development of less flammable, potentially more beneficial in terms of ozone reduction, and/or less costly alternatives, we are proposing an effective date for the 3 percent by weight limit of December 31, 2013.

As just mentioned, to fully evaluate the air quality impact of implementing the 3 percent by weight limit, and flammability of likely reformulations, would require accurate data on products reformulated to comply with the proposed 30 percent by weight VOC limit and the 1 percent by weight VOC aromatic compound limit. Thus, in new subsection 94513(g), we are proposing that manufacturers submit to ARB data for reformulated products sold in calendar year 2011 by June 30, 2012. Data required include product formulation, sales, and VOC and reactivity content. Manufacturers must also provide written updates on the research and development efforts undertaken to achieve the 3 percent by weight VOC limit.

Based on data from the 2012 reporting requirement, we will reassess the feasibility of the proposed 3 percent by weight VOC limit to ensure that further air quality benefits will be achieved. Depending on the outcome of this review, we may modify the requirements for Multi-purpose Solvent and Paint Thinner products. This may include consideration of a reactivity-based strategy rather than requiring further reductions in the mass of VOCs.

b. Proposed New or Modified Definitions and Clarifying Language

We are proposing a new definition for "Artist's Solvent/Thinner," and proposing to exclude products meeting this definition from compliance with the VOC limits for Multi-purpose Solvent and Paint Thinner. This proposal would result in forgoing about an additional 200 pounds per day VOC reduction. We believe the provision is necessary, however, because Artist's Solvent/Thinner products are designed to be used with specialty artist's, solvent-borne paints and their formulations are required to be reviewed by a toxicologist to meet specific ASTM standards.

We expect no other impact on ground level ozone concentrations from the proposed new and modified definitions and clarifying language. These language modification proposals are necessary to clarify regulatory provisions, or implement the proposed VOC limits.

c. Proposed Toxics Prohibition

We are proposing a prohibition on the use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products. No products were reported that currently use these chlorinated Toxic Air Contaminants (TAC). Methylene chloride and perchloroethylene are exempt VOC solvents, while trichloroethylene is a VOC. Thus, the prohibition would remove potential exempt VOC reformulation options for Multi-purpose Solvent and Paint Thinner products. Without this proposed prohibition, there would be a potential that the proposed VOC limits could result in some additional, but small, reduction in the formation of ozone. This is because methylene chloride and perchloroethylene are both considerably less reactive than other exempt VOC solvents such as acetone. Formulating with trichloroethylene would not be likely because it is a VOC, and its use would be restricted by the proposed VOC limits. However, we believe that preventing exposure to these TAC solvents that are potential human carcinogens outweighs the small additional ozone benefit that would be achieved.

d. Proposed Global Warming Potential Limits

The proposed global warming potential (GWP) limit of 150 for compounds used in Double Phase Aerosol Air Freshener, Multi-purpose Solvent and Paint Thinner products is expected to have a negligible, if any, impact on ground level ozone concentrations.

As for Double Phase Aerosol Air Freshener products, no use of the exempt VOC propellants hydrofluorocarbon-152a (HFC-152a) and hydrofluorocarbon-134a (HFC-134a) were reported. However, use of these propellants is a potential reformulation option to meet the proposed 20 percent by weight VOC limit. The proposed GWP limit of 150 would allow use of HFC-152a, with a GWP of 140, but would preclude use of the propellant HFC-134a, which has a GWP of 1,300. The GWP values are 100 year values taken from the Second Assessment Report contained within the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2007). While the proposal allows use of HFC-152a, we do not expect it to be used extensively, if at all. In determining a feasible limit for Double Phase Aerosol Air Freshener products we considered the impacts of each potential VOC limit on climate change. To balance reductions in ground level ozone without increasing GHG emissions, we proposed a VOC limit that is feasible without use of these propellants. This balance means that we are potentially forgoing additional VOC reductions.

In the categories of Multi-purpose Solvent and Paint Thinner, no use of compounds with high GWPs was reported in the Survey Update. Therefore, we believe that chemical compounds that have a GWP greater than 150 are not critical to the formulation of Multi-purpose Solvent and Paint Thinner products. We would expect a negligible, if any, additional ozone reduction benefit if compounds with higher GWPs could be used. The main reformulation options such as use of water, odorless mineral spirits, and VOC exempt compounds, including acetone, reported in the Survey Update, have GWP values that are below 150 or are not listed by the Fourth Assessment Report of the IPCC (IPCC, 2007).

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or that are needed to enhance the enforceability of the lower VOC limits. These clarifications are expected to have no impact on ground level ozone concentrations.

2. Impacts of Proposed Amendments on Particulate Matter (Secondary Organic Aerosols)

Fine particulate matter (PM) is prevalent in the urban atmosphere (see, for example, Pandis *et al.*, 1992), and ambient PM, especially those with diameters less than two and a half micrometers ($PM_{2.5}$), is known to have negative impacts on human health (Schwartz *et al.*, 1996; Moolgavkar and Luebeck, 1996). Like ozone, PM can be formed via atmospheric oxidation of organic compounds (Finlayson-Pitts and Pitts, 2000). Significant advances have been made in the theoretical and the experimental studies of the formation of secondary organic aerosols (SOA) (Pankow, 1994a; Pankow, 1994b; Odum *et al.*, 1996; Seinfeld and Pandis, 1998; Hamer and Bidleman, 1998; Kleindienst, *et al.*, 1999; Yu *et al.*, 1999). In addition, modeling techniques to determine the amount of ozone as well as the amount of aerosol formed from a VOC have been established (Bowman *et al.*, 1994), and the concept similar to maximum incremental reactivity is

being applied to quantitatively assess the aerosol formation potential of a VOC (*i.e.* incremental aerosol reactivity) (Griffin *et al.*, 1999).

Based on the results of these studies, we now know that there is a mechanistic linkage between the ozone formation and SOA formation potentials of a VOC. Because of this relationship, the proposed amendments may also affect the SOA formation potential of the products proposed for regulation. The analysis of the impact on SOA formation resulting from implementing the proposed VOC limits and other amendments is detailed below.

Although most organic compounds contribute to ozone formation, SOA is usually formed from photooxidation of organic compounds with carbon numbers equal to six or more (Seinfeld and Pandis, 1998). It has also been shown that aromatic compounds are more likely to participate in the formation of SOA than are alkanes (Grosjean, 1992; Pandis *et al.*, 1992). In other words, only chemicals that react fast enough in the atmosphere will generate sufficient amounts of low volatility products for forming aerosols. In general terms, the potential to form SOA among commonly used classes of VOCs used in consumer products could be described by the following order, with the lower molecular weight alkanes and ketones being least likely:

| | |
|--------------|--|
| Least Likely | Lower molecular weight alkanes and ketones (6 carbons or less) |
| | Higher molecular weight alkanes |
| | Higher molecular weight aromatics (polysubstituted benzenes) |
| More Likely | Lower molecular weight aromatics (C6 - C8 compounds) |

a. Proposed VOC Standards

The analysis of the potential impact on PM formation from the proposed VOC limits assumes that to meet the proposed limits will require replacing 14.7 tons per day of VOCs with 14.7 tons per day of VOC exempt ingredients. To meet the proposed VOC limits, manufacturers generally have four reformulation options: use of exempt VOCs, such as acetone, para-chloro-benzotrifluoride (PCBTF), or methyl acetate; use of LVP-VOC solvents; use of water; or use of exempt VOC propellants. Substitution for VOCs with water, or VOC exempt propellants would likely result in a small reduction in SOA formation. Two of the more likely exempt VOC solvents to be used to comply, acetone, and methyl acetate, both having three carbon atoms, have little potential to contribute to SOA formation. Indeed, it has been predicted that there would be no SOA yield from acetone (Pandis *et al.*, 1992). Hence, use of these compounds could also result in a reduction in SOA. Use of PCBTF, although a heavy molecule that contains seven carbon atoms, is not likely a strong PM precursor due to its low reactivity. Therefore, use of PCBTF should not result in increasing the formation of SOA.

The proposal to limit the VOC aromatic compound content of Multi-purpose Solvent and Paint Thinner products to 1 percent by weight may provide a small reduction in SOA formation. This is because aromatic compounds, such as xylenes and toluene, are

known to have higher SOA potentials than other commonly used VOCs. However, substitution of LVP-VOC solvents for VOCs could result in a slight SOA increase (Chan *et al.*, 2009). Biogenic hydrocarbons, such as isoprene, emitted from vegetation are known to be an important source of SOA (Ng *et al.*, 2008). Based on this study, it is reasonable to assume that some use of some bio-based solvents useful in reformulations, such as soy methyl esters, may lead to increasing SOA formation.

Because we cannot predict how manufacturers will choose to reformulate, we cannot fully evaluate the potential for an impact on SOA formation. However, it is likely to be only a slight potential for increase, if any, due to the variety of reformulation options available. At any rate, it would not be a significant adverse impact. Additionally, any reformulations that result in increasing SOA would likely be offset by reformulations which have a lower propensity to form SOA. We will continue to monitor implementation of the regulation and reassess the impacts as more data become available.

b. Proposed New or Modified Definitions and Clarifying Language

We expect no impact on SOA formation from the proposed new and modified definitions and clarifying language. These language modification proposals are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

The proposal to prohibit use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products should have negligible or no impact on SOA formation. No products were reported in the Survey Update that use these chlorinated TAC solvents. Methylene chloride and perchloroethylene are exempt VOC solvents, while trichloroethylene is a VOC. These compounds are not expected to be potent participants in SOA formation because they are relatively small molecules. By precluding use of these solvents as a reformulation option, we would potentially forgo some additional small reduction in the production of SOA. For example, if these solvents, rather than LVP-VOC or bio-based solvents were to be used, the SOA formation potential of reformulated Multi-purpose Solvent and Paint Thinner products could be slightly lower. However, preventing the public's exposure to these TAC solvents that are potential human carcinogens outweighs, we believe, the uncertain small potential for a reduction in SOA.

d. Proposed Global Warming Potential Limits

The proposed GWP limit of 150 for compounds used in the reformulation of Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products is expected to have negligible or no impact on PM or SOA formation. We do not believe that compounds with GWP values above 150 could be substituted in such a way to significantly change the amount of SOA formed from these categories.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are needed to enhance the enforceability of the lower VOC limits. Such changes are not expected to have an impact on SOA formation.

3. **Impacts of Proposed Amendments on Climate Change**

Climate change, or global warming, is the process whereby emissions of anthropogenic pollutants, together with other naturally-occurring gases, absorb infrared radiation in the atmosphere, leading to increases in the overall average global temperature. While carbon dioxide (CO₂) is the largest contributor to radiative forcing leading to warming, methane, halocarbons, nitrous oxide (N₂O), and other species also contribute to climate change.

Gases in the atmosphere can contribute to the greenhouse effect both directly and indirectly. Direct effects occur when the gas itself is a GHG. While there is relative agreement on how to account for these direct effects of GHG emissions, accounting for indirect effects is more problematic. Indirect radiative forcing occurs when chemical transformations of the original gas produce other GHGs, when a gas influences the atmospheric lifetimes of methane, and/or when a gas affects atmospheric processes that alter the radiative balance of the earth (e.g., affect cloud formation).

As mentioned earlier, the GWP of a compound may reflect a direct effect as well as an indirect effect on global warming. The direct effect is the warming due to the absorption of radiation by molecules of the compound in question. Compounds with direct effects include VOCs, CO₂, HFCs, hydrofluoroethers (HFE), and hydrochlorofluorocarbons (HCFC). Even though VOCs have direct effects, they are considered GHGs primarily because of their role in creating ozone and in prolonging the life of methane in the atmosphere, although the effect varies depending on local air quality.

The indirect effect is warming due to the impact that the presence of the compound has on the concentration of other GHGs. For example, VOCs contribute indirectly to global warming, in-so-far as they react chemically in the atmosphere in ways that increase GHG concentrations, most notably, concentrations of ozone and methane. The indirect forcing effects of VOCs is, however, still poorly quantified and requires the use of global three-dimensional chemical transport models.

a. Proposed VOC Standards

As just described, VOCs are considered GHGs because of their role in the creation of ozone. However, because the VOC limits will reduce the total amount of VOCs, and thereby ground-level ozone concentrations, the proposed VOC limits should have a slightly beneficial impact on climate change.

For Double Phase Aerosol Air Freshener products, we are aware that use of the VOC exempt propellants, HFC-152a or HFC-134a, is a compliance option for these products. Because these propellants are viable reformulation pathways, a lower VOC limit could have been set to achieve a larger VOC reduction. However, HFC-152a and HFC-134a have GWPs of 140 and 1,300, respectively (IPCC, 2007). Therefore, to minimize climate change impacts, a VOC limit was proposed which we believe to be technologically feasible without the use of compounds with high GWPs, such as HFC-134a. By considering climate change impacts, we are forgoing some additional VOC reductions.

The proposed VOC limits for Multi-purpose Solvent and Paint Thinner products are achievable without use of compounds with high GWPs. We note that no products were reported to contain high GWP compounds in the Survey Update. Therefore, chemical compounds that have high GWPs are not critical to the formulation of Multi-purpose Solvent and Paint Thinner products. We are aware of several HFC and HCFC solvents, with relatively high GWP values, that may have limited use in Multi-purpose Solvent and Paint Thinner products. However, most of these solvents are considered VOCs in California, and/or are stratospheric ozone depleting compounds. Because of these designations, the use of these compounds with high GWP values is limited with the proposed VOC limits. Thus, they are not expected to be reformulation options. The ingredients used in predicted reformulation pathways have GWP values below 150 or have no GWP value listed in the Fourth Assessment Report of the IPCC (IPCC, 2007). Therefore, the implementation of the proposed VOC limits for Multi-purpose Solvent and Paint Thinner products is not expected to impact climate change emissions.

b. Proposed New or Modified Definitions and Clarifying Language

We expect no impact on climate change resulting from the proposed new and modified definitions and clarifying language. These language modification proposals are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

The proposal to prohibit the use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products should have no impact on climate change. No use of these compounds was reported in the Survey Update. However, the proposed prohibition would prevent some potential reformulation pathways, particularly the option to use methylene chloride and perchloroethylene, which are exempt VOCs. The GWP value for methylene chloride is low and no value for perchloroethylene is listed in the Fourth Assessment Report of the IPCC (IPCC, 2007), so no additional benefit to minimizing climate change impacts would be expected in the absence of this proposal. As stated above, the proposed prohibition is not expected to increase GHG emissions because the predicted reformulation pathways rely on use of compounds that are not significant contributors to global warming.

d. Proposed Global Warming Potential Limits

In accordance with Assembly Bill 32 (AB 32), the proposed GWP limit of 150 for compounds used in Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products is designed to minimize the climate change impacts of the emissions from products in these categories. Therefore, we expect the limit to have beneficial impacts on climate change by preventing additional GHG emissions.

For Double Phase Aerosol Air Freshener products, two exempt VOC propellants are reformulation options: HFC-152a and HFC-134a. HFC-152a and HFC-134a have GWPs of 140 and 1,300, respectively (IPCC, 2007). Therefore, the GWP limit of 150 would allow use of HFC-152a but not HFC-134a. While HFC-152a is a viable reformulation option, we do not believe it would be used for the following reasons. First, we believe the more likely path to comply with the proposed VOC limit is to make modifications or adjustments of the valve and spray nozzle to reduce the amount of propellant needed to expel the product. We are also aware of manufacturers with internal environmental policies that preclude the use of HFCs. The comparatively high cost of HFC-152a also makes its use a less desirable alternative. We also note that to minimize use of HFC-152a, the VOC limit is proposed at a level which we believe to be technologically feasible without the use of compounds with high GWPs. Nevertheless, the proposal would allow for use of the propellant HFC-152a. If manufacturers choose to use HFC-152a in their reformulated Double Phase Aerosol Air Freshener products, there is potential for very slight increases in GHG emissions.

As for Multi-purpose Solvent and Paint Thinner products, no products that contain compounds with high GWP values were reported in the Survey Update. Therefore, chemical compounds that have a GWP greater than 150 are not critical to the formulation of Multi-purpose Solvent and Paint Thinner products. We are aware of several HFC and HCFC solvents, with relatively high GWP values, that may have limited use in Multi-purpose Solvent and Paint Thinner products. Many of these solvents are considered VOCs in California, and/or are stratospheric ozone depleting compounds. Because of these designations, the use of these compounds with high GWPs is already limited by the proposed VOC limits or prohibitions already existing on use of stratospheric ozone depleting compounds in the Consumer Products Regulation, section 94509(e). The GWP limit of 150 should further ensure that global warming emissions from use of Multi-purpose Solvent and Paint Thinner products do not increase. We also note that the ingredients used in predicted reformulation pathways have GWP values below 150 or have no GWP value listed in the listed in the Fourth Assessment Report of the IPCC (IPCC, 2007).

Another aspect to consider with respect to the proposed GWP limit for Multi-purpose Solvent and Paint Thinner products, is flammability. Although unlikely, as mentioned above, several HFC and HCFC solvents with high GWP values could be blended into reformulated products. Some of these solvents are non-flammable, therefore, the proposed GWP limit would preclude an option to reduce flammability. However, as

stated above, the use of most of these compounds is already prohibited, or limited, because of their status as VOCs or stratospheric ozone depleting compounds.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are needed to enhance the enforceability of the lower VOC limits. Such changes are expected to have no impact on climate change.

4. **Impacts of Proposed Amendments on Stratospheric Ozone Depletion**

The stratospheric ozone layer shields the earth from harmful ultraviolet (UV) radiation. Depletion of the earth's ozone layer allows a higher penetration of UV radiation to the earth's surface. This increase in UV radiation penetration leads to a greater incidence of skin cancer, cataracts, and impaired immune systems. Reduced crop yields and diminished ocean productivity are also expected. Because the chemical reactions which form ground-level ozone are driven by UV radiation, it is conceivable that a reduction in stratospheric ozone may also result in an increase in the formation of photochemical smog because of the increased levels of UV radiation on the earth's surface (ARB, 2000b). The chemicals most implicated as causing stratospheric ozone depletion are chlorofluorocarbons (CFCs), HCFCs, and other halons (U.S. EPA, 2003). Specifically, the chlorine or bromine atoms released by photolysis of the compounds react in chain reactions leading to the catalytic destruction of ozone (Finlayson-Pitts and Pitts, 2000).

Solar irradiation in the stratosphere contains sufficient UV light to break down CFCs and HCFCs to yield chlorine atoms that convert ozone to molecular oxygen. However, this UV light is not strong enough to break down HFCs and HFEs to yield fluorine atoms. In addition, the molecular structure of HFCs and HFEs includes hydrogen atoms, which renders them susceptible to attack by hydroxyl radicals in the troposphere. Therefore, these chemicals have a relatively short atmospheric lifetime which does not allow any appreciable amounts to penetrate into the stratosphere (ARB, 2008b).

To address stratospheric ozone depletion, the Montreal protocol was enacted in 1989, to phase out a number of CFCs, HCFCs, and halons. As a signatory of this protocol, the United States, in the Federal Clean Air Act of 1990, established timetables for ceasing production (see Title 6, Clean Air Act, section 602). In general, the protocol establishes dates by which certain compounds can no longer be manufactured; however, existing stocks can continue to be used in some applications until exhausted.

a. Proposed VOC Standards

Reducing VOC emissions and reformulating products with HFCs with low GWP values will have negligible or no impact on stratospheric ozone depletion. As products reformulate to meet the proposed VOC limits, provisions in the Consumer Products Regulation (see section 94509(e)) already prohibit the use of various stratospheric

ozone depleting compounds. This provision ensures there will be no increased use of stratospheric ozone depleting compounds. We also note that predicted reformulation options such as LVP-VOCs and exempt VOCs, lack chlorine. Therefore, reformulating with these compounds is not expected to increase the rate of stratospheric ozone depletion. PCBTF, an exempt VOC that is a viable reformulation option, is a chlorinated compound. It is listed under the Significant New Alternatives Program (SNAP) as an alternative for ozone-depleting substances (U.S. EPA, 2008), therefore its ozone depleting potential is likely low.

b. Proposed New or Modified Definitions and Clarifying Language

We expect no impact on stratospheric ozone depletion as a result of the proposed new and modified definitions and clarifying language. These language modification proposals are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

The proposal to prohibit the use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products should have no impact on stratospheric ozone depletion. This is because predicted reformulation options rely on compounds that are not considered stratospheric ozone depleting compounds. We note that no products were reported that contained the above toxic compounds in the Survey Update. It should also be noted that use of stratospheric ozone depleting compounds is already restricted by section 94509(e).

d. Proposed Global Warming Potential Limits

The proposed GWP limit of 150 for compounds used in Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products could have a slight benefit of preventing an increase in stratospheric ozone depleting compounds. This is because some compounds with higher GWPs are also stratospheric ozone depleting compounds.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are needed to enhance the enforceability of the lower VOC limits. Such changes are expected to have no impact on stratospheric ozone depletion.

D. OTHER POTENTIAL ENVIRONMENTAL IMPACTS

1. Impacts of Proposed Amendments on Solid Waste Disposal

Consumer products contribute to the solid waste stream by the nature of their packaging, such as containers used to deliver the products. Therefore, we evaluated the potential impacts of the proposed amendments on solid waste disposal.

a. Proposed VOC Standards

In the case of Double Phase Aerosol Air Freshener products, we do not expect an adverse impact on solid waste disposal from the proposed amendments relating to VOC limits. This is because we do not anticipate any changes in packaging or disposal due to the amendments.

In the case of Multi-purpose Solvent and Paint Thinner products, reformulation options include increasing production of existing complying products, using water-based formulations, or replacing VOC solvents with VOC exempt ingredients. Other reformulation options that could be used by manufacturers include exploring emerging technologies such as soy-based products. None of these reformulation options are expected to alter the current methods of packaging or disposal.

We believe that one of the most likely reformulation pathways is replacing solvents used currently in Multi-purpose Solvent and Paint Thinner products with acetone. Some stakeholders have asserted that this will result in an increase in the amount of Multi-purpose Solvent and Paint Thinner products used because of the faster evaporation rate of acetone. Hence more packaging, due to increased product use for the same task, could occur. While acetone does evaporate faster than the solvents it is predicted to replace, an increase in product use would be likely only if the lid of the product container is removed, or the product is transferred to a container with a large surface area and is exposed to open air for significant periods of time. Therefore, the increase, if any, is expected to be relatively small. According to the Institute for Research and Technical Assistance (IRTA) report titled "Assessment, Development, and Demonstration of Low-VOC Cleaning Systems for SCAQMD Rule 1171," several facilities tested reported they used about ten percent more acetone than their current cleaning solvent (IRTA, 2003). We believe this small percentage increase in solvent use would not significantly increase sales such that there would be a significant increase in the generation of solid waste.

To further reduce the potential adverse impacts on solid waste disposal, we are proposing to temporarily allow small containers (eight fluid ounces or less) of Paint Thinner products to exceed the 30 percent by weight VOC limit until December 31, 2013. It was brought to our attention that consumers may have significant quantities of previously purchased solvent-borne paint, that is either in quart containers that are not subject to low VOC limits, or are larger sizes that were manufactured prior to the effective date of lower VOC limits. If consumers are unable to

thin these products, and they do not perform as expected, the products may be discarded. Consequently, the temporary small size exemption for Paint Thinner is intended to mitigate a possible increase of solid waste disposal that could also affect water quality in the instance where discarded solvents, from solvent-borne paint, leach into ground water.

We also note that most air district architectural coatings rules continue to include an exemption from compliance with VOC limits for one liter (1.057 quart) or less containers of solvent-borne coatings. There are also a number of paint categories in air district rules that have high enough VOC limits that allow for solvent-borne coatings. Exempting small sizes of Paint Thinner from the 30 percent by weight limit allows these paints to continue to be used. In addition, the proposed small container exemption allows manufacturers time to develop low VOC products that are compatible with solvent-borne coatings.

b. Proposed New or Modified Definitions and Clarifying Language

We expect a negligible increase in waste disposal from the proposed special reporting and labeling requirements for Multi-purpose Solvent and Paint Thinner products. Depending upon how manufacturers choose to name their flammable products, additional paper waste could be generated. However, the improvement in public safety that would result from the labeling outweighs this negligible increase in waste generation.

In the case of the proposed modifications related to Automotive Windshield Washer Fluid products, we expect a benefit to waste disposal as the proposed amendment would allow additional smaller sizes of dilutable products to be manufactured and sold which should result in reduced product weights.

Other proposed new and modified definitions and clarifying language should have no impact on solid waste. These language modification proposals are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

The proposal to prohibit the use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products should have no impact on solid waste disposal. This is because the amount of packaging waste to be disposed of would not change with or without this proposal. This proposed prohibition on use of the chlorinated TAC solvents should ensure that there is no increased hazardous waste disposal.

d. Proposed Global Warming Potential Limits

The proposed GWP limit of 150 for compounds used in reformulated Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products is expected to

have no impact on waste disposal. Implementing this proposal does not cause a change in the manner in which products are to be disposed.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are needed to enhance the enforceability of the lower VOC limits. Such changes are not expected to have any impact on waste disposal.

2. **Impacts of Proposed Amendments on Water Quality**

Because of how consumer products are used and disposed of, there are potential water quality impacts. Therefore, we evaluated the impacts of the proposed amendments on water quality.

a. Proposed VOC Standards

Reducing VOCs should have no impact on water quality and could ultimately result in a positive impact if more water-based products are used. As products are reformulated to meet the proposed VOC limits, to a limited extent, water may replace VOCs in some products. This would have a positive impact on water quality by reducing the quantity of VOCs that might be introduced to the water supply.

In the case of Double Phase Aerosol Air Freshener products, we do not expect an adverse impact on water quality. Because these products are designed to be sprayed in indoor air environments, the emissions of these products after reformulation would continue to have an air fate and would be unlikely to enter the water system. It is possible that some reformulations could result in slightly increasing the use of water.

In the case of Multi-purpose Solvent and Paint Thinner products, reformulation options include increasing production of existing complying products, using water-based formulations, or replacing VOC solvents with VOC exempt ingredients. While we expect no impact on water quality from implementing the first tier and second tier limits of this proposal, it is possible that more water will be used to meet the limits. We are not proposing to mitigate the potential increased use of water because the amount of increase is uncertain given the variety of reformulation options. We also believe the air quality benefits of the proposal outweigh this potential impact. We will continue to monitor implementation of the regulation and the potential impacts on water quality.

b. Proposed New or Modified Definitions and Clarifying Language

We expect no impact on water quality resulting from the proposed new and modified definitions and clarifying language. These language modification proposals are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

The proposal to prohibit in the use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products should have a positive impact on water quality by ensuring that these TACs will not enter the water system and subsequently effect influent and effluent at publicly owned treatment works (POTW).

d. Proposed Global Warming Potential Limits

The proposed GWP limit of 150 for compounds used in Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products is expected to have no impact on water quality. We are not aware of compounds with GWP values greater than 150 that could lead to improving water quality if they were to be used in formulations. Therefore, we expect no significant adverse impacts from this proposed limit.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are needed to enhance the enforceability of the lower VOC limits. Such changes are expected to have no impact on water quality.

3. Impacts of Proposed Amendments on Energy

Use of energy to produce and sell various consumer products primarily comes from the manufacturing process and distribution of the products to the point of sale. Therefore, we considered whether the proposed amendments would impact energy use.

a. Proposed VOC Standards

Reformulation of products to meet the proposed VOC limits should have no impact on energy use because we do not expect the manufacturing processes or shipping practices to be changed. We also do not expect the manufacture of compounds used in reformulations to result in energy use above the current situation because the types of chemicals predicted to be used are similar to those to be replaced.

b. Proposed New or Modified Definitions and Clarifying Language

Proposed modifications related to Automotive Windshield Washer Fluid products should result in reduced energy usage. The proposals would allow additional smaller sizes of dilutable products to be used, which, in turn, should result in reduced product weights. Thus, we would expect less energy costs related to transportation. We expect no impact on energy use resulting from the other proposed new and modified definitions, and clarifying language. These language modification proposals are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

The proposed prohibition on use of perchloroethylene, methylene chloride, and trichloroethylene in Multi-purpose Solvent and Paint Thinner products is expected to have negligible, or no impact on energy use. We are not aware of how these compounds could be used in Multi-purpose Solvent and Paint Thinner products such that there would be an appreciable change in energy use or savings. We also note that no use of these compounds was reported in the Survey Update.

d. Proposed Global Warming Potential Limits

The proposed GWP limit of 150 for compounds used in aerosol Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products is expected to have no impact on energy use. In the absence of this provision we are not aware of compounds that could be used in reformulations that would result in less energy consumption.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are needed to enhance the enforceability of the lower VOC limits. Such changes are expected to have no impact on energy consumption.

4. Impact on Public Safety

As Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products are reformulated to meet the proposed VOC limits, the ingredients used or proposed prohibition of certain compounds, could render the reformulated products more or less flammable than existing products.

Because we expect the proposals related to Double Phase Aerosol Air Freshener products to reduce the flammability of these products, the focus of this section will be on potential impacts from use of Multi-purpose Solvent and Paint Thinner products.

a. Proposed VOC Standards

To meet the proposed VOC limits (especially the future effective 3 percent by weight VOC limit) for Multi-purpose Solvent and Paint Thinner products, increased use of acetone is a likely, cost-effective compliance path, because it is an exempt VOC compound. However, staff, as well as stakeholders, has expressed safety concerns related to increased use of acetone. The use of greater than 1 percent acetone in a product meets the federal definition of an "extremely flammable" product. "Extremely flammable" is defined as a substance with a flashpoint at or below 20 degrees Fahrenheit (°F). The flashpoint of acetone is -4 °F. This flashpoint means that at a temperature of -4 °F, vapors of acetone will ignite and quickly propagate. Thus,

incorrect handling of acetone can create a fire hazard. Appendix F contains information related to flammability and other characteristics of a variety of solvents that are currently used, or could be used in Multi-purpose Solvent and Paint Thinner products.

Pure acetone has been widely used as an ingredient in a variety of consumer products and is readily available for sale as a stand-alone solvent. However, acetone has not been widely used by consumers in containers labeled "Paint Thinner" or "Paint Clean-up." Currently available Paint Thinner products are generally formulated with hydrocarbon solvents such as mineral spirits and naphthas. Flash points for these products generally range from 80-120 °F. Products with flash points in this temperature range still present hazards if used incorrectly, however the risk of fire is not as great as acetone-containing products. Many Paint Thinner products in commerce meet the federal definition of a "combustible" product. "Combustible" is defined as a substance with a flashpoint at or above 100°F to an including 150°F.

When ARB began the public process of developing the VOC limits for Multi-purpose Solvent and Paint Thinner products, the SCAQMD concurrently proposed Rule 1143. This rule and ARB staff's proposal are similar, with respect to VOC limits, but differ in effective dates for the limits. As proposals were being developed, safety concerns were raised by the Office of the State Fire Marshal, local fire departments and industry stakeholders that very low VOC limits would necessitate increased use of acetone. This increased use of acetone could increase fire hazards. The concerns relate to the significant difference in the flash points between "typical" products labeled as "Paint Thinner," which are generally formulated with hydrocarbon solvents, and "reformulated" products labeled as "Paint Thinner," which may utilize acetone to meet the proposed VOC limits. Although the reformulated, acetone-containing products would be labeled as "extremely flammable," a typical consumer may not notice the designation, and may handle the reformulated product in the same manner as the former product. Thus, a potential increase in fire hazards could occur.

We agree that this is a potential safety issue. To address this issue, we worked with the stakeholders mentioned above on approaches to notify the household consumer, for a period of time adjacent to the effective dates of the proposed VOC limits, that they are purchasing a more flammable product with different use instructions. As a result, we are proposing additional requirements for certain Multi-purpose Solvent and Paint Thinner products, which are required under federal law, to be labeled "Flammable" or "Extremely Flammable."

In new subsection 94512(e), beginning December 31, 2010, until December 31, 2015, we are proposing to prohibit manufacturers from placing general product names on the principle display panel of "Flammable," or "Extremely Flammable" Multi-purpose Solvent and Paint Thinner products. The general product names used on products currently in commerce include, "Paint Thinner," "Multi-purpose Solvent," "Clean-up Solvent," "Paint Clean-up."

The proposed prohibition includes two alternatives that manufacturers may choose from to continue selling generally named "Flammable," or "Extremely Flammable" Multi-purpose Solvents and Paint Thinners. The first alternative includes providing a "hang tag" or "sticker" affixed to the product that includes the statement "Formulated to meet California VOC limits, see warnings on label." Manufacturers may also choose to display the common name of the chemical that results in the product meeting the criteria for "Flammable" or "Extremely Flammable," in a font as large as or larger, than any of the words on the principle display panel.

The proposed prohibition does not apply to products named "Lacquer Thinner." Many currently available Lacquer Thinners are "Extremely Flammable" because they contain greater than 1 percent acetone. We, and the interested stakeholders, believe consumers are already aware of the hazards associated with these products and it is not necessary to extend the proposed labeling requirement to these products.

Additionally, to potentially reduce the increased fire hazard from reliance on highly flammable Multi-purpose Solvent and Paint Thinner products, we have proposed an effective date for the 3 percent by weight limit of December 31, 2013. This additional compliance time should allow for development of additional, less flammable products.

Also, to assess progress on products being developed to comply with the proposed 3 percent by weight VOC limit, as proposed in new subsection 94513(g), manufacturers must submit data for reformulated products sold in calendar year 2011 by June 30, 2012. Data required includes product formulation, sales, flammability, and VOC and reactivity content. Based on data received from the 2012 reporting requirement, we will reassess the feasibility of the proposed 3 percent by weight VOC limit. Depending upon the outcome of this review, we may modify the requirements for Multi-purpose Solvent and Paint Thinner products.

b. Proposed New or Modified Definitions and Clarifying Language

We expect a net benefit on safety resulting from the labeling proposal for "Flammable," or "Extremely Flammable" Multi-purpose Solvent and Paint Thinner products. Other proposals are language modifications and are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

We are proposing a prohibition on the use of perchloroethylene, trichloroethylene, and methylene chloride in Multi-purpose Solvent and Paint Thinner products. Use of perchloroethylene and methylene chloride could reduce product flammability. However, because these are TACs designated as potential human carcinogens, we believe preventing the public's exposure to these compounds outweighs the potential reduction in flammability.

d. Proposed Global Warming Potential Limits

The proposed GWP limit of 150 for compounds used in the reformulation of Multi-purpose Solvent and Paint Thinner products is expected to have no impact on safety. In the absence of this limit there is a remote potential that some solvents with higher GWP values could be used in product reformulations, and potentially lower the flammability of products. This will be further evaluated as part of the technical assessment in 2012.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are clarifications needed to enhance the enforceability of the lower VOC limits. The changes themselves are expected to have no impact on safety.

5. Impact on Agricultural Resources

As discussed in Chapter VI, one of the reformulation options manufacturers may choose to comply with the proposed limits for Multi-purpose Solvents and Paint Thinners is the use of soy methyl esters.

a. Proposed VOC Standards

Soy methyl esters are LVP-VOC solvents that have been shown to be useful as ingredients in Multi-purpose Solvent and Paint Thinner products. However, we believe that not all manufacturers will choose this option, because of the relatively high cost of soy methyl esters. For those manufacturers that do choose to formulate with soy methyl esters, we believe most will formulate with mixtures of soy and other compounds because mixtures containing less than 5 percent soy by weight, have been shown to function as Multi-purpose Solvents and Paint Thinners for some applications (IRTA, 2007). Because soy methyl esters are a possible reformulation, below, we provide our analysis on the potential impact our proposal could have on worldwide soy production.

It is estimated that about 230 million acres worldwide are dedicated to soybean production, and each acre of soy beans is estimated to yield approximately 460 pounds of soy oil (USDA, 2009; Maier *et al.*, 1998). If we assume that as a worst case scenario, the entire 15.5 tons per day of Multi-purpose Solvent and Paint Thinner products sold were reformulated with 100 percent of soy methyl esters, we predict an increase demand of soy oil of about 11.4 million pounds per year. Using the above soy oil per acre data, it would take approximately 24,600 acres to produce the soy oil needed for Multi-purpose Solvent and Paint Thinner products in California. This represents an increased demand of about 0.01 percent of worldwide soybean production. We, therefore, believe that the impacts on soy production and any environmental impacts associated with it are negligible.

b. Proposed New or Modified Definitions and Clarifying Language

We expect no impact on agricultural resources from the proposed new and modified definitions and clarifying language. These language modifications are necessary to clarify regulatory provisions, or implement the new VOC limits.

c. Proposed Toxics Prohibition

The proposed prohibition on use of perchloroethylene, methylene chloride, and trichloroethylene in Multi-purpose Solvent and Paint Thinner products is expected to have negligible, or no impact on agricultural resources. We note that no use of these compounds was reported in the Survey Update.

d. Proposed Global Warming Potential Limits

The proposed GWP limit of 150 for compounds used in the reformulation of Multi-purpose Solvent and Paint Thinner products is expected to have no impact on agricultural resources. This is because compounds with GWPs greater than 150 are not likely reformulation options. Therefore, impacts on agricultural resources are unchanged by this proposal.

e. Proposed Changes to Method 310

The proposed changes to Method 310 are clarifications to analytical methods already being used and/or are clarifications needed to enhance the enforceability of the lower VOC limits. The changes themselves are expected to have no impact on agricultural resources.

E. ANALYSIS OF NEED FOR REASONABLY FORESEEABLE MITIGATION MEASURES

As part of our obligations under CEQA and AB 32, ARB staff is required to evaluate and mitigate potential adverse environmental impacts resulting from regulatory proposals. Also, pursuant to Health and Safety Code section 39650 *et seq.*, the ARB is required to identify and control TACs. The Health and Safety Code defines a TAC as "...an air pollutant which may cause or contribute to an increase in mortality or serious illness, or which may pose a hazard to human health." Moreover, in accordance with section 39666 of the Health and Safety Code, for TACs for which no safe exposure threshold has been established, the ARB is required to ".... reduce emissions to the lowest level achievable through application of best available control technology or a more effective control method...."

1. Proposed Mitigation Measure Related to Use of Flammable and Extremely Flammable Multi-purpose Solvent and Paint Thinner Products

In the categories of Multi-purpose Solvent and Paint Thinner, a likely reformulation pathway would be to replace VOC solvent with acetone, an exempt VOC solvent. Because acetone is an extremely flammable solvent, due to its low flashpoint, we have evaluated the need for mitigation measures related to its use.

As discussed at length previously, see Section D, number 4 of this chapter, and in accordance with CEQA, we are proposing additional labeling for Multi-purpose Solvent and Paint Thinner products that, in accordance with federal law, are labeled as "flammable" or "extremely flammable." This measure is designed to inform the public that they may be using a reformulated product and use instructions should be noted. This proposal is contained in new subsection 94512(e).

Further, we are proposing a small container (eight fluid ounces) exemption for Paint Thinner products, until December 31, 2013, to allow consumers to purchase small amounts of thinners to be used with previously purchased solvent-borne paints that may require thinning. This measure also could mitigate an increased fire hazard by allowing less flammable products to continue to be used for a short period of time.

2. Proposed Mitigation Measure Related to Greenhouse Gas Emissions

We are proposing new or lower VOC limits for Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products. To comply with these limits, some manufacturers could choose to replace all or a portion of their VOC hydrocarbon propellant in Double Phase Aerosol Air Freshener products with the exempt VOC propellants HFC-152a or HFC-134a. In addition, it is possible that manufacturers could use solvents with high GWP values in reformulated Multi-purpose Solvent and Paint Thinner products. Increased use, or new use of compounds with high GWP would have adverse impacts on climate change.

AB 32 requires GHG emissions to be reduced to 1990 levels by 2020, and also requires that increased use of these gases be minimized. Therefore, we are proposing a measure to minimize the use of GHGs in Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products. As proposed, and contained in subsection 94509(u), Double Phase Aerosol Air Freshener, Multi-purpose Solvent and Paint Thinner products could not contain compounds that have GWP values greater than 150. To determine the GWP of compounds, the Second Assessment Report 100 year values contained in the Fourth Assessment Report of the IPCC are to be used (IPPC, 2007).

Reformulation options for aerosol Double Phase Aerosol Air Freshener products include the use of the exempt VOC propellants HFC-152a and HFC-134a to meet the proposed

20 percent by weight VOC limit. The proposed GWP limit of 150 would allow use of HFC-152a, with a GWP of 140, but would preclude use of the propellant HFC-134a, which has a GWP of 1,300. While the proposal allows use of HFC-152a, we do not expect it to be used extensively, if at all. In determining a feasible limit for Double Phase Aerosol Air Freshener products, staff considered the impacts of a VOC limit on climate change. To balance reductions in ground level ozone and increasing GHG emissions, we proposed a VOC limit that is feasible without use of these GHGs. This balance means that we are potentially forgoing additional VOC reductions.

We also note that in discussions with some major manufacturers of Double Phase Aerosol Air Freshener products, it was indicated that they intend to comply with the proposal without the use of HFCs. We are aware of manufacturers with internal environmental policies precluding the use of HFCs. Finally, HFC-152a is quite expensive relative to VOC hydrocarbon propellants currently in commerce. For all of these reasons we do not expect much, if any, HFC-152a to be used.

In the categories of Multi-purpose Solvent and Paint Thinner, no use of compounds with GWP values above 150 was reported in the Survey Update. Therefore, chemical compounds that have a GWP greater than 150 are not critical to the formulation of Multi-purpose Solvent and Paint Thinner products. We would expect a negligible, or no, additional ozone reduction benefit if compounds with higher GWPs could be used. The main reformulation options such as use of water, odorless mineral spirits, acetone, and other exempt VOC compounds reported in the Survey Update, have GWP values that are below 150, or are not listed by the Fourth Assessment Report of the IPCC (IPCC, 2007).

Although we do not expect increased use of GHGs with high GWP values to be used in these products, to prevent this possibility, in accordance with AB 32, we are proposing a prohibition on the use of any compound with a GWP value of 150 or greater in Double Phase Aerosol Air Freshener, Multi-purpose Solvent and Paint Thinner products as a mitigation measure.

F. RISK ASSESSMENT FOR REDUCED EXPOSURE TO OZONE AND TACS

The health risks associated with ozone exposure have been known for many years and are discussed in further in Chapter IV. Studies have shown that when inhaled, even at relatively low levels, ozone can impact lung tissue and lung function. The greatest risk is to those who are more active outdoors during smoggy periods, such as children, athletes, and outdoor workers. Exposure to levels of ozone above the current ambient air standard leads to lung inflammation and lung tissue damage, and a reduction in the amount of air inhaled into the lungs. Recent evidence has, for the first time, linked the onset of asthma to exposure to elevated ozone levels in exercising children (McConnell *et al.*, 2002).

The actual lowering of health risks from reducing VOC emissions, if the proposal is adopted, is not quantified in this report. However, it has been estimated that about

630 fewer people would die prematurely each year in California from exposure to ozone if the State were to attain the ozone standard (Ostro et al., 2006). In a 2008 report, "Estimating Mortality Risk Reduction and Economic Benefits from Controlling Ozone Air Pollution," the National Research Council's (NRC), Committee on Estimating Mortality Risk Reduction Benefits from Decreasing Tropospheric Ozone Exposure, of the Board on Environmental Studies and Toxicology in the Division on Earth and Life Studies, concluded that it is appropriate for regulatory agencies to use mortality risk to analyze cost and benefits in setting ozone standards (NRC, 2008).

About 93 percent of California residents live in areas where ozone levels exceed State and federal ambient air quality standards. Qualitatively, we conclude that reducing VOC emissions, because of their role as ozone precursors, will result in incremental improvement of the public's health – whether it is in fewer incidences of asthma or hospitalizations, improvement in lung function, or fewer premature deaths.

The VOC reductions from the proposed amendments are designed as partial fulfillment of the State Strategy for California's 2007 State Implementation Plan. Thus, one can conclude that increments of progress towards attainment improve the public's health. As shown in Table VIII-1, the proposed amendments to the Regulation are designed to achieve the maximum feasible VOC emission reduction from the categories proposed for regulation at this time. When fully effective, adopting the amendments would result in a VOC emissions reduction of about 14.7 tons per day. The impacts of our proposal on SOA formation are not clear, although we do not expect a disbenefit.

The proposal for Multi-purpose Solvent and Paint Thinner products that would limit the amount of aromatic VOC hydrocarbon solvents to no more than 1 percent by weight is designed to reduce ground level ozone concentrations. However, as an ancillary benefit, this proposal will also reduce exposure to xylenes, ethyl benzene, and toluene. These compounds are identified TACs (OEHHA, 2000, 2005). Xylenes cause central nervous system effects in humans and irritation of the eyes, nose, and throat. Ethyl benzene is a development toxicant (OEHHA, 2005). Toluene is a reproductive toxicant (OEHHA, 2005).

In addition, the proposed prohibition on the use of methylene chloride, trichloroethylene, and perchloroethylene in Multi-purpose Solvent and Paint Thinner products will prevent public exposure to these TACs (ARB, 1989b, 1990d and 1991b) resulting in public health protection.

In summary, our health risk analysis shows that the proposed amendments would reduce health risks posed by emissions of Double Phase Aerosol Air Freshener, Multi-purpose Solvent, and Paint Thinner products by lowering ground level ozone concentrations and by reducing or preventing exposure to TACs.

G. ALTERNATIVE MEANS OF COMPLIANCE

Two alternative means of compliance with the Consumer Products Regulation have been developed. A current compliance alternative for manufacturers of consumer products is the Alternative Control Plan (ACP). The ACP Regulation (see title 17, CCR, sections 94540-94555), is a voluntary emissions averaging program. Under the ACP, an overall limit on the VOC emissions from a group of products in the ACP is determined. To be approved, an ACP must demonstrate that the total VOC emissions within the ACP would not exceed the emissions that would have resulted had the products been formulated to meet the VOC limit established for each product category. In other words, some products in the ACP could exceed the established VOC limits in the Consumer Products Regulation as long as those increased emissions were offset by additional products that over-comply with the established VOC limits. The ACP provides manufacturers with flexibility, but preserves the overall environmental benefits of emission reductions.

Another compliance alternative that is available for manufacturers is the Innovative Products Provision (see title 17, CCR, section 94511). This provision allows a manufacturer to formulate products that exceed the mass-based VOC limit specified in the Consumer Products Regulation for a particular product category. The manufacturer must demonstrate that, through some characteristic of the higher VOC product, its use will result in less VOC emissions compared to a representative complying product. This alternative is also specifically designed to allow manufacturers flexibility, while preserving the emission benefits of the Consumer Products Regulation.

Absent use of either of these alternatives, staff is not aware of any additional compliance means, other than direct compliance with the proposed amendments.

H. ENVIRONMENTAL JUSTICE

State law defines 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. The ARB is committed to evaluating community impacts of proposed regulations, including environmental justice concerns.

Consumer products are considered area sources. This is because their use is fairly uniform across the State, tracking with housing units, and their emissions are spread over the course of a day, rather than concentrated at a particular time of day. For these reasons, we do not believe that people of any given race, culture, or income would be more impacted than any others would. All Californians should benefit equally from the reduction in VOC emissions from the consumer product categories proposed for regulation.

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IX. FUTURE AND ONGOING ACTIVITIES

In this chapter, we describe future and ongoing activities related to the consumer products program. These activities are directed at developing proposals to further reduce volatile organic compounds (VOC), air toxic, and greenhouse gas emissions from consumer products. As always, our rulemaking activities will be conducted using a transparent process, allowing for stakeholder input. Major activities are summarized below.

A. CONSUMER PRODUCT EMISSIONS REDUCTION COMMITMENTS IN THE STATE IMPLEMENTATION PLAN

As described in Chapter I, in the current SIP, the State Strategy for California's 2007 State Implementation Plan (Strategy), ARB committed to achieving a further 30 to 40 tons per day VOC emissions reduction from consumer products statewide by 2014. Initial measures were adopted in the 2007 to 2008 timeframe, with emission reductions achieved by 2010. Additional measures to achieve the overall reduction commitment are to be adopted between 2010 and 2012 with implementation within the 2012 to 2014 timeframe. The majority of the 5.8 tons per day of VOC reductions approved by the Board at its June 26, 2008, hearing constituted the first increment in meeting this commitment. About 1.3 tons per day of the 5.8 tons per day achieved will actually occur in 2015, and would be credited toward VOC reductions commitments in the post-2014 timeframe. The 14.7 tons per day VOC reduction that would occur from adoption of the amendments proposed in this rulemaking, mark further progress toward meeting the consumer products commitment in the Strategy. Table IX-1 shows our progress toward meeting the consumer products commitment in the Strategy.

**Table IX-1
Consumer Product VOC Reductions Accredited Toward SIP Commitment**

| Consumer Products Rulemaking | VOC Reductions (tons per day) |
|--|-------------------------------|
| June 2008 Amendments | 4.5 |
| September 2009 Amendments (this proposal) | 14.7 |
| 2010 Cleaning Products Amendments (under development) | 5 – 8 |
| Additional Reductions from 2006 Survey Product Categories | 5.8 – 12.8 |
| Totals Reductions by January 1, 2014 | 30 – 40 |

We are continuing the review of data from the 2006 Consumer and Commercial Products Survey as a further basis for identifying and evaluating additional categories for emission reduction opportunities. This survey was designed to collect 2006 calendar year product sales and formulation data for a variety of consumer products including aerosol coatings; personal care products; other cleaning products; lubricants; pesticides; and others. Some categories such as hobby, sporting, and party products

were specifically surveyed to evaluate the use of GHGs. If feasible, additional proposals would be brought for consideration before the Board in 2010.

ARB staff proposes to revise the Strategy as may be appropriate in a 2010 mid-course update: to reflect the emission benefits of newly adopted regulations; provide more detail on the State's intended actions to fulfill the commitment to achieve emission reductions in total by specific dates; update as necessary the emissions inventories for federal ozone and PM_{2.5} non-attainment areas; and revise as necessary other plan aspects, including motor vehicle emissions budgets. The 2010 mid-course review may show the need for additional emission reductions from consumer products.

On March 12, 2008, U.S. EPA reduced the eight-hour "primary" ozone standard to a level of 0.075 ppm. U.S. EPA also strengthened the secondary eight-hour ozone standard to the level of 0.075 ppm, making it identical to the revised primary standard. The final rule became effective on May 27, 2008. These changes will require that new State Implementation Plans (SIP) be drafted. A complete new state strategy will be developed for 2013. The 2013 SIP will likely require more VOC reductions from consumer products.

B. GREENHOUSE GAS REDUCTIONS FROM CONSUMER PRODUCTS

As described in Chapter I, the California Global Warming Solutions Act of 2006 (AB 32) specifies that Discrete Early Action Measures are to be adopted and implemented by 2010. Greenhouse gas (GHG) reductions from consumer products have been designated as a Discrete Early Action Measure. The overall estimate is that greenhouse gas emissions from consumer products could be reduced by 0.25 MMT CO₂e per year. The Pressurized Gas Duster proposal, approved by the Board on June 26, 2008, will achieve approximately 0.20 MMT CO₂e per year in 2010, and 0.23 MMT CO₂e per year by 2020. From information we have gathered from consumer product surveys, we are currently evaluating whether GHG emissions reductions from Tire Sealants and Inflators and Chewing Gum Removers is feasible. We also intend to continue to evaluate data collected on other categories to determine if GHG emission reductions are technologically feasible and cost-effective to implement.

C. 2006 CONSUMER AND COMMERCIAL PRODUCTS SURVEY DATA SUMMARIES

We are continuing the review of data from the 2006 Consumer and Commercial Products Survey. Over 500 surveys have been received. We expect to release non-confidential data summaries in the summer of 2009. These data summaries will serve as the basis for additional VOC and GHG emissions reduction proposals.

D. NAIL COATINGS EXPOSURE ASSESSMENT

Stakeholders have expressed concerns regarding the use of the toxic compounds xylenes; toluene; dibutyl phthalate; and formaldehyde in nail coating formulations. We are actively evaluating these concerns to determine if use of these compounds in nail coatings pose a health hazard in the outdoor ambient air around nail salons. We are modeling emissions of these toxic compounds from an individual business, as well as cumulative emissions from multiple facilities. The goal of these analyses is to assess the potential risk posed to people living in close proximity to these emission sources. Should an adverse health impact in the outdoor ambient air be identified, we would evaluate mitigation strategies under our authority to reduce Toxic Air Contaminants.

E. DRY CLEAN ONLY SPOT REMOVERS

Based on comments from stakeholders, we are currently evaluating spot remover formulas used in commercial dry cleaning facilities. A survey was sent out to dry cleaning chemical manufacturers on January 14, 2009, to gather sales and formulation data on Dry Clean Only Spot Removers. The data received from this survey are currently under review.

The Bay Area Air Quality Management District (BAAQMD) adopted amendments to District Regulation 11, Rule 16 and Regulation 8, Rule 17 which pertain to Dry Cleaning Operations. The BAAQMD rules prohibit the use of halogenated solvents, such as perchloroethylene and trichloroethylene in spotting solutions. We will evaluate the feasibility of regulating Dry Clean Only Spot Removers once the survey data are compiled.

F. PAINT REMOVERS/ STRIPPERS

The Paint Remover/Stripper category will also be evaluated for potential VOC and Toxic Air Contaminant reductions upon the completion of the 2006 Consumer and Commercial Products Survey Data Summaries.

G. CLEANING PRODUCTS

Non-aerosol General Purpose Cleaners, General Purpose Degreasers, Glass Cleaners, and aerosol Furniture Maintenance Products are under evaluation for further regulation. Part of this evaluation is to determine if potential adverse impacts would result from the use of predicted reformulations used to comply with proposed lower VOC limits. We are working with Office of Environmental Health Hazard Assessment staff who are developing health values for various low vapor pressure-VOC glycol ethers that could be used in reformulated products. In accordance with State law, any new health values will need to undergo scientific peer review. Concomitant with this work, exposure scenarios are being developed to simulate usage of cleaning products in household and institutional settings. Air concentrations resulting from modeling these scenarios will be

compared to health values to determine if adverse health impacts would result from use of potential reformulations.

We are also working with State Water Resources Control Board staff to evaluate water quality impacts from use of cleaning products. Of particular concern is a family of surfactants, the alkylphenol ethoxylates. Evidence indicates these surfactants are toxic to aquatic organisms, with the main concern being the estrogenic effects of their degradation products.

If these assessments indicate that there is a potential for adverse environmental impacts from the proposals to establish lower VOC limits for these categories, then mitigation measures will need to be evaluated. During this continued evaluation, stakeholders will be given the opportunity to comment and provide input on specific proposals. Upon completion of this evaluation, we intend to propose to the Board in 2010, new limits for these categories, which we expect to achieve 5 – 8 tons per day VOC reductions toward the consumer products commitment in the Strategy.

Appendix B

Proposed Amendments to the Regulation for Reducing Emissions from Consumer Products and Revisions to Test Method 310

[Note: Proposed amendments are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions.]

**Proposed Amendments to the
REGULATION FOR REDUCING EMISSIONS
FROM CONSUMER PRODUCTS**

SUBCHAPTER 8.5 CONSUMER PRODUCTS

Amend title 17, California Code of Regulation, sections 94508, 94509, 94510, 94512, 94513, and 94515 to read as follows:

Article 2. Consumer Products

94507. Applicability.

Except as provided in Sections 94509(i) and 94510, this article shall apply to any person who sells, supplies, offers for sale, or manufactures consumer products for use in the state of California.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

§ 94508. Definitions.

- (a) For the purpose of this article, the following definitions apply:
- (1) "Adhesive" means any product that is used to bond one surface to another by attachment. "Adhesive" does not include products used on humans and animals, adhesive tape, contact paper, wallpaper, shelf liners, or any other product with an adhesive incorporated onto or in an inert substrate. For "Contact Adhesive," "Construction, Panel, and Floor Covering Adhesive," and "General Purpose Adhesive" only, "adhesive" also does not include units of product, less packaging, which weigh more than one pound and consist of more than 16 fluid ounces. This limitation does not apply to aerosol adhesives.
- (2) "Adhesive Remover" means a product designed to remove adhesive from either a specific substrate or a variety of substrates. "Adhesive Remover" does not include products that remove adhesives intended for use on humans or animals.

For the purpose of this definition and "Adhesive Remover" subcategories (A-D), the term "adhesive" shall mean a substance used to bond one or more materials.

Adhesive includes, but is not limited to: caulks; sealants; glues; or similar substances used for the purpose of forming a bond.

- (A) "Floor or Wall Covering Adhesive Remover" means a product designed or labeled to remove floor or wall coverings and associated adhesive from the underlying substrate.
- (B) "Gasket or Thread Locking Adhesive Remover" means a product designed or labeled to remove gaskets or thread locking adhesives. Products labeled for dual use as a paint stripper and gasket remover and/or thread locking adhesive remover are considered "Gasket or Thread Locking Adhesive Remover."
- (C) "General Purpose Adhesive Remover" means a product designed or labeled to remove cyanoacrylate adhesives as well as non-reactive adhesives or residue from a variety of substrates. "General Purpose Adhesive Remover" includes, but is not limited to, products that remove thermoplastic adhesives; pressure sensitive adhesives; dextrine or starch-based adhesives; casein glues; rubber or latex-based adhesives; as well as products that remove stickers; decals; stencils; or similar materials. "General Purpose Adhesive Remover" does not include "Floor or Wall Covering Adhesive Remover."
- (D) "Specialty Adhesive Remover" means a product designed to remove reactive adhesives from a variety of substrates. Reactive adhesives include adhesives that require a hardener or catalyst in order for the bond to occur. Examples of reactive adhesives include, but are not limited to: epoxies; urethanes; silicones. "Specialty Adhesive Remover" does not include "Gasket or Thread Locking Adhesive Remover."
- (3) "Aerosol Adhesive" means any adhesive packaged as an aerosol product in which the spray mechanism is permanently housed in a nonrefillable can designed for hand-held application without the need for ancillary hoses or spray equipment. Aerosol adhesives include special purpose spray adhesives, mist spray adhesives, and web spray adhesives.
- (4) "Aerosol Cooking Spray" means any aerosol product designed either to reduce sticking on cooking and baking surfaces or to be applied on food, or both.
- (5) "Aerosol Product" means a pressurized spray system that dispenses product ingredients by means of a propellant contained in a product or a product's container, or by means of a mechanically induced force. "Aerosol Product" does not include "Pump Spray."

- (6) "Agricultural Use" means the use of any pesticide or method or device for the control of pests in connection with the commercial production, storage or processing of any animal or plant crop. "Agricultural Use" does not include the sale or use of pesticides in properly labeled packages or containers which are intended for: (A) Home use, (B) Use in structural pest control, or (C) Industrial or Institutional use. For the purposes of this definition only:

"Home use" means use in a household or its immediate environment.

"Structural pest control" means a use requiring a license under Chapter 14 (commencing with Section 8500), Division 3, of the Business and Professions Code.

"Industrial use" means use for or in a manufacturing, mining, or chemical process or use in the operation of factories, processing plants, and similar sites.

"Institutional use" means use within the confines of, or on property necessary for the operation of buildings such as hospitals, schools, libraries, auditoriums, and office complexes.

- (7) "Air Freshener" means any product including, but not limited to, sprays, wicks, wipes, diffusers, powders, and crystals, designed or labeled for the purpose of masking odors, or freshening, cleaning, scenting, or deodorizing the air. "Air Freshener" includes dual purpose air freshener/disinfectant products. "Air Freshener" does not include products that are used on the human body, products that function primarily as cleaning products as indicated on a product label, "Odor Remover/Eliminator," or "Toilet/Urinal Care Product."
- (8) "All Other Carbon-Containing Compounds" means all other compounds which contain at least one carbon atom and are not a "Table B" or a "LVP-VOC."
- (9) "All Other Forms" means all consumer product forms for which no form-specific VOC standard is specified. Unless specified otherwise by the applicable VOC standard, "all other forms" include, but are not limited to, solids, liquids (which includes the liquid containing or liquid impregnated portion of the cloth or paper wipes (towelettes), wicks, powders, and crystals.
- (10) "Antimicrobial Hand or Body Cleaner or Soap" means a cleaner or soap which is designed to reduce the level of microorganisms on the skin through germicidal activity, and is regulated as an over-the-counter drug by the U.S. Food and Drug Administration. "Antimicrobial Hand or Body Cleaner or Soap" includes, but is not limited to, (A) antimicrobial hand or body washes/cleaners, (B) foodhandler hand washes, (C) healthcare personnel hand washes, (D) pre-operative skin preparations and (E) surgical scrubs. "Antimicrobial Hand or Body Cleaner or Soap" does not include prescription drug products, antiperspirants,

"Astringent/Toner," deodorant, "Facial Cleaner or Soap," "General-use Hand or Body Cleaner or Soap," "Hand Dishwashing Detergent" (including antimicrobial), "Heavy-duty Hand Cleaner or Soap," "Medicated Astringent/Medicated Toner," and "Rubbing Alcohol."

- (11) "Anti-Static Product" means a product that is labeled to eliminate, prevent, or inhibit the accumulation of static electricity. "Anti-Static Product" does not include "Electronic Cleaner," "Floor Polish or Wax," "Floor Coating," and products that meet the definition of "Aerosol Coating Product" or "Architectural Coating."
- (12) "Architectural Coating" means a coating applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs.
- (13) "Aromatic Compound" means a VOC that contains one or more benzene or equivalent heterocyclic rings.
- (14) "Artist's Solvent/Thinner" means any liquid product, labeled to meet ASTM D4236 – 95 (March 1, 2005) Standard Practice for Labeling Art Materials for Chronic Health Hazards, which is incorporated by reference herein, and packaged in a container equal to or less than 32 fluid ounces, labeled to reduce the viscosity of, and or remove, art coating compositions or components.
- ~~(15)(13)~~ "ASTM" means the American Society for Testing and Materials ASTM International.
- ~~(16)(14)~~ "Astringent/Toner" means any product designed or labeled to be applied to the skin for the purpose of cleaning or tightening pores. This category also includes clarifiers and substrate-impregnated products. This category does not include any hand, face, or body cleaner or soap product, "Medicated Astringent/Medicated Toner," cold cream, lotion, antiperspirant, or any Astringent/Toner product regulated as a drug by the United States Food and Drug Administration (FDA).
- ~~(17)(15)~~ "Automotive Hard Paste Wax" means an automotive wax or polish which is: (A) designed to protect and improve the appearance of automotive paint surfaces; and (B) a solid at room temperature; and (C) contains 0% water by formulation.
- ~~(18)(16)~~ "Automotive Instant Detailer" means a product designed for use in a pump spray that is applied to the painted surface of automobiles and wiped off prior to the product being allowed to dry.
- ~~(19)(17)~~ "Automotive Rubbing or Polishing Compound" means a product designed primarily to remove oxidation, old paint, scratches or "swirl marks," and other defects from the painted surfaces of motor vehicles without leaving a protective barrier.

(20)(18) "Automotive Wax, Polish, Sealant or Glaze" means a product designed to seal out moisture, increase gloss, or otherwise enhance a motor vehicle's painted surfaces. "Automotive Wax, Polish, Sealant or Glaze" includes, but is not limited to, products designed for use in autobody repair shops and "drive-through" car washes, as well as products designed for the general public. "Automotive Wax, Polish, Sealant or Glaze" does not include "Automotive Rubbing or Polishing Compound," automotive wash and wax products, surfactant-containing car wash products, and products designed for use on unpainted surfaces such as bare metal, chrome, glass, or plastic.

(21)(19) "Automotive Windshield Washer Fluid (Dilutable)" means any liquid which meets the following criteria:

- (A) the product is sold either in a container with a capacity of ~~55~~ 10 gallons or more, or a container with a capacity of one quart or less; and
- (B) the product is designed or labeled for use in a motor vehicle windshield washer fluid system either as an anti-freeze or for the purpose of cleaning, washing, bug removal, or wetting the windshield(s).

"Automotive Windshield Washer Fluid (Dilutable)" does not include any fluid which is placed in a new motor vehicle at the time the vehicle is manufactured.

(22)(20) "Automotive Windshield Washer Fluid (Pre-Mixed)" means any liquid which meets the following criteria:

- (A) the product is sold in a container with a capacity that is greater than one quart, but less than ~~55~~ 10 gallons; and
- (B) the product is designed or labeled for use in a motor vehicle windshield washer fluid system as an anti-freeze or for the purpose of cleaning, washing, bug removal, or wetting the windshield(s).

"Automotive Windshield Washer Fluid (Pre-Mixed)" does not include any fluid which is placed in a new motor vehicle at the time the vehicle is manufactured.

(23)(24) "Bathroom and Tile Cleaner" means a product designed or labeled to clean tile or surfaces in bathrooms. "Bathroom and Tile Cleaner" does not include "Toilet/Urinal Care Product."

(24)(22) "Brake Cleaner" means a cleaning product designed or labeled to remove oil, grease, brake fluid, brake pad material or dirt from motor vehicle brake mechanisms.

~~(25)~~(23) "Bug and Tar Remover" means a product labeled to remove either or both of the following from painted motor vehicle surfaces without causing damage to the finish: (A) biological-type residues such as insect carcasses and tree sap and, (B) road grime, such as road tar, roadway paint markings, and asphalt.

~~(26)~~(24) "California Sales" means the sales (net pounds of product, less packaging and container, per year) in California for either the calendar year immediately prior to the year that the information required by the Executive Officer pursuant to section 94513 (required information) is due or, if that data is not available, any consecutive 12 month period commencing no earlier than 2 years prior to the due date of the required information. If direct sales data for California is not available, sales may be estimated by prorating national or regional sales data by population.

~~(27)~~(25) "Carburetor or Fuel-Injection Air Intake Cleaner" means a product designed or labeled to remove fuel deposits, dirt, or other contaminants from a carburetor, choke, throttle body of a fuel-injection system, or associated linkages. "Carburetor or Fuel-injection Air Intake Cleaner" does not include products designed or labeled exclusively to be introduced directly into the fuel lines or fuel storage tank prior to introduction into the carburetor or fuel injectors, or products designed or labeled exclusively to be introduced during engine operation directly into air intake vacuum lines by using a pressurized sprayer wand.

~~(28)~~(26) "Carpet/Upholstery Cleaner" means a cleaning product designed or labeled for the purpose of eliminating dirt or stains on rugs, carpeting, or objects upholstered or covered with fabrics such as wool, cotton, nylon or other synthetic fabrics. "Carpet/Upholstery Cleaner" includes, but is not limited to, products used on household furniture, the interior of motor vehicles, and products that make "Fabric Protectant" claims. "Carpet/Upholstery Cleaner" does not include "Spot Remover," vinyl or leather cleaners, "Dry Cleaning Fluids," or products designed exclusively for use at industrial facilities engaged in furniture or carpet manufacturing.

~~(29)~~(27) "Charcoal Lighter Material" means any combustible material designed to be applied on, incorporated in, added to, or used with charcoal to enhance ignition. "Charcoal Lighter Material" does not include any of the following: (A) electrical starters and probes, (B) metallic cylinders using paper tinder, (C) natural gas, (D) propane, and (E) fat wood.

~~(30)~~(28) "Colorant" means any pigment or coloring material used in a consumer product for an aesthetic effect, or to dramatize an ingredient.

~~(31)~~(29) "Construction, Panel, and Floor Covering Adhesive" means any non-aerosol, one-component adhesive that is designed or labeled for the installation, remodeling, maintenance, or repair of: (A) structural and building components that include, but are not limited to, beams, trusses, studs, paneling (drywall or drywall laminates, fiberglass reinforced plastic (FRP), plywood, particle board,

insulation board, pre-decorated hardboard or tileboard, etc.), ceiling and acoustical tile, molding, fixtures, countertops or countertop laminates, cove or wall bases, and flooring or subflooring; or (B) floor or wall coverings that include, but are not limited to, wood or simulated wood covering, carpet, carpet pad or cushion, vinyl-backed carpet, flexible flooring material, nonresilient flooring material, mirror tiles and other types of tiles, and artificial grass. "Construction, Panel, and Floor Covering Adhesive" does not include "Floor Seam Sealer."

~~(32)~~~~(30)~~ "Consumer" means any person who seeks, purchases, or acquires any consumer product for personal, family, household, or institutional use. Persons acquiring a consumer product for resale are not "consumers" for that product.

~~(33)~~~~(34)~~ "Consumer Product" means a chemically formulated product used by household and institutional consumers including, but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; aerosol paints; and automotive specialty products; but does not include other paint products, furniture coatings, or architectural coatings. As used in this article, the term "consumer product" shall also refer to aerosol adhesives, including aerosol adhesives used for consumer, industrial, and commercial uses.

~~(34)~~~~(32)~~ "Contact Adhesive" means a non-aerosol adhesive that: (A) is designed for application to both surfaces to be bonded together, and (B) is allowed to dry before the two surfaces are placed in contact with each other, and (C) forms an immediate bond that is impossible, or difficult, to reposition after both adhesive-coated surfaces are placed in contact with each other, and (D) does not need sustained pressure or clamping of surfaces after the adhesive-coated surfaces have been brought together using sufficient momentary pressure to establish full contact between both surfaces. "Contact Adhesive" does not include rubber cements that are primarily intended for use on paper substrates. "Contact Adhesive" also does not include vulcanizing fluids that are designed and labeled for tire repair only.

~~(35)~~~~(33)~~ "Contact Adhesive - General Purpose" means any contact adhesive that is not a "Contact Adhesive - Special Purpose."

~~(36)~~~~(34)~~ "Contact Adhesive - Special Purpose" means a contact adhesive that: (A) is used to bond melamine-covered board, unprimed metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber, high pressure laminate or wood veneer 1/16 inch or less in thickness to any porous or nonporous surface, and is sold in units of product, less packaging, that contain more than eight fluid ounces, or (B) is used in automotive applications that are (1.) automotive under-the-hood applications requiring heat, oil or gasoline resistance, or (2.) body-side molding, automotive weatherstrip or decorative trim.

~~(37)~~~~(35)~~ "Container/Packaging" means the part or parts of the consumer or institutional product which serve only to contain, enclose, incorporate, deliver, dispense, wrap or store the chemically formulated substance or mixture of substances which is solely responsible for accomplishing the purposes for which the product was designed or intended. "Container/Packaging" includes any article onto or into which the principal display panel and other accompanying literature or graphics are incorporated, etched, printed or attached.

~~(38)~~~~(36)~~ "Crawling Bug Insecticide" means any insecticide product that is designed for use against ants, cockroaches, or other household crawling arthropods, including, but not limited to, mites, silverfish or spiders. "Crawling Bug Insecticide" does not include products designed to be used exclusively on humans or animals, or any house dust mite product. For the purposes of this definition only:

"House dust mite product" means a product whose label, packaging, or accompanying literature states that the product is suitable for use against house dust mites, but does not indicate that the product is suitable for use against ants, cockroaches, or other household crawling arthropods.

"House dust mite" means mites which feed primarily on skin cells shed in the home by humans and pets and which belong to the phylum Arthropoda, the subphylum Chelicerata, the class Arachnida, the subclass Acari, the order Astigmata, and the family Pyroglyphidae.

~~(39)~~~~(37)~~ "Deodorant Body Spray" means:

(A) for products manufactured before January 1, 2006: a "Personal Fragrance Product" with 20 percent or less fragrance.

(B) for products manufactured on or after January 1, 2006: a "Personal Fragrance Product" with 20 percent or less fragrance, that is designed for application all over the human body to provide a scent. A "Deodorant Body Spray" product that indicates or depicts on the container or packaging, or on any sticker or label affixed thereto, that it can be used on or applied to the human axilla, is a "Deodorant" as defined in section 94501(d).

~~(40)~~~~(38)~~ "Device" means any instrument or contrivance (other than a firearm) which is designed for trapping, destroying, repelling, or mitigating any pest or any other form of plant or animal life (other than man and other than bacteria, virus, or other microorganism on or in living man or other living animals); but not including equipment used for the application of pesticides when sold separately therefrom.

~~(41)~~~~(39)~~ "Disinfectant" means a product that is labeled as a "disinfectant", or is labeled to destroy or irreversibly inactivate infectious or other undesirable bacteria, pathogenic fungi, or viruses on surfaces or inanimate objects and whose label is

registered as a "disinfectant" under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA, 7 U.S.C. 136, et seq.). Products that are labeled as both a "sanitizer" and a "disinfectant" are considered disinfectants. "Disinfectant" does not include any of the following: (A) products labeled solely for use on humans or animals, (B) products labeled solely for agricultural use, (C) products labeled solely for use in swimming pools, therapeutic tubs, or hot tubs, (D) products which are labeled to be used on heat sensitive critical or semi-critical medical devices or medical equipment surfaces, (E) products which are pre-moistened wipes or towelettes sold exclusively to medical, convalescent, or veterinary establishments, (F) products which are labeled to be applied to food-contact surfaces and are not required to be rinsed prior to contact with food, or (G) products which are labeled as "Bathroom and Tile Cleaners," "Glass Cleaners," "General Purpose Cleaners," "Toilet/Urinal Care Products," "Metal Polishers," "Carpet Cleaners," or "Fabric Refreshers" that may also make disinfecting or anti-microbial claims on the label.

~~(42)~~(40) "Distributor" means any person to whom a consumer product is sold or supplied for the purposes of resale or distribution in commerce, except that manufacturers, retailers, and consumers are not distributors.

~~(43)~~(41) "Double Phase Aerosol Air Freshener" means an aerosol air freshener with the liquid contents in two or more distinct phases that requires the product container be shaken before use to mix the phases, producing an emulsion.

~~(44)~~(42) "Dry Cleaning Fluid" means any non-aqueous liquid product designed and labeled exclusively for use on: (1) fabrics which are labeled "for dry clean only," such as clothing or drapery; or (2) "S-coded" fabrics. "Dry Cleaning Fluid" includes, but is not limited to, those products used by commercial dry cleaners and commercial businesses that clean fabrics such as draperies at the customer's residence or work place. "Dry Cleaning Fluid" does not include "Spot Remover" or "Carpet/Upholstery Cleaner." For the purposes of this definition, S-coded fabric means an upholstery fabric designed to be cleaned only with water-free spot cleaning products as specified by the Joint Industry Fabric Standards Committee."

~~(45)~~(43) "Dual Purpose Air Freshener/Disinfectant" means an aerosol product that is represented on the product container for use as both a disinfectant and an air freshener, or is so represented on any sticker, label, packaging, or literature attached to the product container.

~~(46)~~(44) "Dusting Aid" means a product designed or labeled to assist in removing dust and other soils from floors and other surfaces without leaving a wax or silicone based coating. "Dusting Aid" does not include "Pressurized Gas Duster."

~~(47)~~(45) "Electrical Cleaner" means a product labeled to remove heavy soils such as grease, grime, or oil from electrical equipment, including, but not limited

to, electric motors, armatures, relays, electric panels, or generators. Electrical Cleaner does not include "General Purpose Cleaner," "General Purpose Degreaser," "Dusting Aid," "Electronic Cleaner," "Energized Electrical Cleaner," "Pressurized Gas Duster," "Engine Degreaser," "Anti-Static Product," or products designed to clean the casings or housings of electrical equipment.

~~(48)~~(46) "Electronic Cleaner" means a product labeled for the removal of dirt, moisture, dust, flux, or oxides from the internal components of electronic or precision equipment such as circuit boards, and the internal components of electronic devices, including but not limited to, radios, compact disc (CD) players, digital video disc (DVD) players, and computers. "Electronic Cleaner" does not include "General Purpose Cleaner," "General Purpose Degreaser," "Dusting Aid," "Pressurized Gas Duster," "Engine Degreaser," "Electrical Cleaner," "Energized Electrical Cleaner," "Anti-Static Product," or products labeled to clean the casings or housings of electronic equipment. "Electronic Cleaner" does not include any product that meets both of the following criteria:

- 1) the product is labeled to clean and/or degrease electronic equipment, where cleaning and/or degreasing is accomplished when electrical current exists, or when there is a residual electrical potential from a component;
- 2) the product label clearly displays the statements: "Energized Electronic Equipment use only."

~~(49)~~(47) "Energized Electrical Cleaner" means a product that meets both of the following criteria:

- 1) the product is labeled to clean and/or degrease electrical equipment, where cleaning and/or degreasing is accomplished when electrical current exists, or when there is a residual electrical potential from a component such as a capacitor;
- 2) the product label clearly displays the statements: "Energized Equipment use only. Not to be used for motorized vehicle maintenance, or their parts."

"Energized Electrical Cleaner" does not include "Electronic Cleaner."

~~(50)~~(48) "Engine Degreaser" means a cleaning product designed or labeled to remove grease, grime, oil and other contaminants from the external surfaces of engines and other mechanical parts.

~~(51)~~(49) "Executive Officer" means the Executive Officer of the Air Resources Board, or his or her delegate.

~~(52)~~(50) "Existing Product" means any formulation of the same product category and form sold, supplied, manufactured, or offered for sale in California prior to the

following dates, or any subsequently introduced identical formulation:

- (A) October 21, 1991, for all products listed in section 94509(a) that have initial effective dates of January 1, 1993, or January 1, 1994;
- (B) January 6, 1993, for all products listed in section 94509(a) that have initial effective dates of January 1, 1995, or January 1, 1997, and charcoal lighter materials subject to section 94509(h);
- (C) August 16, 1998, for all products listed in section 94509(a) that have initial effective dates of January 1, 2001, January 1, 2002, January 1, 2003, or January 1, 2005;
- (D) November 19, 2000, for all products in the following product categories listed in section 94509(a): "Non-aerosol General Purpose Degreaser," "Sealant and Caulking Compound," and "Tire Sealant and Inflator."
- (E) July 20, 2005, for all products listed in section 94509(a) that have an effective date of December 31, 2006, December 31, 2008, or December 31, 2009; and
- (F) December 8, 2007, for all products listed in section 94509(a) that have an initial effective date of December 31, 2008, or December 31, 2010 for Brake Cleaner, Carburetor or Fuel-Injection Air Intake Cleaner, Aerosol Engine Degreaser, Resilient Flooring Material, Nonresilient Flooring Material, Aerosol General Purpose Degreaser, and Aerosol Temporary Hair Color.
- (G) July 18, 2009, for all products listed in section 94509(a) that have an initial effective date of December 31, 2010, or December 31, 2012, December 31, 2013, or December 31, 2014.

(53)(54)"Fabric Protectant" means:

- (A) for products manufactured before December 31, 2008: a product designed or labeled to be applied to fabric substrates to protect the surface from soiling from dirt and other impurities or to reduce absorption of liquid into the fabric's fibers. "Fabric Protectant" does not include "Waterproofers," products designed for use solely on leather, or products designed for use solely on fabrics which are labeled "for dry clean only" and sold in containers of 10 fluid ounces or less.
- (B) for products manufactured on or after December 31, 2008: a product designed or labeled to be applied to fabric substrates to protect the surface from soiling from dirt or other impurities or to reduce absorption of liquid into the fabric's fibers. "Fabric Protectant" does not include "Waterproofers," or products labeled for use solely on leather. "Fabric Protectant" does not

include pigmented products that are designed or labeled to be used primarily for coloring, products used for construction, reconstruction, modification, structural maintenance or repair of fabric substrates, or products that renew or restore fabric and qualifying as either "Clear Coating" or "Vinyl/Fabric/Leather/Polycarbonate Coating" under section 94521(a).

~~(54)~~(52) "Fabric Refresher" means a product labeled to neutralize or eliminate odors on non-laundered fabric including, but not limited to, soft household surfaces, rugs, carpeting, draperies, bedding, automotive interiors, footwear, athletic equipment, clothing and/or on household furniture or objects upholstered or covered with fabrics such as, but not limited to, wool, cotton, or nylon. "Fabric Refresher" does not include "Anti-static Product," "Carpet/Upholstery Cleaner," "Footwear or Leather Care Product," "Spot Remover," or "Disinfectant," or products labeled for application to both fabric and human skin.

~~(55)~~(53) "Fabric Softener-Single Use Dryer Product" means a laundry care product designed or labeled for single use in the clothes dryer to impart softness to, or control static cling of, a load of washable fabrics; and may impart a fragrance or scent. For the purpose of this definition only, "single use" means a product that is intended for one time use during a single drying cycle and is removed after completion of the drying cycle. A "load" is the amount of washable fabrics in a single drying cycle. "Fabric Softener-Single Use Dryer Product" includes treated nonwoven sheets which are typically packaged in boxes with a multiple number of sheets. "Fabric Softener-Single Use Dryer Product" does not include products applied to washable fabrics prior to placing the washable fabrics in the clothes dryer.

~~(56)~~(54) "Facial Cleaner or Soap" means a cleaner or soap designed primarily to clean the face. "Facial Cleaner or Soap" includes, but is not limited to, facial cleansing creams, semisolids, liquids, lotions, and substrate-impregnated forms. "Facial Cleaner or Soap" does not include prescription drug products, "Antimicrobial Hand or Body Cleaner or Soap," "Astringent/Toner," "General-use Hand or Body Cleaner or Soap," "Medicated Astringent/Medicated Toner," or "Rubbing Alcohol."

~~(57)~~(55) "Fat Wood" means pieces of wood kindling with high naturally-occurring levels of sap or resin which enhance ignition of the kindling. "Fat wood" does not include any kindling with substances added to enhance flammability, such as wax-covered or wax-impregnated wood-based products.

~~(58)~~(56) "Flea and Tick Insecticide" means any insecticide product that is designed for use against fleas, ticks, their larvae, or their eggs. "Flea and Tick Insecticide" does not include products that are designed to be used exclusively on humans or animals and their bedding.

~~(59)~~(57) "Floor Coating" means an opaque coating that is labeled and designed for application to flooring, including but not limited to, decks, porches, steps, and

other horizontal surfaces which may be subject to foot traffic.

(60)(58) "Floor Maintenance Product" means any product designed or labeled to restore, maintain, or enhance a previously applied floor finish. "Floor Maintenance Product" includes, but is not limited to, products that are labeled as Spray Buff products or Floor Maintainers or Restorers. "Floor Maintenance Product" does not include floor polish products, products designed solely for the purpose of cleaning, products designed or labeled exclusively for use on marble floors, or coatings subject to architectural coatings regulations.

(61)(59) "Floor Polish or Wax" means a product designed or labeled to polish, wax, condition, protect, temporarily seal, or otherwise enhance floor surfaces by leaving a protective finish that is designed or labeled to be periodically replenished. "Floor Polish or Wax" does not include "Floor Maintenance Products," "Floor Wax Stripper," or coatings subject to architectural coatings regulations.

"Floor Polish or Wax" is divided into three subcategories: products for resilient flooring materials, products for nonresilient flooring materials and wood floor wax. For the purposes of this article:

- (A) "Resilient Flooring Material" means flexible flooring material including but is not limited to, asphalt, cork, linoleum, no-wax, rubber, seamless vinyl, and vinyl composite flooring.
- (B) "Nonresilient Flooring Material" means flooring of a mineral content which is not flexible. "Nonresilient Flooring material" includes but is not limited to terrazzo, marble, slate, granite, brick, stone, ceramic tile, and concrete.
- (C) "Wood Floor Wax" means any wax-based products designed or labeled for use solely on wood floors. "Wood Floor Wax" does not include products that make the claim to "clean and wax" or "clean and polish."

(62)(60) "Floor Seam Sealer" means any product designed and labeled exclusively for bonding, fusing, or sealing (coating) seams between adjoining rolls of installed flexible sheet flooring.

(63)(64) "Floor Wax Stripper" means a product designed to remove natural or synthetic floor polishes or waxes through breakdown of the polish or wax polymers, or by dissolving or emulsifying the polish or wax. "Floor Wax Stripper" does not include aerosol floor wax strippers or products designed to remove floor wax solely through abrasion.

(64)(62) "Flying Bug Insecticide" means any insecticide product that is designed for use against flying insects or other flying arthropods, including but not limited to flies, mosquitoes, moths, or gnats. "Flying Bug Insecticide" does not include "wasp

and hornet insecticide," products that are designed to be used exclusively on humans or animals, or any moth-proofing product. For the purposes of this definition only, "moth-proofing product" means a product whose label, packaging, or accompanying literature indicates that the product is designed to protect fabrics from damage by moths, but does not indicate that the product is suitable for use against flying insects or other flying arthropods.

(65)(63) "Footwear or Leather Care Product" means any product designed or labeled to be applied to footwear or to other leather articles/components, to maintain, enhance, clean, protect, or modify the appearance, durability, fit, or flexibility of the footwear or leather article/component. Footwear includes both leather and non-leather foot apparel. "Footwear or Leather Care Product" does not include "Fabric Protectant," "General Purpose Adhesive," "Contact Adhesive," "Vinyl/Fabric/Leather/Polycarbonate Coating," as defined in section 94521(a), "Rubber/Vinyl Protectant," "Fabric Refresher," products solely for deodorizing, or sealant products with adhesive properties used to create external protective layers greater than 2 millimeters thick.

(66)(64) "Fragrance" means a substance or complex mixture of aroma chemicals, natural essential oils, and other functional components with a combined vapor pressure not in excess of 2 mm of Hg at 20°C, the sole purpose of which is to impart an odor or scent, or to counteract a malodor.

(67)(65) "Furniture Maintenance Product" means a wax, polish, conditioner, or any other product labeled for the purpose of polishing, protecting or enhancing finished wood surfaces other than floors, and other furniture surfaces including but not limited to acrylics, ceramic, plastics, stone surfaces, metal surfaces, and fiberglass. "Furniture Maintenance Product" does not include "Dusting Aids," "Wood Cleaners," and products designed solely for the purpose of cleaning, or products designed to leave a permanent finish such as stains, sanding sealers and lacquers.

(68)(66) "Furniture Coating" means any paint designed for application to room furnishings including, but not limited to, cabinets (kitchen, bath and vanity), tables, chairs, beds, and sofas.

(69)(67) "Gel" means a colloid in which the disperse phase has combined with the continuous phase to produce a semisolid material, such as jelly.

(70)(68) "General Purpose Adhesive" means any non-aerosol adhesive designed for use on a variety of substrates. "General Purpose Adhesive" does not include (A) contact adhesives, (B) construction, panel, and floor covering adhesives, (C) adhesives designed exclusively for application on one specific category of substrates (i.e., substrates that are composed of similar materials, such as different types of metals, paper products, ceramics, plastics, rubbers, or vinyls), or (D) adhesives designed exclusively for use on one specific category of articles

(i.e., articles that may be composed of different materials but perform a specific function, such as gaskets, automotive trim, weather-stripping, or carpets).

(71)(69) "General Purpose Cleaner" means a general purpose cleaning product labeled for use on a variety of hard surfaces, including small appliances. "General Purpose Cleaner" includes, but is not limited to, products designed or labeled for general floor cleaning, kitchen, countertop, or sink cleaning, and cleaners designed or labeled to be used on a variety of hard surfaces such as stovetops, cooktops, or microwaves.

(72)(70) "General Purpose Degreaser" means any product labeled to remove or dissolve grease, grime, oil and other oil-based contaminants from a variety of substrates, including automotive or miscellaneous metallic parts. "General Purpose Degreaser" does not include "Engine Degreaser," "General Purpose Cleaner," "Adhesive Remover," "Electronic Cleaner," "Electrical Cleaner," "Energized Electrical Cleaner," "Metal Polish/Cleanser," products used exclusively in "solvent cleaning tanks or related equipment," or products that are (A) sold exclusively to establishments which manufacture or construct goods or commodities; and (B) labeled "not for retail sale." "Solvent cleaning tanks or related equipment" includes, but is not limited to, cold cleaners, vapor degreasers, conveyorized degreasers, film cleaning machines, or products designed to clean miscellaneous metallic parts by immersion in a container.

(73)(71) "General-use Hand or Body Cleaner or Soap" means a cleaner or soap designed to be used routinely on the skin to clean or remove typical or common dirt and soils. "General-use Hand or Body Cleaner or Soap" includes, but is not limited to, hand or body washes, dual-purpose shampoo-body cleaners, shower or bath gels, and moisturizing cleaners or soaps. "General-use Hand or Body Cleaner or Soap" does not include prescription drug products, "Antimicrobial Hand or Body Cleaner or Soap," "Astringent/Toner," "Facial Cleaner or Soap," "Hand Dishwashing Detergent" (including antimicrobial), "Heavy-duty Hand Cleaner or Soap," "Medicated Astringent/Medicated Toner," or "Rubbing Alcohol."

(74)(72) "Glass Cleaner" means a cleaning product designed or labeled primarily for cleaning surfaces made of glass. "Glass Cleaner" does not include products designed or labeled solely for the purpose of cleaning optical materials used in eyeglasses, photographic equipment, scientific equipment and photocopying machines.

(75)(73) "Global Warming Potential (GWP)" means the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time.

(76)(74) "Global Warming Potential Value" or "GWP Value" means the global warming potential value of a chemical or compound as specified in the IPCC: 1995 Second Assessment Report (SAR), Table 2.14, in Climate Change 2007: The

Physical Sciences Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, which is incorporated by reference herein.

If Table 2.14 does not contain a SAR 100-year GWP Value for a specific chemical or compound, then the 100-year GWP Value in Table 2.14 for that chemical or compound shall be used. If there is no 100-year GWP Value for a chemical or compound listed in Table 2.14 or GWP Value listed in Table 2.15, then the GWP Value is assumed to be equal to the GWP limit of the applicable product category.

~~(77)~~(75) "Graffiti Remover" means a product labeled to remove spray paint, ink, marker, crayon, lipstick, nail polish, or shoe polish, from a variety of non-cloth or non-fabric substrates. "Graffiti Remover" does not include "Paint Remover or Stripper," "Nail Polish Remover," or "Spot Remover." Products labeled for dual use as both a paint stripper and graffiti remover are considered "Graffiti Removers."

~~(78)~~(76) "Hair Mousse" means a hairstyling foam designed to facilitate styling of a coiffure and provide limited holding power.

~~(79)~~(77) "Hair Shine" means any product designed for the primary purpose of creating a shine when applied to the hair. "Hair Shine" includes, but is not limited to, dual-use products designed primarily to impart a sheen to the hair. "Hair Shine" does not include "Hair Spray," "Hair Mousse," "Hair Styling Product," "Hair Styling Gel," or products whose primary purpose is to condition or hold the hair.

~~(80)~~(78) "Hair Styling Gel" means a consumer product manufactured before December 31, 2006, that is a high viscosity, often gelatinous, product that contains a resin and is designed for the application to hair to aid in styling and sculpting of the hair coiffure.

~~(81)~~(79) "Hair Spray" means:

- (A) for products manufactured before December 31, 2006: a consumer product designed primarily for the purpose of dispensing droplets of a resin on and into a hair coiffure which will impart sufficient rigidity to the coiffure to establish or retain the style for a period of time, and
- (B) for products manufactured on or after December 31, 2006: a consumer product that is applied to styled hair, and is designed or labeled to provide sufficient rigidity, to hold, retain and/or (finish) the style of the hair for a period of time. "Hair Spray" includes aerosol hair sprays, pump hair sprays, spray waxes; color, glitter, or sparkle hairsprays that make finishing claims; and products that are both a styling and finishing product. "Hair Spray" does not include spray products that are intended to aid in styling but does not

provide finishing of a hairstyle.

For the purposes of this subchapter, "finish" or "finishing" means the maintaining and/or holding of previously styled hair for a period of time.

For the purposes of this subchapter, "styling" means the forming, sculpting, or manipulating the hair to temporarily alter the hair's shape.

~~(82)~~(80) "Hair Styling Product" means a consumer product manufactured on or after December 31, 2006, that is designed or labeled for the application to wet, damp or dry hair to aid in defining, shaping, lifting, styling and/or sculpting of the hair. "Hair Styling Product" includes, but is not limited to hair balm, clay, cream, creme, curl straightener, gel, liquid, lotion, paste, pomade, putty, root lifter, serum, spray gel, stick, temporary hair straightener, wax, spray products that aid in styling but do not provide finishing of a hairstyle, and leave-in volumizers, detanglers and/or conditioners that make styling claims. "Hair Styling Product" does not include "Hair Mousse," "Hair Shine," "Hair Spray," or shampoos and/or conditioners that are rinsed from the hair prior to styling.

For the purposes of this subchapter, "finish" or "finishing" means the maintaining and/or holding of previously styled hair for a period of time.

For the purposes of this subchapter, "styling" means the forming, sculpting, or manipulating the hair to temporarily alter the hair's shape.

~~(83)~~(81) "Heavy-Duty Hand Cleaner or Soap" means a product designed to clean or remove difficult dirt and soils such as oil, grease, grime, tar, shellac, putty, printer's ink, paint, graphite, cement, carbon, asphalt, or adhesives from the hand with or without the use of water. "Heavy-duty Hand Cleaner or Soap" does not include prescription drug products, "Antimicrobial Hand or Body Cleaner or Soap," "Astringent/Toner," "Facial Cleaner or Soap," "General-use Hand or Body Cleaner or Soap," "Medicated Astringent/Medicated Toner" or "Rubbing Alcohol."

~~(84)~~(82) "Herbicide" means a pesticide product designed to kill or retard a plant's growth, but excludes products that are: (A) for agricultural use, or (B) restricted materials that require a permit for use and possession.

(85) "High-Temperature Coating" means a high performance coating labeled and formulated for application to substrates exposed continuously or intermittently to temperatures above 204°C (400°F).

~~(86)~~(83) "Household Product" means any consumer product that is primarily designed to be used inside or outside of living quarters or residences that are occupied or intended for occupation by individuals, including the immediate surroundings.

(87) "Industrial Maintenance Coating" means a high performance architectural coating, including primers, sealers, undercoaters, intermediate coats, and

topcoats formulated for application to substrates, including floors, exposed to one or more of the following extreme environmental conditions listed below and labeled "For industrial use only" or "For professional use only."

(A) Immersion in water, wastewater, or chemical solutions (aqueous and non-aqueous solutions), or chronic exposure of interior surfaces to moisture condensation; or

(B) Acute or chronic exposure to corrosive, caustic or acidic agents, or to chemicals, chemical fumes, or chemical mixtures or solutions; or

(C) Frequent exposure to temperatures above 121°C (250°F); or

(D) Frequent heavy abrasion, including mechanical wear and frequent scrubbing with industrial solvents, cleansers, or scouring agents; or

(E) Exterior exposure of metal structures and structural components.

~~(88)~~(84) "Insect Repellent" means a pesticide product that is designed to be applied on human skin, hair or attire worn on humans in order to prevent contact with or repel biting insects or arthropods.

~~(89)~~(85) "Insecticide" means a pesticide product that is designed for use against insects or other arthropods, but excluding products that are: (A) for agricultural use, or (B) for a use which requires a structural pest control license under Chapter 14 (commencing with Section 8500) of the Business and Professions Code, or (C) restricted materials that require a permit for use and possession.

~~(90)~~(86) "Insecticide Fogger" means any insecticide product designed to release all or most of its content, as a fog or mist, into indoor areas during a single application.

~~(91)~~(87) "Institutional Product" or "Industrial and Institutional (I&I) Product" means a consumer product that is designed for use in the maintenance or operation of an establishment that: (A) manufactures, transports, or sells goods or commodities, or provides services for profit; or (B) is engaged in the nonprofit promotion of a particular public, educational, or charitable cause. "Establishments" include, but are not limited to, government agencies, factories, schools, hospitals, sanitariums, prisons, restaurants, hotels, stores, automobile service and parts centers, health clubs, theaters, or transportation companies. "Institutional Product" does not include household products and products that are incorporated into or used exclusively in the manufacture or construction of the goods or commodities at the site of the establishment.

~~(92)~~(88) "Label" means any written, printed, or graphic matter affixed to, applied to, attached to, blown into, formed, molded into, embossed on, or appearing upon any consumer product or consumer product package, for purposes of branding,

identifying, or giving information with respect to the product or to the contents of the package.

(93)~~(89)~~ "Laundry Prewash" means a product that is designed for application to a fabric prior to laundering and that supplements and contributes to the effectiveness of laundry detergents and/or provides specialized performance.

(94)~~(90)~~ "Laundry Starch/Sizing/Fabric Finish Product" means a product that is labeled for application to a fabric, either during or after laundering, to impart and prolong a crisp, fresh look and may also act to help ease ironing of the fabric. "Laundry Starch/Sizing/Fabric Finish Product" includes, but is not limited to, starch, sizing, and fabric finish.

(95)~~(94)~~ "Lawn and Garden Insecticide" means an insecticide product labeled primarily to be used in household lawn and garden areas to protect plants from insects or other arthropods. Notwithstanding the requirements of section 94512(a) aerosol "Lawn and Garden Insecticide" may claim to kill insects or other arthropods.

(96)~~(92)~~ "Liquid" means a substance or mixture of substances which is capable of a visually detectable flow as determined under ASTM D-4359-90 (May 25, 1990) Standard Test Method for Determining Whether a Material Is a Liquid or a Solid, which is incorporated by reference herein. "Liquid" does not include powders or other materials that are composed entirely of solid particles.

(97)~~(93)~~ "Lubricant" means a product that reduces friction, heat, noise, or wear between moving parts, or loosens rusted or immovable parts or mechanisms. "Lubricant" does not include automotive power steering fluids; products for use inside power generating motors, engines, and turbines, and their associated power-transfer gearboxes; two cycle oils or other products designed to be added to fuels; products for use on the human body or animals or products that are (1) sold exclusively to establishments which manufacture or construct goods or commodities, and (2) labeled "not for retail sale."

(98)~~(94)~~ "LVP-VOC" means a chemical "compound" or "mixture" that contains at least one carbon atom and meets one of the following:

- (A) has a vapor pressure less than 0.1 mm Hg at 20°C, as determined by ARB Method 310; or
- (B) is a chemical "compound" with more than 12 carbon atoms, or a chemical "mixture" comprised solely of "compounds" with more than 12 carbon atoms, as verified by formulation data, and the vapor pressure and boiling point are unknown; or
- (C) is a chemical "compound" with a boiling point greater than 216°C, as determined by ARB Method 310; or

(D) is the weight percent of a chemical "mixture" that boils above 216°C, as determined by ARB Method 310.

For the purposes of the definition of LVP-VOC, chemical "compound" means a molecule of definite chemical formula and isomeric structure, and chemical "mixture" means a substance comprised of two or more chemical "compounds."

(99)(95) "Manufacturer" means any person who imports, manufactures, assembles, produces, packages, repackages, or relabels a consumer product.

(100)(96) "Medicated Astringent/Medicated Toner" means any product regulated as a drug by the Food and Drug Administration (FDA) which is applied to the skin for the purpose of cleaning or tightening pores. "Medicated Astringent/Medicated Toner" includes, but is not limited to, clarifiers and substrate-impregnated products. "Medicated Astringent/Medicated Toner" does not include hand, face, or body cleaner or soap products, "Personal Fragrance Product," "Astringent/Toner," cold cream, lotion, antiperspirants, or products that must be purchased with a doctor's prescription.

(101)(97) "Metal Polish/Cleanser" means any product designed primarily to improve the appearance of finished metal, metallic, or metallized surfaces by physical or chemical action. To "improve the appearance" means to remove or reduce stains, impurities, or oxidation from surfaces or to make surfaces smooth and shiny. "Metal Polish/Cleanser" includes, but is not limited to, metal polishes used on brass, silver, chrome, copper, stainless steel and other ornamental metals. "Metal Polish/Cleanser" does not include "Automotive Wax, Polish, Sealant or Glaze," Tire or Wheel Cleaner, "Paint Remover or Stripper," products designed and labeled exclusively for automotive and marine detailing, or products designed for use in degreasing tanks.

(102)(98) "Mist Spray Adhesive" means any aerosol adhesive which is not a "Special Purpose Spray Adhesive" and which delivers a particle or mist spray, resulting in the formation of fine, discrete particles that yield a generally uniform and smooth application of adhesive to the substrate.

(103)(99) "Motor Vehicle Wash" means a product designed or labeled to wash, wax and shine, or wash and/or clean the exterior surface of motor vehicles. "Motor Vehicle Wash" includes, but is not limited to, products for use in commercial, fleet, hand, and "drive through" car washes; commercial truck washing or large vehicle washing stations; vehicle dealers and repair shops as well as products intended for household consumer use. "Motor Vehicle Wash" does not include "Bug and Tar Remover," "Glass Cleaner," "Tire or Wheel Cleaner," and products labeled for use exclusively on locomotives or aircraft.

~~(104)~~(100) "Multi-purpose Dry Lubricant" means any lubricant which is: (A) designed or labeled to provide lubricity solely by depositing a thin film of graphite, molybdenum disulfide ("moly"), or polytetrafluoroethylene or closely related fluoropolymer ("teflon") on surfaces, and (B) designed or labeled for general purpose lubrication, or for use in a wide variety of applications.

~~(105)~~(104) "Multi-purpose Lubricant" means any lubricant designed or labeled for general purpose lubrication, or a lubricant labeled for use in a wide variety of applications. "Multi-purpose Lubricant" does not include "Multi-purpose Dry Lubricant," "Penetrant," or "Silicone-based Multi-Purpose Lubricant."

~~(106)~~(102) "Multi-purpose Solvent" means:

- (A) for products manufactured before January 1, 2008: any organic liquid designed to be used for a variety of purposes, including cleaning or degreasing of a variety of substrates, or thinning, dispersing or dissolving other organic materials. "Multi-purpose Solvent" includes solvents used in institutional facilities, except for laboratory reagents used in analytical, educational, research, scientific or other laboratories. "Multi-purpose Solvent" does not include solvents used in cold cleaners, vapor degreasers, conveyorized degreasers or film cleaning machines, or solvents that are incorporated into, or used exclusively in the manufacture or construction of, the goods or commodities at the site of the establishment.
- (B) for products manufactured on or after January 1, 2008: any liquid product designed or labeled to be used for dispersing, or dissolving, or removing contaminants or other organic materials. "Multi-purpose Solvent" also includes: ~~(A)~~(1) products that do not display specific use instructions on the product container or packaging, ~~(B)~~(2) products that do not specify an end-use function or application on the product container or packaging, and ~~(C)~~(3) solvents used in institutional facilities, except for laboratory reagents used in analytical, educational, research, scientific or other laboratories, (4) "Paint Clean-up" products, and (5) products labeled to prepare surfaces for painting. "Multi-purpose Solvent" does not include solvents used in cold cleaners, vapor degreasers, conveyorized degreasers or film cleaning machines, solvents labeled exclusively for the clean-up of application equipment used for polyaspartic and polyurea coatings, or solvents that are incorporated into, or used exclusively in the manufacture or construction of, the goods or commodities at the site of the establishment. "Multi-purpose Solvent" also does not include any product making any representation that the product may be used as, or is suitable for use as a consumer product which qualifies under another definition in section 94508; such products are not Multi-purpose Solvents and are subject to the "Most Restrictive Limit" provision of section 94512.

- (107)(403) "Nail Polish" means any clear or colored coating designed for application to the fingernails or toenails and including but not limited to, lacquers, enamels, acrylics, base coats and top coats.
- (108)(404) "Nail Polish Remover" means a product designed to remove nail polish and coatings from fingernails or toenails.
- (109)(405) "Non-Carbon Containing Compound" means any compound which does not contain any carbon atoms.
- (110)(406) "Non-Selective Terrestrial Herbicide" means a terrestrial herbicide product that is toxic to plants without regard to species.
- (111)(407) "Odor Remover/Eliminator" means a product that is designed or labeled to be applied exclusively to hard surfaces to inhibit the ability of soils to create malodors, or functions to entrap, encapsulate, neutralize, convert or eliminate malodor molecules. "Odor Remover/Eliminator" does not include products designed or labeled for use in cleaning soils from hard surfaces, laundering, softening, de-wrinkling or cleaning fabrics, or dishwashing, or products that are defined as "Air Freshener," "Bathroom and Tile Cleaner," "Carpet/Upholstery Cleaner," "Fabric Refresher," "General Purpose Cleaner," "Toilet/Urinal Care Product," "Disinfectant," or "Sanitizer."
- (112)(408) "Oven Cleaner" means any cleaning product designed or labeled to clean and to remove dried or baked on food deposits from oven walls.
- (113)(409) "Paint" means any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer which is converted to an opaque solid film after application and is used for protection, decoration or identification, or to serve some functional purpose such as the filling or concealing of surface irregularities or the modification of light and heat radiation characteristics.
- (114) "Paint Clean-up" means any liquid product labeled for cleaning oil-based or water-based paint, lacquer, varnish, or related coatings from, but not limited to, painting equipment or tools, plastics, or metals.
- (115)(410) "Paint Remover or Stripper" means any product designed to strip or remove paints or other related coatings, by chemical action, from a substrate without markedly affecting the substrate. "Paint Remover or Stripper" does not include "Multi-purpose Solvent," paint brush cleaners, products designed and labeled exclusively as "Graffiti Remover," and hand cleaner products that claim to remove paints and other related coatings from skin.
- (116)(411) "Paint Thinner" means any liquid product used for reducing the viscosity of coating compositions or components, that prominently displays the term "Paint

Thinner," "Lacquer Thinner," "Thinner," or "Reducer" on the front panel of its packaging. "Paint Thinner" does not include thinners labeled for the thinning of Industrial Maintenance Coatings, Zinc-Rich Primers, and High Temperature Coatings. "Paint Thinner" also does not include products labeled and used exclusively as a component in a specific coating. "Paint Thinner" also does not include "Artist's Solvent/Thinner."

~~(117)~~(142) "Penetrant" means a lubricant designed or labeled primarily to loosen metal parts that have bonded together due to rusting, oxidation, or other causes. "Penetrant" does not include "Multi-purpose Lubricant" that claim to have penetrating qualities, but are not labeled primarily to loosen bonded parts.

~~(118)~~(143) "Person" shall have the same meaning as defined in Health and Safety Code Section 39047.

~~(119)~~(144) "Personal Fragrance Product" means any product which is applied to the human body or clothing for the primary purpose of adding a scent or masking a malodor, including, but not limited to, cologne, perfume, aftershave, toilet water, lotion, powder, body mist, and body spray. "Personal Fragrance Product" does not include: (A) Deodorant, as defined in section 94501(d); (B) medicated products designed primarily to alleviate fungal or bacterial growth on feet or other areas of the body; (C) mouthwashes, breath fresheners and deodorizers; (D) lotions, moisturizers, powders or other skin care products designed or labeled to be used primarily to alleviate skin conditions such as dryness and irritations; (E) products designed exclusively to be applied to human genitalia areas, undergarments, and any paper products, napkins or other products that are affixed to undergarments, such as sanitary pads; (F) soaps, shampoos, and products primarily used to clean the human body; and (G) fragrance products designed to be used exclusively on non-human animals.

~~(120)~~(145) "Pesticide" means and includes any substance or mixture of substances labeled, designed, or intended for use in preventing, destroying, repelling or mitigating any pest, or any substance or mixture of substances labeled, designed, or intended for use as a defoliant, desiccant, or plant regulator, provided that the term "pesticide" will not include any substance, mixture of substances, or device which the United States Environmental Protection Agency does not consider to be a pesticide.

~~(121)~~(146) "Pressurized Gas Duster" means a pressurized product labeled to remove dust from a surface solely by means of mass air or gas flow, including surfaces such as photographs, photographic film negatives, computer keyboards, and other types of surfaces that cannot be cleaned with solvents. "Pressurized Gas Duster" does not include "Dusting Aid," "General Purpose Cleaner," "Electrical Cleaner," "Electronic Cleaner," "Energized Electrical Cleaner," or "Anti-Static Product." Pressurized Gas Duster does not include products labeled exclusively to remove dust from equipment where dust removal is accomplished when: electric current exists; residual electrical potential from a component such as a

capacitor exists; or an open flame exists, as long as the "Principal Display Panel" clearly displays the statement: "Energized Equipment use only."

~~(122)~~(147) "Principal Display Panel or Panels" means that part, or those parts of a label that are so designed as to most likely be displayed, presented, shown or examined under normal and customary conditions of display or purchase. Whenever a principal display panel appears more than once, all requirements pertaining to the "principal display panel" shall pertain to all such "principal display panels."

~~(123)~~(148) "Product Brand Name" means the name of the product exactly as it appears on the principal display panel of the product.

~~(124)~~(149) "Product Category" means the applicable category which best describes the product as listed in this Section 94508.

~~(125)~~(120) "Product Form," for the purpose of complying with Section 94513 only, means the applicable form which most accurately describes the product's dispensing form as follows:

- A = Aerosol Product
- S = Solid
- P = Pump Spray
- L = Liquid
- SS = Semisolid
- O = Other

~~(126)~~(124) "Propellant" means a liquefied or compressed gas that is used in whole or in part, such as a cosolvent, to expel a liquid or any other material from the same self-pressurized container or from a separate container.

~~(127)~~(122) "Pump Spray" means a packaging system in which the product ingredients within the container are not under pressure and in which the product is expelled only while a pumping action is applied to a button, trigger or other actuator.

~~(128)~~(123) "Responsible Party" means the company, firm or establishment which is listed on the product's label. If the label lists two companies, firms or establishments, the responsible party is the party which the product was "manufactured for" or "distributed by," as noted on the label.

~~(129)~~(124) "Restricted Materials" means pesticides established as restricted materials under Title 3, California Code of Regulations, section 6400.

~~(130)~~(125) "Retailer" means any person who sells, supplies, or offers consumer products for sale directly to consumers.

(131)(126) "Retail Outlet" means any establishment at which consumer products are sold, supplied, or offered for sale directly to consumers.

(132)(127) "Rubber/Vinyl Protectant" means:

- (A) for products manufactured before December 31, 2008: any product designed to protect, preserve or renew vinyl, rubber, and plastic on vehicles, tires, luggage, furniture, and household products such as vinyl covers, clothing, and accessories. "Rubber/Vinyl Protectant" does not include products primarily designed to clean the wheel rim, such as aluminum or magnesium wheel cleaners, and tire cleaners that do not leave an appearance-enhancing or protective substance on the tire.
- (B) for products manufactured on or after December 31, 2008: any product labeled to protect, preserve or renew vinyl, or rubber on vehicles, tires, luggage, furniture, and/or household products such as vinyl covers, clothing, or accessories. "Rubber/Vinyl Protectant" does not include: products labeled to clean the wheel rim, such as aluminum or magnesium wheel cleaners; tire cleaners that do not leave an appearance-enhancing or protective substance on the tire; pigmented products designed or labeled to be used primarily for coloring; products used for construction, reconstruction, modification, structural maintenance or repair of rubber or vinyl substrates; or products, other than those labeled to be used on vehicle tires, qualifying as either "Clear Coating" or "Vinyl/Fabric/Leather/Polycarbonate Coating" under section 94521(a).

(133)(128) "Rubbing Alcohol" means any product containing isopropyl alcohol (also called isopropanol) or denatured ethanol and labeled for topical use, usually to decrease germs in minor cuts and scrapes, to relieve minor muscle aches, as a rubefacient, and for massage.

(134)(129) "Sanitizer" means a product that is labeled as a "sanitizer," or is labeled to reduce, but not necessarily eliminate, microorganisms in the air, on surfaces, or on inanimate objects, and whose label is registered as a "sanitizer" under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA; 7 U.S.C. section 136 et seq.). Products that are labeled as both a "sanitizer" and a "disinfectant" are considered disinfectants. "Sanitizer" does not include (A) "Disinfectant," (B) products labeled solely for use on humans or animals, (C) products labeled solely for agricultural use, (D) products labeled solely for use in swimming pools, therapeutic tubs, or hot tubs, (E) products which are labeled to be used on heat sensitive critical or semi-critical medical devices or medical equipment surfaces, (F) products which are pre-moistened wipes or towelettes sold exclusively to medical, convalescent or veterinary establishments (G) products which are labeled to be applied to food-contact surfaces and are not required to be rinsed prior to contact with food, or (H) products which are labeled as "Bathroom and Tile Cleaner," "Glass Cleaner," "General Purpose Cleaner," "Toilet/Urinal Care

Product," "Metal Polish," "Carpet Cleaner," or "Fabric Refresher" that may also make sanitizing or anti-microbial claims on the label.

~~(135)~~(130) "Sealant or Caulking Compound" means any product with adhesive properties that is designed to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. "Sealant or Caulking Compound" does not include roof cements and roof sealants; insulating foams; removable caulking compounds; clear/paintable/water resistant caulking compounds; floor seam sealers; products designed exclusively for automotive uses; or sealers that are applied as continuous coatings. "Sealant or Caulking Compound" also does not include units of product, less packaging, which weigh more than one pound and consist of more than 16 fluid ounces. For the purposes of this definition only:

"Removable caulking compounds" means a compound which temporarily seals windows or doors for three to six month time intervals.

"Clear/paintable/water resistant caulking compounds" means a compound which contains no appreciable level of opaque fillers or pigments; transmits most or all visible light through the caulk when cured; is paintable; and is immediately resistant to precipitation upon application.

"Sealant or Caulking Compound" is divided into two subcategories:

(A) "Chemically Curing Sealant or Caulking Compound" means any "Sealant or Caulking Compound" which achieves its final composition and physical form through a chemical curing process, where product ingredients participate in a chemical reaction in the presence of a catalyst that causes a change in chemical structure and leads to the release of chemical byproducts.

"Chemically Curing Sealant or Caulking Compound" includes, but is not limited to, products that utilize silicone, polyurethane, silyl-terminated polyether, or silyl-terminated polyurethane reactive chemistries. "Chemically Curing Sealant or Caulking Compound" does not include products which are not solely dependent on a chemically curing process to achieve the cured state.

(B) "Non-Chemically Curing Sealant or Caulking Compound" means any "Sealant or Caulking Compound" not defined under "Chemically Curing Sealant or Caulking Compound."

~~(136)~~(134) "Semisolid" means a product that, at room temperature, will not pour, but will spread or deform easily, including but not limited to gels, pastes, and greases.

~~(137)~~(432) "Shaving Cream" means an aerosol product which dispenses a foam lather intended to be used with a blade or cartridge razor, or other wet-shaving system, in the removal of facial or other bodily hair. "Shaving Cream" does not include "Shaving Gel."

~~(138)~~(133) "Shaving Gel" means an aerosol product which dispenses a post-foaming semi-solid designed to be used with a blade, cartridge razor, or other shaving system in the removal of facial or other bodily hair. "Shaving Gel" does not include "Shaving Cream."

~~(139)~~(134) "Silicone-based Multi-purpose Lubricant" means any lubricant which is:

(A) designed and labeled to provide lubricity primarily through the use of silicone compounds including, but not limited to, polydimethylsiloxane, and

(B) designed and labeled for general purpose lubrication, or for use in a wide variety of applications. "Silicone-based Multi-purpose Lubricant" does not include products designed and labeled exclusively to release manufactured products from molds.

~~(140)~~(135) "Single Phase Aerosol Air Freshener" means an aerosol air freshener with the liquid contents in a single homogeneous phase and which does not require that the product container be shaken before use.

~~(141)~~(136) "Solid" means a substance or mixture of substances which, either whole or subdivided (such as the particles comprising a powder), is not capable of visually detectable flow as determined under ASTM D-4359-90 (May 25, 1990) Standard Test Method for Determining Whether a Material Is a Liquid or a Solid, which is incorporated by reference herein.

~~(142)~~(137) "Special Purpose Spray Adhesive" means an aerosol adhesive that meets any of the following definitions:

(A) "Mounting Adhesive" means an aerosol adhesive designed to permanently mount photographs, artwork, and any other drawn or printed media to a backing (paper, board, cloth, etc.) without causing discoloration to the artwork.

(B) "Flexible Vinyl Adhesive" means an aerosol adhesive designed to bond flexible vinyl to substrates. Flexible vinyl means a nonrigid polyvinyl chloride plastic with at least five percent, by weight, of plasticizer content. A plasticizer is a material, such as a high boiling point organic solvent, that is incorporated into a vinyl to increase its flexibility, workability, or distensibility, and may be determined using ASTM Method E260-91 (Jan. 25, 1991) Standard Practice for Packed Column Gas Chromatography, which is incorporated by reference herein, or from product formulation data.

(C) "Polystyrene Foam Adhesive" means an aerosol adhesive designed to bond polystyrene foam (e.g. Styrofoam®, expanded polystyrene foam, etc.) to substrates.

- (D) "Automobile Headliner Adhesive" means an aerosol adhesive designed to bond together layers in motor vehicle headliners.
- (E) "Polyolefin Adhesive" means an aerosol adhesive designed to bond polyolefins (e.g. polyethylene, polypropylene, etc.) to substrates.
- (F) "Laminate Repair/Edgebanding Adhesive" means an aerosol adhesive designed for:
- (1) the touch-up or repair of items laminated with high pressure laminates (e.g. lifted edges, delaminations, etc.), or for
 - (2) the touch-up, repair, or attachment of edgebanding materials, including, but not limited to, other laminates, synthetic marble, veneers, wood moulding, and decorative metals.

For the purposes of this definition "high pressure laminate" means sheet materials which consist of paper, fabric, or other core material that have been laminated at temperatures exceeding 265 degrees F, and at pressures between 1,000 and 1,400 psi.

- (G) "Automotive Engine Compartment Adhesive" means an aerosol adhesive designed for use in motor vehicle under-the-hood applications which require oil and plasticizer resistance, as well as high shear strength, at temperatures of 200-275° F.

~~(143)~~(138) "Spot Remover" means any product labeled to clean localized areas, or remove localized spots or stains on cloth or fabric such as drapes, carpets, upholstery, or clothing, that does not require subsequent laundering to achieve stain removal. "Spot Remover" does not include "Dry Cleaning Fluid," "Laundry Prewash," or aerosol products labeled solely for gum removal.

~~(144)~~(139) "Spray Buff Product" means a product designed to restore a worn floor finish in conjunction with a floor buffing machine and special pad.

~~(145)~~(140) "Table B Compound" means any carbon-containing compound listed as an exception to the definition of VOC in Section 94508.

~~(146)~~(141) "Temporary Hair Color" means any product that applies color, glitter, or UV-active pigments to hair, wigs, or fur and is removable when washed. "Temporary Hair Color" includes hair color mousses and products labeled to add texture or thickness to cover thinning/balding areas. "Temporary Hair Color" does not include "Hair Spray," "Hair Styling Product," or "Hair Mousse."

~~(147)~~(142) "Terrestrial" means to live on or grow from land.

- ~~(148)~~(143) "Tire or Wheel Cleaner" means a product designed or labeled exclusively to clean either tires, wheels, or both. "Tire or Wheel Cleaner" includes, but is not limited to, products for use in commercial, fleet, hand, and "drive-through" car washes; commercial truck washing or large vehicle washing stations; vehicle dealers and repair shops, as well as household consumer products. "Tire or Wheel Cleaner" does not include products labeled for use exclusively on locomotives or aircraft.
- ~~(149)~~(144) "Tire Sealant and Inflator" means any pressurized product that is designed to temporarily inflate and seal a leaking tire.
- ~~(150)~~(145) "Toilet/Urinal Care Product" means any product designed or labeled to clean and/or to deodorize toilet bowls, toilet tanks, or urinals. Toilet bowls, toilet tanks, or urinals includes, but is not limited to, toilets or urinals connected to permanent plumbing in buildings and other structures, portable toilets or urinals placed at temporary or remote locations, and toilet or urinals in vehicles such as buses, recreational motor homes, boats, ships, and aircraft. "Toilet/Urinal Care Product" does not include "Bathroom and Tile Cleaner" or "General Purpose Cleaner."
- ~~(151)~~(146) "Type A Propellant" means a compressed gas such as CO₂, N₂, N₂O, or compressed air which is used as a propellant, and is either incorporated with the product or contained in a separate chamber within the product's packaging.
- ~~(152)~~(147) "Type B Propellant" means any halocarbon which is used as a propellant including chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs).
- ~~(153)~~(148) "Type C Propellant" means any propellant which is not a Type A or Type B propellant, including propane, isobutane, n-butane, and dimethyl ether (also known as dimethyl oxide).
- ~~(154)~~(149) "Undercoating" means any aerosol product designed to impart a protective, non-paint layer to the undercarriage, trunk interior, and/or firewall of motor vehicles to prevent the formation of rust or to deaden sound. "Undercoating" includes, but is not limited to, rubberized, mastic, or asphaltic products.
- ~~(155)~~(150) "Usage Directions" means the text or graphics on the product's principal display panel, label, or accompanying literature which describes to the end user how and in what quantity the product is to be used.
- ~~(156)~~(151) "Volatile Organic Compound (VOC)" means any compound containing at least one atom of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, and excluding the following:

- (A) methane,
 methylene chloride (dichloromethane),
 1,1,1-trichloroethane (methyl chloroform),
 trichlorofluoromethane (CFC-11),
 dichlorodifluoromethane (CFC-12),
 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113),
 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114),
 chloropentafluoroethane (CFC-115),
 chlorodifluoromethane (HCFC-22),
 1,1,1-trifluoro-2,2-dichloroethane (HCFC-123),
 1,1-dichloro-1-fluoroethane (HCFC-141b),
 1-chloro-1,1-difluoroethane (HCFC-142b),
 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124),
 trifluoromethane (HFC-23),
 1,1,2,2-tetrafluoroethane (HFC-134),
 1,1,1,2-tetrafluoroethane (HFC-134a),
 pentafluoroethane (HFC-125),
 1,1,1-trifluoroethane (HFC-143a),
 1,1-difluoroethane (HFC-152a),
 ethoxy-nonafluorobutane (HFE 7200),
 cyclic, branched, or linear completely methylated siloxanes,
 the following classes of perfluorocarbons:

1. cyclic, branched, or linear, completely fluorinated alkanes;
2. cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
3. cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
4. sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds to carbon and fluorine, and

- (B) the following low-reactive organic compounds which have been exempted by the U.S. EPA:

acetone,
 ethane,
 methyl acetate,
 parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene),
 perchloroethylene (tetrachloroethylene).

~~(157)~~(152) "VOC Content" means the total weight of VOC in a product expressed as a percentage of the product weight (exclusive of the container or packaging), as determined pursuant to sections 94515(a) and (b).

~~(158)~~(163) "Wasp and Hornet Insecticide" means any insecticide product that is designed for use against wasps, hornets, yellow jackets or bees by allowing the

user to spray from a distance a directed stream or burst at the intended insects, or their hiding place.

~~(159)(154)~~ "Waterproofer" means a product designed and labeled exclusively to repel water from fabric or leather substrates. "Waterproofer" does not include "Fabric Protectant."

~~(160)(155)~~ "Wax" means a material or synthetic thermoplastic substance generally of high molecular weight hydrocarbons or high molecular weight esters of fatty acids or alcohols, except glycerol and high polymers (plastics). "Wax" includes, but is not limited to, substances derived from the secretions of plants and animals such as caruba wax and beeswax, substances of a mineral origin such as ozocerite and paraffin, and synthetic polymers such as polyethylene.

~~(161)(156)~~ "Web Spray Adhesive" means any aerosol adhesive which is not a "Mist Spray Adhesive" or "Special Purpose Spray Adhesive."

~~(162)(157)~~ "Windshield Water Repellent" means a product designed or labeled exclusively to repel water from motor vehicle exterior automotive glass surfaces. "Windshield Water Repellent" does not include "Automotive Windshield Washer Fluid."

~~(163)(158)~~ "Wood Cleaner" means a product labeled to clean wooden materials including but not limited to decking, fences, flooring, logs, cabinetry, and furniture. "Wood Cleaner" does not include "Dusting Aid," "General Purpose Cleaner," "Furniture Maintenance Product," "Floor Wax Stripper," "Floor Polish or Wax," or products designed and labeled exclusively to preserve or color wood.

~~(164)~~ "Zinc-Rich Primer" means a coating that meets all the following specifications: (A) coating contains at least 65 percent metallic zinc powder or zinc dust by weight of total solids; and (B) coating is formulated for application to metal substrates to provide a firm bond between the substrate and subsequent applications of coatings; and (C) coating is intended for professional use only and labeled "For Professional Use Only."

NOTE: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38562, 38580, 39601, 39601, and 41712, Health and Safety Code. Reference: Sections 38501, 38510, 38560, 38560.5, 38562, 38580, 39002, 39600, 40000, and 41712, Health and Safety Code.

§ 94509. Standards for Consumer Products.

- (a) Except as provided in Sections 94510 (Exemptions), 94511 (Innovative Products), 94514 (Variances), 94540 through 94555 (Alternative Control Plan), and 94567(a)(1) (Hairspray Credit Program), Title 17, California Code of Regulations, no person shall sell, supply, offer for sale, or manufacture for sale in California any consumer product which, at the time of sale or manufacture, contains volatile organic compounds in excess of the limits specified in the following Table of Standards after the specified effective dates.

**Table of Standards
Percent Volatile Organic Compound by Weight**

| Product Category | Effective Date ¹ | VOC Standard ² |
|--|------------------------------------|----------------------------------|
| Adhesive *: Aerosol** | 1/1/95 | 75 |
| Mist Spray Adhesive** | 1/1/2002 | 65 |
| Web Spray Adhesive** | 1/1/2002 | 55 |
| Special Purpose Spray Adhesive** | | |
| Mounting, Automotive Engine Compartment, and Flexible Vinyl Adhesive | 1/1/2002 | 70 |
| Polystyrene Foam and Automobile Headliner Adhesive | 1/1/2002 | 65 |
| Polyolefin and Laminate Repair/Edgebanding Adhesive | 1/1/2002 | 60 |
| ===== | | |
| [**See 94509(i), 94512(d), and 94513(d) for additional requirements that apply to aerosol adhesive.] | | |
| ===== | | |
| Construction, Panel, and Floor Covering# | 1/1/95 | 40 |
| | 12/31/2002 | 15 |
| | 12/31/2008 | 7 |
| ===== | | |
| [#See section 94509(k) for the effective date of the VOC limit for certain types of "Construction, Panel, and Floor Covering Adhesive, and section 94509(p) for additional requirements that apply to Construction, Panel, and Floor Covering Adhesive.] | | |
| ===== | | |
| Contact## | 1/1/95 | 80 |
| Contact Adhesive – General Purpose | 12/31/2006 | 55 |
| Contact Adhesive – Special Purpose | 12/31/2006 | 80 |

| | | |
|---|------------|----|
| ===== | | |
| [##See sections 94509(m) and 94512(d) for additional requirements that apply to Contact Adhesive.] | | |
| General Purpose | 1/1/95 | 10 |
| ===== | | |
| *See section 94510(i) for an exemption that applies to adhesives sold in containers of one fluid ounce or less. | | |
| Adhesive Remover*: | | |
| Floor or Wall Covering Adhesive Remover | 12/31/2006 | 5 |
| Gasket or Thread Locking Adhesive Remover | 12/31/2006 | 50 |
| General Purpose Adhesive Remover | 12/31/2006 | 20 |
| Specialty Adhesive Remover | 12/31/2006 | 70 |
| ===== | | |
| [*See sections 94509(n) and 94512(d) for additional requirements that apply to Adhesive Remover.] | | |
| Aerosol Cooking Spray | 1/1/95 | 18 |
| Air Freshener*: | | |
| Double Phase Aerosol | 1/1/93 | 30 |
| [*See section 94509(t) for additional requirements that apply to Double Phase Aerosol Air Freshener.] | 12/31/2004 | 25 |
| | 12/31/2012 | 20 |
| | ===== | |
| Single Phase Aerosol | 1/1/93 | 70 |
| | 1/1/96 | 30 |
| Dual Purpose Air Freshener/Disinfectant aerosol | 1/1/94 | 60 |
| liquid/pump spray | 1/1/93 | 18 |
| solid/semisolid | 1/1/93 | 3 |
| ===== | | |
| [*See sections 94510(f) and 94510(g)(2) for exemptions that apply to certain Air Fresheners, and 94509(o) for additional requirements that apply to Air Freshener.] | | |
| Anti-static Product: | | |
| aerosol | 12/31/2008 | 80 |
| non-aerosol | 12/31/2006 | 11 |
| Astringent/Toner (Non-FDA regulated) | 12/31/2010 | 35 |
| Automotive Rubbing or Polishing Compound | 1/1/2005 | 17 |

| | | |
|--|--|----------------------|
| Automotive Wax/Polish/Sealant/Glaze: all other forms | 1/1/2005 | 15 |
| hard paste wax | 1/1/2005 | 45 |
| instant detailer | 1/1/2001 | 3 |
| Automotive Windshield Washer Fluid: Type "A" areas* | 1/1/93 12/31/2008 | 35 25 |
| All other areas (all forms) Dilutable and Pre-Mixed** | 1/1/93 12/31/2002 | 10 1 |
| <p>=====</p> <p>**See section 94508(a)(19), section 94508(a)(20), and section 94509(l) for provisions that apply to Automotive Windshield Washer Fluid.</p> <p>=====</p> <p>* Type "A" areas include only the following: Del Norte, Shasta and Trinity Counties; the Great Basin Valley, Lake Tahoe, Mountain Counties, and Northeast Plateau Air Basins, as defined in Title 17, California Code of Regulations, Sections 60105, 60108, 60111, and 60113.</p> | | |
| Bathroom and Tile Cleaner*: aerosol | 1/1/94 | 7 |
| all other forms | 1/1/94 | 5 |
| non-aerosol | 12/31/2008 | 1 |
| <p>=====</p> <p>[*See section 94509(p) for additional requirements that apply to Bathroom and Tile Cleaner.]</p> | | |
| Brake Cleaners | 1/1/97 12/31/2002 12/31/2008 12/31/2010 | 50 45 20 10 |
| Bug and Tar Remover | 1/1/2002 | 40 |
| Carburetor or Fuel-injection Air Intake Cleaner * | 1/1/95 12/31/2002 12/31/2008 12/31/2010 | 75 45 20 10 |
| <p>=====</p> <p>*See section 94509(k) for the effective date of the VOC limit for Carburetor or Fuel-injection Air Intake Cleaner.</p> | | |

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|--|--------------------------------|----------------|
| Carpet /Upholstery Cleaner*: aerosol | 1/1/2001 12/31/2010 | 7 5 |
| non-aerosol (dilutable) | 1/1/2001 | 0.1 |
| non-aerosol (ready-to-use) | 1/1/2001 12/31/2010 | 3 1 |
| [*See section 94509(q) for additional requirements that apply to Carpet/Upholstery Cleaner] | | |
| Charcoal Lighter Material | See Section 94509(h) | |
| Disinfectant: aerosol | 12/31/2008 | 70 |
| non-aerosol | 12/31/2008 | 1 |
| Dusting Aid: aerosol | 1/1/95 1/1/97 12/31/2010 | 35 25 17 |
| non-aerosol | 1/1/95 12/31/2010 | 7 3 |
| Electrical Cleaner* [*See sections 94509(n) and 94512(d) for additional requirements that apply to Electrical Cleaner.] | 12/31/2006 | 45 |
| Electronic Cleaner* [*See sections 94509(m) and 94512(d) for additional requirements that apply to Electronic Cleaner.] | 12/31/2007 | 75 |
| Engine Degreaser: | 1/1/93 1/1/96 | 75 50 |
| aerosol | 12/31/2004 12/31/2010 | 35 10 |
| non-aerosol | 12/31/2004 | 5 |

| | | |
|---|--------------------------------|---------------|
| Fabric Protectant* aerosol | 1/1/95 1/1/97 | 75 60 |
| non-aerosol | 1/1/95 1/1/97 12/31/2010 | 75 60 1 |
| [*See section 94509(q) for additional requirements that apply to Fabric Protectant] | | |
| Fabric Refresher: aerosol | 12/31/2006 | 15 |
| non-aerosol | 12/31/2006 | 6 |
| Fabric Softener – Single Use Dryer Product | See Section 94509(s) | |
| Floor Maintenance Product | 12/31/2010 | 1 |
| Floor Polish or Wax: Resilient Flooring Material | 1/1/94 12/31/2010 | 7 1 |
| Nonresilient Flooring Material | 1/1/94 12/31/2010 | 10 1 |
| Wood Floor Wax | 1/1/94 12/31/2010 | 90 70 |
| Floor Wax Stripper: non-aerosol | See Section 94509(j) | |
| Footwear or Leather Care Product*: aerosol | 12/31/2006 | 75 |
| solid | 12/31/2006 | 55 |
| all other forms | 12/31/2006 | 15 |
| [*See section 94509(m) for additional requirements that apply to Footwear or Leather Care Product.] | | |
| Furniture Maintenance Product: aerosol | 1/1/94 12/31/2004 | 25 17 |
| all other forms (except solid/paste forms) | 1/1/94 | 7 |
| non-aerosol (except solid/paste forms) | 12/31/2008 | 3 |

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|--|--------------------------------------|----------------|
| General Purpose Cleaner*: aerosol and non-aerosol | 1/1/94 | 10 |
| aerosol | 12/31/2008 | 8 |
| non-aerosol | 12/31/2004 | 4 |
| [*See section 94509(p) for additional requirements that apply to General Purpose Cleaner.] | | |
| General Purpose Degreaser*: aerosol | 1/1/2002 12/31/2008 12/31/2010 | 50 20 10 |
| non-aerosol | 12/31/2004 | 4 |
| [*See section 94509(m) for additional requirements that apply to General Purpose Degreaser.] | | |
| Glass Cleaner: aerosol | 1/1/93 12/31/2012 | 12 10 |
| non-aerosol | 1/1/93 1/1/96 12/31/2004 | 8 6 4 |
| Graffiti Remover*: aerosol | 12/31/2006 | 50 |
| non-aerosol | 12/31/2006 | 30 |
| [*See section 94509(n) for additional requirements that apply to Graffiti Remover.] | | |
| Hair Mousse | 1/1/94 12/31/2002 | 16 6 |
| Hair Shine | 1/1/2005 | 55 |
| Hair Spray | 1/1/93 6/1/99 | 80 55 |
| Hair Styling Gel | 1/1/94 | 6 |
| Hair Styling Product: aerosol and pump spray | 12/31/2006 | 6 |
| all other forms | 12/31/2006 | 2 |
| Heavy-duty Hand Cleaner or Soap | 1/1/2005 | 8 |
| Insect Repellent: aerosol | 1/1/94 | 65 |

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|---|--------------------------------------|----------------|
| Insecticide*: Crawling Bug Insecticide (all forms): | 1/1/95 1/1/98 | 40 20 |
| aerosol | 12/31/2004 | 15 |
| Flea and Tick Insecticide | 1/1/95 | 25 |
| Flying Bug Insecticide (all forms): | 1/1/95 | 35 |
| aerosol | 12/31/2003 | 25 |
| Fogger | 1/1/95 | 45 |
| Lawn and Garden Insecticide (all forms) | 1/1/95 | 20 |
| non-aerosol | 12/31/2003 | 3 |
| Wasp and Hornet Insecticide | 1/1/2005 | 40 |
| *See sections 94510(g)(1) and 94510(k) for exemptions that apply to certain insecticides. | | |
| Laundry Prewash: aerosol/solid | 1/1/94 | 22 |
| all other forms | 1/1/94 | 5 |
| Laundry Starch/Sizing/Fabric Finish Product: | 1/1/95 12/31/2008 | 5 4.5 |
| Metal Polish/Cleanser | 1/1/2005 | 30 |
| Motor Vehicle Wash non-aerosol | 12/31/10 | 0.2 |
| Multi-purpose Lubricant: (excluding solid or semisolid products) | 1/1/2003 12/31/2013 12/31/2015 | 50 25 10 |
| [*See sections 94509(q) and 94513(f) for additional requirements that apply to Multi-purpose Lubricant] | | |
| Multi-purpose Solvent | 12/31/2010 12/31/2013 | 30 3 |
| [*See sections 94509(u), 94512(e), and 94513(g) for additional requirements that apply to Multi-purpose Solvent.] | | |

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|---|--|--------------------|
| Nail Polish Remover | 1/1/94 1/1/96 12/31/2004 12/31/2007 | 85 75 0 1 |
| Non-selective Terrestrial Herbicide: non-aerosol | 1/1/2002 | 3 |
| Odor Remover/Eliminator aerosol | 12/31/2010 | 25 |
| non-aerosol | 12/31/2010 | 6 |
| Oven Cleaner*: aerosol/pump spray | 1/1/93 | 8 |
| liquid | 1/1/93 | 5 |
| non-aerosol (including pump spray and liquid) | 12/31/2008 | 1 |
| [*See section 94509(p) for additional requirements that apply to Oven Cleaner.] | | |
| Paint Remover or Stripper | 1/1/2005 | 50 |
| Paint Thinner | 12/31/2010 12/31/2013 | 30 3 |
| [*See sections 94509(u), 94510(m), 94512(e), and 94513(g) for additional requirements that apply to Paint Thinner.] | | |
| Penetrant* | 1/1/2003 12/31/2013 | 50 25 |
| [*See section 94509(q) and 94513(f) for additional requirements that apply to Penetrant] | | |
| Personal Fragrance Product*: products with 20% or less fragrance | 1/1/95 1/1/99 | 80 75 |
| products with more than 20% fragrance | 1/1/95 1/1/99 | 70 65 |
| *See sections 94510(h), 94510(j), and 94510(l) for exemptions and requirements that apply to Personal Fragrance Products. | | |
| Pressurized Gas Duster* | 12/31/2010 | 1 |
| [*See section 94509(r) and 94510(c) for additional provisions that apply to Pressurized Gas Duster] | | |

| | | |
|--|------------------------|----------|
| Rubber/Vinyl Protectant: aerosol | 1/1/2005 | 10 |
| non-aerosol | 1/1/2003 | 3 |
| Sanitizer: aerosol | 12/31/2008 | 70 |
| non-aerosol | 12/31/2008 | 1 |
| Sealant or Caulking Compound* all forms | 12/31/2002 | 4 |
| Chemically Curing non-aerosol | 12/31/2012 | 3 |
| Non-chemically Curing non-aerosol | 12/31/2010 | 1.5 |
| ===== | | |
| [*See sections 94509(q) and 94512(d) for additional requirements that apply to Sealant or Caulking Compound] | | |
| Shaving Cream | 1/1/94 | 5 |
| Shaving Gel | 12/31/2006 | 7 |
| | 12/31/2009 | 4 |
| Silicone-based Multi-purpose Lubricant: (excluding solid or semisolid products) | 1/1/2005 | 60 |
| Spot Remover*: aerosol | 1/1/2001 12/31/2010 | 25 15 |
| non-aerosol | 1/1/2001 12/31/2010 | 8 3 |
| ===== | | |
| [*See section 94509(q) for additional requirements that apply to Spot Remover] | | |
| Temporary Hair Color: aerosol | 12/31/2010 | 55 |
| Tire or Wheel Cleaner aerosol | 12/31/2010 | 8 |
| non-aerosol | 12/31/2010 | 2 |
| Tire Sealant and Inflator | 12/31/2002 | 20 |

| | | |
|--|------------|----|
| Toilet/Urinal Care Product: [*] aerosol | 12/31/2006 | 10 |
| non-aerosol | 12/31/2006 | 3 |
| ===== | | |
| [*See section 94509(o) for additional requirements that apply to Toilet/Urinal Care Product] | | |
| Undercoating: aerosol | 1/1/2002 | 40 |
| Windshield Water Repellent | 12/31/2010 | 75 |
| Wood Cleaner: aerosol | 12/31/2006 | 17 |
| non-aerosol | 12/31/2006 | 4 |

¹ See section 94509(d) for the effective date of the VOC standards for products registered under FIFRA, and section 94509(c) and (d) for the "sell-through" allowed for products manufactured prior to the effective date of standards.

² See section 94510(c) for an exemption that applies to fragrances in consumer products, and section 94510(d) for an exemption that applies to LVP-VOCs.

(b) *Products that are diluted prior to use*

- (1) Except for "Automotive Windshield Washer Fluid (Dilutable)," for consumer products for which the label, packaging, or accompanying literature specifically states that the product should be diluted with water or non-VOC solvent prior to use, the limits specified in subsection (a) shall apply to the product only after the minimum recommended dilution has taken place. For purposes of this subsection (b), "minimum recommended dilution" shall not include recommendations for incidental use of a concentrated product to deal with limited special applications such as hard-to-remove soils or stains.
- (2) For consumer products for which the label, packaging, or accompanying literature states that the product should be diluted with any VOC solvent prior to use, the limits specified in subsection (a) shall apply to the product only after the maximum recommended dilution has taken place.
- (3) For "Automotive Windshield Washer Fluids (Dilutable)" for which the label, packaging, or accompanying literature front panel of the product label specifically states that the product should be diluted with water or non-VOC solvent (e.g. identified as a "concentrate") prior to use;
 - (A) the VOC limits specified in section 94509(a) shall apply to the product only after the minimum recommended dilution has taken place;
 - (B) for the purpose of complying with the VOC limits specified in section 94509(a), different dilution instructions for "Type A areas" and other areas of California

may be specified on the product label if the dilution instructions meet the following criteria:

1. The instructions are readily visible, and
2. The instructions can be easily understood by the consumer, and
3. The instructions clearly specify the recommended dilutions to apply in "Type A areas" and in other areas of California, and

If the dilution instructions specified on the product label meet these criteria, the VOC limits specified in section 94509(a) shall apply to the product only after the minimum recommended dilution has taken place for the area in which the product is sold, supplied, or offered for sale.

- (4) For products sold in pump spray containers, the VOC limits specified in section 94509(a) shall apply to the product prior to any minimum recommended dilution.

(c) *Self-through of products.*

- (1) *Self-through period.* Notwithstanding the provisions of Section 94509(a) or 94509(j), a consumer product manufactured prior to each of the effective dates specified for that product in the Table of Standards may be sold, supplied, or offered for sale for up to three years after each of the specified effective dates. This subsection (c) does not apply to:

- (A) any consumer product that does not display on the product container or package the date on which the product was manufactured, or a code indicating such date, or
- (B) any consumer product on which the manufacturer has used a code indicating the date of manufacture that is different than the code specified in section 94512(b)(2), but an explanation of the code has not been filed with the ARB Executive Officer by the deadlines specified in section 94512(c)(1) or section 94512(c)(2), or
- (C) Solid "Air Fresheners" and "Toilet/Urinal Care Product" that contain para-dichlorobenzene; these products are subject to the one-year self-through period specified in section 94509(o).
- (D) Products contained in multi-unit packages, as specified below:
 1. Subsection (c)(1) does not apply to any individual consumer products unit contained within a multi-unit package that is produced or assembled after January 1, 2006, where the multi-unit package does not display the date(s) or date-code(s) of the individual product units, or display the date of

assembly, such that the displayed information is not readily observable without irreversibly disassembling any portion of the container or packaging.

2. For the purposes of this section, "date of assembly" means the date that the individual product units are assembled into the finished multi-unit package.
3. For multi-unit packages that display the "date of assembly" instead of the date(s) or date-code(s) of the individual product units, the "date of assembly" shall be the "date of manufacture" for all of the product units contained within the multi-unit package. In other words, all of the product units shall be deemed to have been manufactured on the date these units are assembled into the multi-unit package, even if the individual product units show different date(s) or date-code(s).

(2) *Notification for products sold during the sell-through period.* Any person who sells or supplies a consumer product subject to the Table of Standards in section 94509 must notify the purchaser of the product in writing of the date on which the self-through period for that product will end, provided, however, that this notification must be given only if all of the following conditions are met:

- (A) the product is being sold or supplied to a distributor or retailer;
- (B) the sell-through period for the product will expire 6 months or less from the date the product is sold or supplied;
- (C) the product does not comply with the lowest VOC standard that applies on the date the sell-through period ends; and
- (D) the product is subject to a VOC standard with an effective date on or after December 31, 2004.

- (d) *Products registered under FIFRA.* For those consumer products that are registered under the Federal Insecticide, Fungicide, and Rodenticide Act, (FIFRA; 7 U.S.C. Section 136-136y), the effective date of the VOC standards specified in subsection (a) is one year after the date specified in the Table of Standards. For those consumer products that are registered under FIFRA, the three year period provided in subsection (c) shall also begin one year after the date specified in the Table of Standards.
- (e) *Products containing ozone-depleting compounds.* For any consumer product for which VOC standards are specified under subsection (a), no person shall sell, supply, offer for sale, or manufacture for sale in California any consumer product which contains any of the following ozone-depleting compounds:

CFC-11 (trichlorofluoromethane),
CFC-12 (dichlorodifluoromethane),

CFC-113 (1,1,1-trichloro-2,2,2-trifluoroethane),
 CFC-114 (1-chloro-1,1-difluoro-2-chloro-2,2-difluoroethane),
 CFC-115 (chloropentafluoroethane), halon 1211 (bromochlorodifluoromethane),
 halon 1301 (bromotrifluoromethane), halon 2402 (dibromotetrafluoroethane),
 HCFC-22 (chlorodifluoromethane),
 HCFC-123 (2,2-dichloro-1,1,1-trifluoroethane),
 HCFC-124 (2-chloro-1,1,1,2-tetrafluoroethane),
 HCFC-141b (1,1-dichloro-1-fluoroethane),
 HCFC-142b (1-chloro-1,1-difluoroethane), 1,1,1-trichloroethane, and carbon tetrachloride.

- (f) The requirements of section 94509 (e) shall not apply to any existing product formulation that complies with the Table of Standards or any existing product formulation that is reformulated to meet the Table of Standards, provided the ozone depleting compound content of the reformulated product does not increase.
- (g) The requirements of section 94509 (e) shall not apply to any ozone depleting compounds that may be present as impurities in a consumer product in an amount equal to or less than 0.01% by weight of the product.
- (h) *Requirements for charcoal lighter materials.* The following requirements shall apply to all charcoal lighter material products as defined in section 94508(a):
 - (1) *Regulatory Standards*
 - (A) In all areas of California except the South Coast Air Quality Management District, no person shall sell, supply, or offer for sale after January 1, 1993 any charcoal lighter material product unless at the time of the transaction:
 1. the manufacturer or distributor of the charcoal lighter material has been issued a currently effective certification pursuant to subsection (h)(2).
 2. the charcoal lighter material meets the formulation criteria and other conditions specified in the applicable Executive Order issued pursuant to subsection (h)(2).
 3. the product usage directions for the charcoal lighter material are the same as those provided to the Executive Officer pursuant to subsection (h)(2)(C).
 - (B) In the South Coast Air Quality Management District, the regulatory standards specified in subsection (h)(1)(A) shall be applicable upon the effective date of this subsection.

(2) *Certification Requirements*

- (A) No charcoal lighter material formulation shall be certified under this subsection unless the applicant for certification demonstrates to the Executive Officer's satisfaction that the VOC emissions from the ignition of charcoal with the charcoal lighter material are less than or equal to 0.020 pound of VOC per start, using the procedures specified in the South Coast Air Quality Management District Rule 1174 Ignition Method Compliance Certification Protocol, dated February 27, 1991 (the "SCAQMD Rule 1174 Testing Protocol"). The provisions relating to LVP-VOC in sections 94508(a) and 94510(d) shall not apply to any charcoal lighter material subject to the requirements of sections 94509(a) and (h).
- (B) The Executive Officer may approve alternative test procedures which are shown to provide equivalent results to those obtained using the SCAQMD Rule 1174 Testing Protocol.
- (C) A manufacturer or distributor of charcoal lighter material may apply to the Executive Officer for certification of a charcoal lighter material formulation in accordance with this subsection (h)(2). The application shall be in writing and shall include, at a minimum, the following:
1. the results of testing conducted pursuant to the procedures specified in SCAQMD Rule 1174 Testing Protocol.
 2. the exact text and/or graphics that will appear on the charcoal lighter material's principal display panel, label, and any accompanying literature. The provided material shall clearly show the usage directions for the product. These directions shall accurately reflect the quantity of charcoal lighter material per pound of charcoal that was used in the SCAQMD Rule 1174 Testing Protocol for that product, unless:
 - i) the charcoal lighter material is intended to be used in fixed amounts independent of the amount of charcoal used, such as certain paraffin cubes, or
 - ii) the charcoal lighter material is already incorporated into the charcoal, such as certain "bag light," "instant light," or "match light" products.
 3. For a charcoal lighter material which meets the criteria specified in subsection (h)(2)(C)(2.)(i), the usage instructions provided to the Executive Officer shall accurately reflect the quantity of charcoal lighter material used in the SCAQMD Rule 1174 Testing Protocol for that product.

4. Any physical property data, formulation data, or other information required by the Executive Officer for use in determining when a product modification has occurred and for use in determining compliance with the conditions specified on the Executive Order issued pursuant to section (h)(2).
- (D) Within 30 days of receipt of an application, the Executive Officer shall advise the applicant in writing either that it is complete or that specified additional information is required to make it complete. Within 30 days of receipt of additional information, the Executive Officer shall advise the applicant in writing either that the application is complete, or that specified additional information or testing is still required before it can be deemed complete.
 - (E) If the Executive Officer finds that an application meets the requirements of this subsection (h)(2), then he or she shall issue an Executive Order certifying the charcoal lighter material formulation and specifying such conditions as are necessary to insure that the requirements of this subsection (h) are met. The Executive Officer shall act on a complete application within 90 days after the application is deemed complete.

(3) Notice of Modifications

For any charcoal lighter material for which certification has been granted pursuant to subsection (h)(2), the applicant for certification shall notify the Executive Officer in writing within 30 days of: (i) any change in the usage directions, or (ii) any change in product formulation, test results, or any other information submitted pursuant to subsection (h)(2) which may result in VOC emissions greater than 0.020 pound of VOC per start.

(4) Revocation of Certification

If the Executive Officer determines that any certified charcoal lighter material formulation results in VOC emissions from the ignition of charcoal which are greater than 0.020 pound of VOC per start, as determined by the SCAQMD Rule 1174 Testing Protocol and the statistical analysis procedures contained therein, the Executive Officer shall revoke or modify the certification as is necessary to assure that the charcoal lighter material will result in VOC emissions of less than or equal to 0.020 pound of VOC per start. The Executive Officer shall not revoke or modify the prior certification without first affording the applicant for the certification an opportunity for a hearing in accordance with the procedures specified in Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 1, Article 4 (commencing with section 60040), to determine if the certification should be modified or revoked.

- (5) Notwithstanding any other provision of this subsection 94509(h), charcoal lighter material products manufactured prior to January 1, 1993, may be sold, supplied,

or offered for sale until July 1, 1994, in all areas of California except the South Coast Air Quality Management District. Charcoal lighter material products subject to SCAQMD Rule 1174 and sold, supplied, or offered for sale in the South Coast Air Quality Management District shall meet the requirements of section 94509(h) upon the effective date of this subsection, regardless of the date on which the products were manufactured.

- (i) *Requirements for aerosol adhesives* (as defined in sections 94508(a)(1) and 94508(a)(3)).
 - (1) As specified in Health and Safety Code section 41712(h)(2), the standards for aerosol adhesives apply to all uses of aerosol adhesives, including consumer, industrial, and commercial uses. Except as otherwise provided in sections 94509(c), 94510, 94511, and 94514, no person shall sell, supply, offer for sale, use or manufacture for sale in California any aerosol adhesive which, at the time of sale, use, or manufacture, contains VOCs in excess of the specified standard.
 - (2)(A) In order to qualify as a "Special Purpose Spray Adhesive" the product must meet one or more of the definitions for "Special Purpose Spray Adhesive" specified in section 94508(a); but if the product label indicates that the product is suitable for use on any substrate or application not listed in one of the definitions for "Special Purpose Spray Adhesive," then the product shall be classified as either a "Web Spray Adhesive" or a "Mist Spray Adhesive."
 - (B) If a product meets more than one of the definitions specified in section 94508(a) for "Special Purpose Spray Adhesive," and is not classified as a "Web Spray Adhesive" or "Mist Spray Adhesive" under subsection (2)(A), then the VOC limit for the product shall be the lowest applicable VOC limit specified in section 94509(a).
 - (3) Effective 1/1/2002, no person shall sell, supply, offer for sale, or manufacture for use in California any aerosol adhesive which contains any of the following compounds: methylene chloride, perchloroethylene, or trichloroethylene, except that an aerosol adhesive manufactured before 1/1/2002 may be sold, supplied, or offered for sale until 1/1/2005, so long as the product container or package displays the date on which the product was manufactured, or a code indicating such date product complies with product dating requirements in section 94512(b).
 - (4) All aerosol adhesives must comply with the labeling requirements specified in section 94512(d), and all manufacturers and responsible parties for aerosol adhesives must comply with the special reporting requirements specified in section 94513(d).

- (j) *Requirements for Floor Wax Strippers.* After an effective date of January 1, 2002, no person shall sell, supply, offer for sale, or manufacture for use in California any floor wax stripper unless the following requirements are met:
 - (1) The label of each non-aerosol floor wax stripper must specify a dilution ratio for light or medium build-up of polish that results in an as-used VOC concentration of 3 percent by weight or less.
 - (2) If a non-aerosol floor wax stripper is also intended to be used for removal of heavy build-up of polish, the label of that floor wax stripper must specify a dilution ratio for heavy build-up of polish that results in an as-used VOC concentration of 12 percent by weight or less.
 - (3) The terms "light build-up," "medium build-up" or "heavy build-up" are not specifically required, as long as comparable terminology is used.
- (k) *Effective dates of the VOC limits for "Carburetor or Fuel-injection Air Intake Cleaners" and "Construction, Panel, and Floor Covering Adhesives."* "The definitions for the product categories of "Carburetor or Fuel-injection Air Intake Cleaners" and "Construction, Panel, and Floor Covering Adhesives" were modified as part of the "Mid-term Measures II" rulemaking action that was considered by the Board in October 1999. As a result of these modifications, certain types of consumer products were included in these definitions that had not previously been included. For those consumer products that were included in these definitions for the first time as a result of the "Mid-term Measures II" rulemaking action, the VOC limits (in section 94509(a)) applicable to these newly included products shall not become legally effective until December 31, 2002.
- (l) *Automotive Windshield Washer Fluids.* The provisions of subsection 94509(b)(1) shall not apply to "Automotive Windshield Washer Fluid (Pre-Mixed)" as defined in section 94508(a).
- (m) *Requirements for Contact Adhesives, Electronic Cleaners, Footwear or Leather Care Products, and General Purpose Degreasers.*
 - (1) Except as provided below in sections 94509(m)(2) and (m)(4), effective December 31, 2005, no person shall sell, supply, offer for sale, or manufacture for use in California any Contact Adhesive, Electronic Cleaner, Footwear or Leather Care Product, or General Purpose Degreaser that contains any of the following compounds: methylene chloride, perchloroethylene, or trichloroethylene.
 - (2) *Sell-through of Products.* Contact Adhesives, Electronic Cleaners, Footwear or Leather Care Products, and General Purpose Degreasers that contain

methylene chloride, perchloroethylene, or trichloroethylene and were manufactured before December 31, 2005, may be sold, supplied, or offered for sale until December 31, 2008, so long as the ~~product container or package displays the date on which the product was manufactured, or a code indicating such date~~ product complies with product dating requirements in section 94512(b).

- (3) *Notification for products sold during the sell-through period.* Any person who sells or supplies a consumer product identified above in section 94509(m)(1) must notify the purchaser of the product in writing that the sell-through period for that product will end on December 31, 2008, provided, however, that this notification must be given only if both of the following conditions are met:

(A) the product is sold or supplied to a distributor or retailer; and

(B) the product is sold or supplied on or after June 30, 2008.

- (4) *Impurities.* The requirements of section 94509(m)(1) and (m)(3) shall not apply to any Contact Adhesive, Electronic Cleaner, Footwear or Leather Care Product, or General Purpose Degreaser containing methylene chloride, perchloroethylene, or trichloroethylene that is present as an impurity in a combined amount equal to or less than 0.01% by weight.

(n) *Requirements for Adhesive Removers, Electrical Cleaners, and Graffiti Removers.*

- (1) Except as provided below in sections 94509(n)(2) and (n)(4), effective December 31, 2006, no person shall sell, supply, offer for sale, or manufacture for use in California any Adhesive Remover, Electrical Cleaner, or Graffiti Remover that contains any of the following compounds: methylene chloride, perchloroethylene, or trichloroethylene.

- (2) *Sell-through of Products.* Adhesive Removers, Electrical Cleaners, and Graffiti Removers that contain methylene chloride, perchloroethylene, or trichloroethylene and were manufactured before December 31, 2006, may be sold, supplied, or offered for sale until December 31, 2009, so long as the ~~product container or package displays the date on which the product was manufactured, or a code indicating such date~~ product complies with product dating requirements in section 94512(b).

- (3) *Notification for products sold during the sell-through period.* Any person who sells or supplies a consumer product identified above in section 94509(n)(1) must notify the purchaser of the product in writing that the sell-through period for that product will end on December 31, 2009, provided, however, that this notification must be given only if both of the following conditions are met:

(A) the product is sold or supplied to a distributor or retailer; and

(B) the product is sold or supplied on or after June 30, 2009.

- (4) *Impurities.* The requirements of section 94509(n)(1) and (n)(3) shall not apply to any Adhesive Remover, Electrical Cleaner, or Graffiti Remover containing methylene chloride, perchloroethylene, or trichloroethylene that is present as an impurity in a combined amount equal to or less than 0.01% by weight.

(o) *Requirements for Solid Air Fresheners and Toilet/Urinal Care Products.*

- (1) Effective December 31, 2005, no person shall sell, supply, offer for sale, or manufacture for use in California any Solid Air Fresheners or Toilet/Urinal Care Products that contain para-dichlorobenzene, except that those Solid Air Fresheners and Toilet/Urinal Care Products that contain para-dichlorobenzene and were manufactured before December 31, 2005 may be sold, supplied, or offered for sale until December 31, 2006, so long as the product container or package displays the date on which the product was manufactured, or a code indicating such date.

- (2) *Notification for products sold during the sell-through period.* Any person who sells or supplies any Solid Air Freshener or Toilet/Urinal Care Product that contains para-dichlorobenzene must notify the purchaser of the product in writing that the sell-through period for the product will end on December 31, 2006, provided, however, that this notification must be given only if both of the following conditions are met:

(A) the product is sold or supplied to a distributor or retailer; and

(B) the product is sold or supplied on or after June 30, 2006.

(p) *Requirements for Bathroom and Tile Cleaners, Construction, Panel, and Floor Covering Adhesives, electronic cleaners labeled as energized electronic equipment use only, General Purpose Cleaners, and Oven Cleaners.*

- (1) Except as provided below in sections 94509(p)(2) and (p)(4), effective December 31, 2008, no person shall sell, supply, offer for sale, or manufacture for use in California any Bathroom and Tile Cleaner, Construction, Panel, and Floor Covering Adhesive, electronic cleaners labeled as energized electronic equipment use only, General Purpose Cleaner, or Oven Cleaner that contains any of the following compounds: methylene chloride, perchloroethylene, or trichloroethylene.

- (2) *Sell-through of Products.* Bathroom and Tile Cleaners, Construction, Panel, and Floor Covering Adhesives, electronic cleaners labeled as energized electronic equipment use only, General Purpose Cleaners, and Oven

Cleaners that contain methylene chloride, perchloroethylene, or trichloroethylene and were manufactured before December 31, 2008, may be sold, supplied, or offered for sale until December 31, 2011, so long as the product complies with the product dating requirements in section 94512(b)

- (3) *Notification for products sold during the sell-through period.* Any person who sells or supplies a consumer product identified above in section 94509(p)(1) must notify the purchaser of the product in writing that the sell-through period for that product will end on December 31, 2011, provided, however, that this notification must be given only if both of the following conditions are met:

(A) the product is sold or supplied to a distributor or retailer; and

(B) the product is sold or supplied on or after June 30, 2011.

- (4) *Impurities.* The requirements of section 94509(p)(1) and (p)(3) shall not apply to any Bathroom and Tile Cleaner, Construction, Panel, and Floor Covering Adhesive, electronic cleaner labeled as energized electronic equipment use only, General Purpose Cleaner, or Oven Cleaner containing methylene chloride, perchloroethylene, or trichloroethylene that is present as an impurity in a combined amount equal to or less than 0.01% by weight.

- (q) *Requirements for Carpet/Upholstery Cleaner, Fabric Protectant, Multi-Purpose Lubricant, Penetrant, Sealant or Caulking Compound, and Spot Remover.*

- (1) Except as provided below in sections 94509(q)(2), (q)(4), and (q)(5), effective December 31, 2010, no person shall sell, supply, offer for sale, or manufacture for use in California any Carpet/Upholstery Cleaner, Fabric Protectant, Multi-Purpose Lubricant, Penetrant, Sealant or Caulking Compound, or Spot Remover that contains any of the following compounds: methylene chloride, perchloroethylene, or trichloroethylene.

- (2) *Sell-through of Products.* Carpet/Upholstery Cleaners, Fabric Protectants, Multi-Purpose Lubricants, Penetrants, Sealant or Caulking Compound and Spot Removers that contain methylene chloride, perchloroethylene, or trichloroethylene and were manufactured before December 31, 2010, may be sold, supplied, or offered for sale until December 31, 2013, so long as the product complies with the product dating requirements in section 94512(b).

- (3) *Notification for products sold during the sell-through period.* Any person who sells or supplies a consumer product identified above in section 94509(q)(1) must notify the purchaser of the product in writing that the sell-through period for that product will end on December 31, 2013, provided, however, that this notification must be given only if both of the following conditions are met:

(A) the product is sold or supplied to a distributor or retailer; and

(B) the product is sold or supplied on or after June 30, 2013.

(4) *Impurities.* The requirements of section 94509(q)(1) and (q)(3) shall not apply to any Carpet/Upholstery Cleaner, Fabric Protectant, Multi-Purpose Lubricant, Penetrant, Sealant or Caulking Compound, or Spot Remover containing methylene chloride, perchloroethylene, or trichloroethylene that is present as an impurity in a combined amount equal to or less than 0.01% by weight.

(5) The requirements of this section 94509(q) shall not apply to "Penetrant" products used on equipment when electrical current exists; residual electrical potential from a component exists; or an open flame exists, as long as the "Principal Display Panel" clearly displays the statement: "Non-flammable: For use on energized equipment only."

(r) *Requirements for Pressurized Gas Duster.*

(1) Except as provided below in sections 94509(r)(2) and (r)(3), effective December 31, 2010, no person shall sell, supply, offer for sale, or manufacture for use in California any Pressurized Gas Duster product that contains methylene chloride, perchloroethylene, or any chemical compound that has a Global Warming Potential (GWP) Value of 150 or greater.

(2) *Sell-through of Products.* Pressurized Gas Duster products that contain any chemical compound that has a GWP Value greater than 150, and were manufactured before December 31, 2010, may be sold, supplied, or offered for sale until December 31, 2011, so long as the product complies with the product dating requirements in section 94512(b).

(3) *Notification for products sold during the sell-through period.* Any person who sells or supplies a Pressurized Gas Duster identified above in section 94509(r)(2) must notify the purchaser of the product, in writing, that the sell-through period for that product will end on December 31, 2011, provided, however, that this notification must be given only if both of the following conditions are met:

(A) the product is sold or supplied to a distributor or retailer; and

(B) the product is sold or supplied on or after June 30, 2011.

(4) The provisions relating to fragrance in section 94510(c) shall not apply to any Pressurized Gas Duster subject to the requirements of this subsection 94509(r).

(5) *Impurities.* The requirements of section 94509(r)(1), (r)(2), and (r)(3) shall not apply to any Pressurized Gas Duster containing any chemical compound that

is present as an impurity in a combined amount equal to or less than 0.1% by weight.

(s) *Requirements for Fabric Softener – Single Use Dryer Product.*

- (1) Effective December 31, 2010, Fabric Softener – Single Use Dryer Product shall not contain more than 0.05 grams of VOC per use. Compliance with the VOC limit shall be determined per sheet, or equivalent delivery substrate, based on the minimum recommended use for a single drying cycle specified on the product packaging or label. In other words, if one sheet is the minimum recommended use for a single drying cycle, then the VOC limit applies per sheet. If two sheets are the minimum recommended use for a single drying cycle, then the VOC limit applies to the aggregate VOC content in two sheets. For purposes of this subsection, "minimum recommended use" shall not include recommendations for incidental use of additional sheets, or equivalent delivery substrate, for limited applications such as for extra large or double loads of washable fabrics in large capacity clothes dryers.
- (2) The provisions relating to fragrance in section 94510(c) shall not apply to Fabric Softener – Single Use Dryer Product subject to the requirements of this subsection 94509(s)(1).

(t) *Requirements for Double Phase Aerosol Air Freshener.*

- (1) Except as provided below in sections 94509(t)(2) and (t)(4), effective December 31, 2012, no person shall sell, supply, offer for sale, or manufacture for use in California any Double Phase Aerosol Air Freshener that contains any chemical compound that has a Global Warming Potential (GWP) Value of 150 or greater.
- (2) Sell-through of Products. Double Phase Aerosol Air Fresheners that contain any chemical compound that has a GWP Value of 150 or greater, and were manufactured before December 31, 2012, may be sold, supplied, or offered for sale until December 31, 2015, so long as the product complies with the product dating requirements in section 94512(b).
- (3) Notification for products sold during the sell-through period. Any person who sells or supplies a Double Phase Aerosol Air Freshener identified above in section 94509(t)(2) must notify the purchaser of the product, in writing, that the sell-through period for that product will end on December 31, 2015, provided, however, that this notification must be given only if both of the following conditions are met:
 - (A) the product is sold or supplied to a distributor or retailer; and
 - (B) the product is sold or supplied on or after June 30, 2015.

(4) Impurities. The requirements of section 94509(t)(1), (t)(2), and (t)(3) shall not apply to any chemical compound that is present as an impurity in a combined amount equal to or less than 0.1% by weight.

(u) Requirements for Multi-purpose Solvent and Paint Thinner.

(1) Except as provided below in sections 94509(u)(2) and (u)(4), effective December 31, 2010, no person shall sell, supply, offer for sale, or manufacture for use in California any Multi-purpose Solvent or Paint Thinner that contains any of the following:

(A) chemical compounds that have a Global Warming Potential (GWP) Value of 150 or greater;

(B) methylene chloride, perchloroethylene, or trichloroethylene;

(C) greater than 1% "Aromatic Compounds" by weight.

(2) Sell-through of Products. Multi-purpose Solvents and Paint Thinners that contain any chemical compound that has a GWP Value of 150 or greater; methylene chloride, perchloroethylene, or trichloroethylene; or greater than 1% "Aromatic Compounds" by weight; and were manufactured before December 31, 2010, may be sold, supplied, or offered for sale until December 31, 2013, so long as the product complies with the product dating requirements in section 94512(b).

(3) Notification for products sold during the sell-through period. Any person who sells or supplies a consumer product identified above in section 94509(u)(2) must notify the purchaser of the product in writing that the sell-through period for that product will end on December 31, 2013, provided, however, this notification must be given only if both of the following conditions are met:

(A) the product is sold or supplied to a distributor or retailer; and

(B) the product is sold or supplied on or after June 30, 2013.

(4) Impurities. The requirements of section 94509(u)(1), (u)(2) and (u)(3) shall not apply to any Multi-purpose Solvent, or Paint Thinner that contains any of the following:

(A) chemical compounds that have a Global Warming Potential (GWP) Value of 150 or greater and are present as impurities in a combined amount equal to or less than 0.1% by weight;

(B) methylene chloride, perchloroethylene, or trichloroethylene that is present as an impurity in a combined amount equal to or less than 0.01% by weight.

NOTE: Authority cited: Sections 38500, 38501, 38510, 38560, 38560.5, 38562, 38580, 39600, 39601, 39650, 39658, 39659, 39666, and 41712, Health and Safety Code.
Reference: Sections 38505, 39002, 39600, 39650, 39655, 39656, 39658, 39659, 39666, 40000, and 41712, Health and Safety Code.

§ 94510. Exemptions.

- (a) This article shall not apply to any consumer product manufactured in California for shipment and use outside of California.
- (b) The provisions of this article shall not apply to a manufacturer or distributor who sells, supplies, or offers for sale in California a consumer product that does not comply with the VOC standards specified in Section 94509, as long as the manufacturer or distributor can demonstrate both that the consumer product is intended for shipment and use outside of California, and that the manufacturer or distributor has taken reasonable prudent precautions to assure that the consumer product is not distributed to California. This subsection (b) does not apply to consumer products that are sold, supplied, or offered for sale by any person to retail outlets in California.
- (c) Except for Fabric Softener – Single Use Dryer Product and Pressurized Gas Duster, the VOC limits specified in Section 94509(a) shall not apply to fragrances up to a combined level of 2 percent by weight contained in any consumer product.
- (d) The VOC limits specified in Section 94509(a) shall not apply to any LVP-VOC.
- (e) The requirements of Section 94512(b) shall not apply to consumer products registered under the Federal Insecticide, Fungicide, and Rodenticide Act, (FIFRA; 7 U.S.C. Section 136-36y).
- (f) The VOC limits specified in Section 94509(a) shall not apply to air fresheners that are comprised entirely of fragrance, less compounds not defined as VOCs under Section 94508 or exempted under Section 94510(d).
- (g) The VOC limits specified in Section 94509(a) shall not apply to:
 - (1) insecticides containing at least 98% para-dichlorobenzene.
 - (2) Until December 30, 2006, the VOC limits specified in Section 94509(a) shall not apply to solid air fresheners containing at least 98% para-dichlorobenzene. On or after December 31, 2006, the provisions of section 94509(o) apply to solid air fresheners containing para-dichlorobenzene.

- (h) Except as specified in 94510(h)(3) below, the VOC limits specified in Section 94509(a) shall not apply to:
- (1) existing personal fragrance products or personal fragrance products in development on or before April 1, 1992, provided that both (i) the registration data specified in section 94513 is submitted for every such product by the date specified in section 94513(a), or prior to July 1, 1993, whichever date occurs later, and (ii) such product is sold in California prior to January 1, 1994. For the purposes of this subsection, a product "in development" means:
 - (A) a product which a fragrance materials manufacturer is designing at the request of a personal fragrance product manufacturer, or
 - (B) a product which is the subject of a written marketing profile or other documentation authorizing the creation and marketing of the product.
 - (2) personal fragrance products in development may be registered to qualify for this exemption under hypothetical trade names or pseudonyms, provided that the actual trade name is supplied to the Executive Officer within 30 days of marketing such products, or January 1, 1994, whichever occurs first.
 - (3) Effective December 31, 2014, subsections 94510(h)(1) and 94510(h)(2) shall no longer apply to any "Personal Fragrance Product" that contains 20 percent or less fragrance. Products manufactured before December 31, 2014 may be sold, supplied, or offered for sale until December 31, 2017, so long as the product complies with the product dating requirements in Section 94512(b).
- (i) The VOC limits specified in Section 94509(a) shall not apply to adhesives sold in containers of 1 fluid ounce or less.
- (j) The VOC limits specified in Section 94509(a) shall not apply to any VOC which is a fragrance in a personal fragrance product.
- (k) The VOC limits specified in Section 94509(a) shall not apply to bait station insecticides. For the purpose of this section, bait station insecticides are containers enclosing an insecticidal bait that is not more than 0.5 ounce by weight, where the bait is designed to be ingested by insects and is composed of solid material feeding stimulants with less than 5 percent (%) active ingredients.
- (l) Except as specified in 94510(l)(1), the 1/1/99 VOC limits specified in Section 94509(a) for personal fragrance products shall not apply to such products which have been sold in California prior to 1/1/99.
- (1) On or after December 31, 2014, the 75 percent by weight VOC limit shall apply to any "Personal Fragrance Product" that contains 20 percent or less fragrance.

Products manufactured before December 31, 2014 may be sold, supplied, or offered for sale until December 31, 2017, so long as the product complies with the product dating requirements in Section 94512(b).

- (m) Until December 31, 2013, the VOC limits specified in Section 94509(a), and the prohibition of Aromatic Compounds listed in section 94509(u)(5), shall not apply to Paint Thinners that are packaged in containers with a capacity less than or equal to 8 fluid ounces.

NOTE: Authority cited: Sections 39600, 39601 and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

§ 94511. Innovative Products.

- (a) The Executive Officer shall exempt a consumer product from the VOC limits specified in Section 94509(a) if a manufacturer demonstrates by clear and convincing evidence that, due to some characteristic of the product formulation, design, delivery systems or other factors, the use of the product will result in less VOC emissions as compared to:
- (1) the VOC emissions from a representative consumer product which complies with the VOC limits specified in Section 94509(a), or
 - (2) the calculated VOC emissions from a noncomplying representative product, if the product had been reformulated to comply with the VOC limits specified in section 94509(a). VOC emissions shall be calculated using the following equation:

$$E_R = E_{NC} \times \text{VOC}_{STD} \div \text{VOC}_{NC}$$

where:

E_R = The VOC emissions from the noncomplying representative product, had it been reformulated.

E_{NC} = The VOC emissions from the noncomplying representative product in its current formulation.

VOC_{STD} = the VOC limit specified in 94509(a).

VOC_{NC} = the VOC content of the noncomplying product in its current formulation.

If a manufacturer demonstrates that this equation yields inaccurate results due to some characteristic of the product formulation or other factors, an alternative method which accurately calculates emissions may be used upon approval of the Executive Officer.

- (b) For the purposes of this section, "representative consumer product" means a consumer product which meets all of the following criteria:
- (1) the representative product shall be subject to the same VOC limit in Section 94509(a) as the innovative product.
 - (2) the representative product shall be of the same product form as the innovative product, unless the innovative product uses a new form which does not exist in the product category at the time the application is made.
 - (3) the representative product shall have at least similar efficacy as other consumer products in the same product category based on tests generally accepted for that product category by the consumer products industry.
- (c) A manufacturer shall apply in writing to the Executive Officer for any exemption claimed under subsection (a). The application shall include the supporting documentation that demonstrates the reduction of emissions from the innovative product, including the actual physical test methods used to generate the data and, if necessary, the consumer testing undertaken to document product usage. In addition, the applicant must provide any information necessary to enable the Executive Officer to establish enforceable conditions for granting the exemption including the VOC content for the innovative product and test methods for determining the VOC content. All information submitted by a manufacturer pursuant to this section shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022.
- (d) Within 30 days of receipt of the exemption application the Executive Officer shall determine whether an application is complete as provided in section 60030(a), Title 17, California Code of Regulations.
- (e) Within 90 days after an application has been deemed complete, the Executive Officer shall determine whether, under what conditions, and to what extent, an exemption from the requirements of Section 94509(a) will be permitted. The applicant and the Executive Officer may mutually agree to a longer time period for reaching a decision, and additional supporting documentation may be submitted by the applicant before a decision has been reached. The Executive Officer shall notify the applicant of the decision in writing and specify such terms and conditions that are necessary to ~~insure~~ensure that emissions from the product will meet the emissions reductions specified in subsection (a), and that such emissions reductions can be enforced.
- (f) In granting an exemption for a product the Executive Officer shall establish conditions that are enforceable. These conditions shall include the VOC content of the innovative product, dispensing rates, application rates, ~~application rates~~, and any other parameters determined by the Executive Officer to be necessary. The Executive Officer shall also specify the test methods for determining conformance to

the conditions established. The test methods shall include criteria for reproducibility, accuracy, and sampling and laboratory procedures.

- (g) For any product for which an exemption has been granted pursuant to this section, the manufacturer shall notify the Executive Officer in writing within 30 days of any change in the product formulation or recommended product usage directions, and shall also notify the Executive Officer within 30 days if the manufacturer learns of any information which would alter the emissions estimates submitted to the Executive Officer in support of the exemption application.
- (h) If the VOC limits specified in Section 94509(a) are lowered for a product category through any subsequent rulemaking, all innovative product exemptions granted for products in the product category, except as provided in this subsection (h), shall have no force and effect as of the effective date of the modified VOC standard. This subsection (h) shall not apply to those innovative products which have VOC emissions less than the applicable lowered VOC limit and for which a written notification of the product's emissions status versus the lowered VOC limit has been submitted to and approved by the Executive Officer at least 60 days before the effective date of such limits.
- (i) If the Executive Officer believes that a consumer product for which an exemption has been granted no longer meets the criteria for an innovative product specified in subsection (a), the Executive Officer may modify or revoke the exemption as necessary to assure that the product will meet these criteria. The Executive Officer shall not modify or revoke an exemption without first affording the applicant an opportunity for a public hearing held in accordance with the procedures specified in Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 1, Article 4 (commencing with Section 60040), to determine if the exemption should be modified or revoked.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

§ 94512. Administrative Requirements.

(a) Most Restrictive Limit.

(1) Products Manufactured Before January 1, 2007, and FIFRA-registered Insecticides Manufactured Before January 1, 2008. Notwithstanding the definition of "Product Category" in Section 94508, if anywhere on the principal display panel of any consumer product manufactured before January 1, 2007, or any FIFRA-registered insecticide manufactured before January 1, 2008, any representation is made that the product may be used as, or is suitable for use as a consumer product for which a lower VOC limit is specified in Section 94509(a), then the lowest VOC limit shall apply. This requirement does not apply to general purpose cleaners and insecticide foggers.

(2) *Products Manufactured on or After January 1, 2007, and FIFRA-registered Insecticides Manufactured on or After January 1, 2008.* Notwithstanding the definition of "product category" in Section 94508, if anywhere on the container or packaging of any consumer product manufactured on or after January 1, 2007, or any FIFRA-registered insecticide manufactured on or after January 1, 2008, or on any sticker or label affixed thereto, any representation is made that the product may be used as, or is suitable for use as a consumer product for which a lower VOC limit is specified in Section 94509(a), then the lowest VOC limit shall apply. This requirement does not apply to general purpose cleaners and insecticide foggers.

(3) *Rules that Apply when a Product Category Definition Excludes Other Product Categories.*

If a definition of a regulated product category in section 94508(a) states that the product category "does not include" one or more other product categories, the "most restrictive limit" provisions of section 94512(a) apply to regulated products that meet the definition of the regulated product category and also make any representation that the regulated product may be used as (or is suitable for use as) a product that falls within one or more of the excluded product categories. Notwithstanding the foregoing above, this provision does not apply to "Disinfectant"/"Sanitizer" products labeled as "Bathroom and Tile Cleaners," "Glass Cleaners," "General Purpose Cleaners," "Toilet/Urinal Care Products," "Metal Polishes," "Carpet Cleaners," or "Fabric Refreshers" that may also make disinfecting/sanitizing or anti-microbial claims on the label.

For example, if the definition for Regulated Product Category A states that it "does not include" Regulated Product Category B, then the "most restrictive limit" provisions apply to a regulated product that meets the definition of Regulated Product Category A, but also makes a representation that it may be used as (or is suitable for use as) Regulated Product Category B. In other words, if the regulated product makes any representation that it may be used as (or is suitable for use as) Regulated Category Product B, then the regulated product would be subject to the lowest VOC limit specified in section 94509(a) for either Product Category A or Product Category B.

For the purposes of this section:

"Regulated product" means a consumer product for which a VOC standard is specified in section 94509(a), and

"Representation" has the same meaning as used above in subsections 94512(a)(1) and 94512(a)(2) (i.e., what statements qualify as a "representation" depends on the date the product was manufactured and whether the statements appear on the "principal display panel" or other parts of the product container or packaging.)

(b) *Product Dating.*

- (1) Each manufacturer of a consumer product subject to Section 94509 shall clearly display on each consumer product container or package, the day, month, and year on which the product was manufactured, or a code indicating such date. Codes that represent a sequential batch number, or that otherwise cannot be attributed to a specific day, month, and year, do not satisfy this requirement.
- (2) A manufacturer who uses the following code to indicate the date of manufacture shall not be subject to the requirements of section 94512(c)(1), if the code is represented separately from other codes on the product container so that it is easily recognizable:

YY DDD = year year day day day

Where: "YY" = two digits representing the year in which the product was manufactured, and

"DDD" = three digits representing the day of the year on which the product was manufactured, with "001" representing the first day of the year, "002" representing the second day of the year, and so forth (i.e. the "Julian date").

- (3) This date or code shall be displayed on each consumer product container or package no later than twelve months prior to the effective date of the applicable standard specified in Section 94509.
- (4) Except as otherwise provided in subsection (b)(5), for products manufactured on or after January 1, 2006, the date or code shall be displayed on the product container such that it is readily observable without irreversibly disassembling any portion of the product container or packaging. For the purposes of this subsection, information may be displayed on the bottom of a container as long as it is clearly legible without removing any product packaging.

(5) *Products Sold in Multi-unit Packages.*

- (A) Products sold, supplied, or offered for sale in multi-unit packages are not required to comply with subsection (b)(4).
- (B) If a multi-unit package does not comply with subsection (b)(4), the "sell-through" provisions of section 94509(c)(1) shall not apply to the individual product units contained within the multi-unit package. In other words, if any multi-unit package produced or assembled after January 1, 2006, does not display the date(s) or date-code(s) of the product units, such that the displayed information is readily observable without irreversibly disassembling any portion of the container or packaging, the

individual product units shall be subject to the VOC standards in effect when the multi-unit package is sold, supplied, or offered for sale, regardless of the date on which the product units were manufactured.

- (C) A multi-unit package may comply with subsection (b)(4) by displaying the date of assembly instead of the date(s) or date-code(s) of the individual product units, so long as the date of assembly is readily observable without irreversibly disassembling any portion of the container or packaging. The "date of assembly" means the date that the individual product units are assembled into the finished multi-unit package. If the date of assembly is displayed instead of the individual date(s) or date-code(s), the "date of assembly" shall be the "date of manufacture" for all of the product units contained within the multi-unit package. In other words, all of the product units shall be deemed to have been manufactured on the date these units are assembled into the multi-unit package, even if the individual product units show different date(s) or date-code(s), and the "date of assembly" shall be "date of manufacture" of each product unit for the purposes of applying the "sell-through" provisions of section 94509(c).

(6) The requirements of this subsection (b) shall not apply to:

- (A) personal fragrance products of 2 milliliters or less, which are offered to consumers free of charge for the purpose of sampling the product; or
- (B) products containing no VOCs (as defined in section 94508), or containing VOCs at 0.10% by weight or less.

(c) *Additional Product Dating Requirements.*

- (1) If a manufacturer uses a code indicating the date of manufacture, for any consumer product subject to section 94509 an explanation of the code must be filed with the Executive Officer of the ARB no later than twelve months prior to the effective date of the applicable standard specified in section 94509. Thereafter, manufacturers using a code must file an explanation of the code with the Executive Officer on an annual basis, beginning in 2006. The explanation of the code must be received by the Executive Officer on or before January 31st of each year, with the first explanation due on or before January 31, 2006.
- (2) If a manufacturer changes any code indicating the date of manufacture for any consumer product subject to subsection (c)(1), an explanation of the modified code must be received by the Executive Officer before any products displaying the modified code are sold, supplied, or offered for sale in California.

- (3) No person shall erase, alter, deface, or otherwise remove or make illegible any date or code indicating the date of manufacture from any regulated product container without the express authorization of the manufacturer.
- (4) Codes indicating the date of manufacture are public information and may not be claimed as confidential.

(d) *Additional Labeling Requirements for Aerosol Adhesive, Adhesive Remover, Electronic Cleaner, Electrical Cleaner, Energized Electrical Cleaner, Contact Adhesive, and Sealant or Caulking Compound (non-aerosol).*

- (1) In addition to the requirements specified in subsections (a), (b), and (c), both the manufacturer and responsible party for each aerosol adhesive, adhesive remover, electronic cleaner, electrical cleaner, energized electrical cleaner, contact adhesive product, and sealant or caulking compound (non-aerosol) subject to this article shall ensure that all products clearly display the following information on each product container which is manufactured on or after the effective date for the category specified in section 94509(a), except that for non-chemically curing sealant or caulking compound (non-aerosol), the effective date of this requirement is December 31, 2010, and for chemically curing sealant or caulking compound (non-aerosol), the effective date of this requirement is December 31, 2012:

- (A) The product category as specified in section 94509(a) or an abbreviation of the category shall be displayed;
- (B)
 - 1. The applicable VOC standard for the product that is specified in section 94509(a), except for Energized Electrical Cleaner, expressed as a percentage by weight, shall be displayed unless the product is included in an alternative control plan approved by the Executive Officer, as provided in Article 4, Sections 94540-94555, Title 17, California Code of Regulations, and the product exceeds the applicable VOC standard;
 - 2. If the product is included in an alternative control plan approved by the Executive Officer, and the product exceeds the applicable VOC standard specified in section 94509(a), the product shall be labeled with the term "ACP" or "ACP product;"
- (C) If the product is classified as a special purpose spray adhesive, the applicable substrate and/or application or an abbreviation of the substrate/application that qualifies the product as special purpose shall be displayed;
- (D) If the manufacturer or responsible party uses an abbreviation as allowed by this subsection 94512(d)(1)(A), an explanation of the abbreviation must be filed with the Executive Officer before the abbreviation is used.

- (2) The information required in section 94512(d)(1), shall be displayed on the product container such that it is readily observable without removing or disassembling any portion of the product container or packaging. For the purposes of this subsection, information may be displayed on the bottom of a container as long as it is clearly legible without removing any product packaging.
- (3) No person shall remove, alter, conceal, or deface the information required in section 94512(d)(1) prior to final sale of the product.

(e) Additional Requirements for Multi-purpose Solvent and Paint Thinner.

- (1) In addition to the requirements specified in section 94512(a), (b), and (c), both the manufacturer and responsible party for each Multi-purpose Solvent and Paint Thinner sold or offered for sale in areas of California outside the South Coast Air Quality Management District shall ensure that all products manufactured on or after the effective date for the category specified in section 94509(a), meet the following requirements:
 - (A) Each product container must clearly display the VOC content in percent by weight as determined from actual formulation data.
 - (B) The information required by this subsection 94512(e)(1), shall be displayed on the product container such that it is readily observable without removing or disassembling any portion of the product container or packaging.
 - (C) No person shall remove, alter, conceal, or deface the information required by this subsection 94512(e)(1) prior to final sale of the product.
- (2) In addition to the requirements specified in section 94512(a), (b), (c), and (e)(1):
 - (A) Except as provided below in section 94512(e)(2)(B), effective December 31, 2010, until December 31, 2015, no person shall sell, supply, offer for sale, or manufacture for use in California any "Flammable" or "Extremely Flammable" Multi-purpose Solvent or Paint Thinner named, on the Principle Display Panel as "Paint Thinner," "Multi-purpose Solvent," "Clean-up Solvent," or "Paint Clean-up."
 - (B) Section 94512(e)(2)(A) does not apply to products that meet any of the following criteria:
 - 1. Products which include an attached "hang tag" or sticker that displays, at a minimum, the following statement: "Formulated to

meet California VOC limits; see warnings on label."

2. Products where the Principle Display Panel displays, in a font size as large as or larger than the font size of any other words on the panel, the common name of the chemical compound (e.g., "Acetone," "Methyl acetate," etc.) that results in the product meeting the criteria for "Flammable" or "Extremely Flammable."

(C) For the purposes of this subsection (e)(2), a product is "Flammable" or "Extremely Flammable" if it is labeled as "Flammable" or "Extremely Flammable" on the product container, or if the product meets the criteria for these terms specified in title 16, Code of Federal Regulations, section 1500.3(c)(6).

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

§ 94513. Reporting Requirements.

- (a) Upon 90 days written notice, the Executive Officer may require any responsible party to report information for any consumer product or products the Executive Officer may specify including, but not limited to, all or part of the information specified in the following subsections (a)(1) through (a)(12). If the responsible party does not have or does not provide the information requested by the Executive Officer, the Executive Officer may require the reporting of this information by the person that has the information, including, but not limited to, any formulator, manufacturer, supplier, parent company, private labeler, distributor, or repackager.
- (1) the company name, address, telephone number, and designated contact person;
 - (2) any claim of confidentiality made pursuant to Title 17, California Code of Regulations, Section 91011;
 - (3) the product brand name for each consumer product and the product label;
 - (4) the product category to which the consumer product belongs;
 - (5) the applicable product form(s) listed separately;
 - (6) an identification of each product brand name and form as a "Household Product," "I&I Product," or both;
 - (7) separate California sales in pounds per year, to the nearest pound, and the method used to calculate California sales for each product form;

- (8) for information submitted by multiple companies, an identification of each company which is submitting relevant data separate from that submitted by the responsible party. All information from all companies shall be submitted by the date specified in Section 94513(a);
- (9) for each product brand name and form, the net percent by weight of the total product, less container and packaging, comprised of the following, rounded to the nearest one-tenth of a percent (0.1%):
 - (A) Total Table B Compounds
 - (B) Total LVP-VOCs that are not fragrances
 - (C) Total All Other Carbon-Containing Compounds that are not fragrances
 - (D) Total All Non-Carbon-Containing Compounds
 - (E) Total Fragrance
 - (F) For products containing greater than two percent by weight fragrance, but excluding "personal fragrance products":
 - (i) the percent of fragrance that are LVP-VOCs, and
 - (ii) the percent of fragrance that are all other carbon-containing compounds
 - (G) For "personal fragrance products," the density of the fragrance
 - (H) Total Para-dichlorobenzene
- (10) for each product brand name and form, the identity, including the specific chemical name and associated Chemical Abstract Services (CAS) number, of the following:
 - (A) Each Table B Compound
 - (B) Each LVP-VOC that is not a fragrance
- (11) if applicable, the weight percent comprised of propellant for each product;
- (12) if applicable, an identification of the type of propellant (Type A, Type B, Type C, or a blend of the different types);
- (b) In addition to the requirements of section 94513(a)(10), the responsible party shall report or shall arrange to have reported to the Executive Officer the net percent by weight of each ozone-depleting compound which is (1) listed in section 94509(e) and (2) contained in a product subject to reporting under section 94513(a) in any amount greater than 0.1 percent by weight.
- (c) All information submitted by any person pursuant to Section 94513 shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022.
- (d) *Special Reporting Requirements for Aerosol Adhesives*

On or before March 31, 2004, all responsible parties for aerosol adhesives shall

report to the Executive Officer the following information for products sold or offered for sale in California:

- (1) data regarding product sales and composition for the year 2003, including the information listed in Section 94513(a), and any other information that the Executive Officer may specify; and
- (2) a written update of the research and development efforts undertaken to achieve VOC limits lower than the limits specified in section 94509(a). The written update must include detailed information about the raw materials (solvents, propellants, resins, and polymers) and hardware (valves, actuators, cans) used in product reformulation, the testing protocols used, the results of the testing, and the cost of reformulation efforts.
- (3) On or before December 31, 2003, the Executive Officer shall notify responsible parties in writing that they are to submit aerosol adhesive product and research data by March 31, 2004.

(e) *Special Reporting Requirements for Consumer Products that Contain Perchloroethylene or Methylene Chloride:*

- (1) The requirements of this subsection shall apply to all responsible parties for:
 - (A) consumer products that are subject to section 94509(a) and contain perchloroethylene or methylene chloride, and
 - (B) Energized Electrical Cleaners as defined in section 94508(a), that contain perchloroethylene or methylene chloride. For the purposes of this subsection, a product "contains perchloroethylene or methylene chloride" if the product contains 1.0 percent or more by weight (exclusive of the container or packaging) of either perchloroethylene or methylene chloride.
- (2) For each consumer product that contains perchloroethylene or methylene chloride, the responsible party shall report the following information for products sold in California during each calendar year, beginning with the year 2000, and ending with the year 2010.
 - (A) the product brand name and a copy of the product label with legible usage instructions;
 - (B) the product category to which the consumer product belongs;
 - (C) the applicable product form(s) (listed separately);
 - (D) for each product form listed in (C), the total sales in California during the calendar year to the nearest pound (exclusive of the container or packaging).

and the method used for calculating the California sales;

(E) the weight percent, to the nearest 0.10 percent, of perchloroethylene and methylene chloride in the consumer product.

(3) The information specified in subsection 94513(e)(2) shall be reported for each calendar year by March 1 of the following year. The first report shall be due on March 1, 2001, for calendar year 2000. A new report is due on March 1 of each year thereafter, until March 1, 2011, when the last report is due.

(4) Upon request, the Executive Officer shall make the perchloroethylene information submitted pursuant to this subsection available to publicly owned treatment works in California, in accordance with the procedures for handling of confidential information specified in Title 17, California Code of Regulations, sections 91000-91022.

(A) On or before July 1, 2002, the Executive Officer shall evaluate the information, along with data on influent and effluent levels of perchloroethylene as reported by publicly-owned treatment works personnel and any other relevant information, to determine if it is likely that publicly-owned treatment works are experiencing increased levels of perchloroethylene, relative to 1996 levels, that can be attributed to consumer products which contain perchloroethylene.

(B) If the Executive Officer determines that it is likely that increased perchloroethylene levels at the publicly-owned treatment works are caused by increased levels of perchloroethylene in consumer products subject to this regulation, then the Executive Officer shall, in conjunction with the publicly-owned treatment works and other appropriate parties, implement measures which are feasible, appropriate, and necessary for reducing perchloroethylene levels at the publicly-owned treatment works.

(f) Special Reporting Requirements for Multi-purpose Lubricant and Penetrant products

(1) On or before March 31, 2012, all responsible parties for Multi-purpose Lubricant and Penetrant products shall report to the Executive Officer the following information for products sold or offered for sale in California:

(A) data regarding product sales and composition for the year 2011, including the information listed in section 94513(a), and the entire product label; and

(B) a written update of the research and development efforts undertaken to achieve the 25 percent VOC limits specified in section 94509(a). The written update must include detailed information about the raw materials evaluated for use, maximum incremental reactivity (MIR) values for any VOC or LVP-VOC used or evaluated, the function of the raw material evaluated, hardware

used in product reformulation, the testing protocols used, the results of the testing, and the cost of reformulation efforts.

- (2) On or before March 31, 2014, all responsible parties for Multi-purpose Lubricant products shall report to the Executive Officer the following information for products sold or offered for sale in California:

- (a) data regarding product sales and composition for the year 2013, including the information listed in Section 94513(a), and the entire product label; and
- (b) a written update of the research and development efforts undertaken to achieve the 10 percent VOC limit specified in section 94509(a). The written update must include detailed information about the raw materials evaluated for use, MIR values for any VOC or LVP-VOC used or evaluated, the function of the raw material evaluated, hardware used in product reformulation, the testing protocols used, the results of the testing, and the cost of reformulation efforts.

(g) Special Reporting Requirements for Multi-purpose Solvent and Paint Thinner products

- (1) On or before June 30, 2012, all responsible parties for Multi-purpose Solvent and Paint Thinner products shall report to the Executive Officer the following information for products sold or offered for sale in California:

- (a) data regarding product sales and composition for the year 2011, including the information listed in section 94513(a), and the entire product label; and
- (b) a written update of the research and development efforts undertaken to achieve the 3 percent VOC limits specified in section 94509(a). The written update must include detailed information about the raw materials evaluated for use; maximum incremental reactivity (MIR) values for any VOC or LVP-VOC used or evaluated; the function of the raw material evaluated; the testing protocols used; the results of the testing; and the cost of reformulation efforts.

NOTE: Authority cited: Sections 39600, 39601, 41511, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, 41511, and 41712, Health and Safety Code.

§ 94514. Variances.

- (a) *Applications for variances.* Any person who cannot comply with the requirements set forth in Section 94509, because of extraordinary reasons beyond the person's reasonable control may apply in writing to the Executive Officer for a variance. The

variance application shall set forth:

- (1) the specific grounds upon which the variance is sought;
 - (2) the proposed date(s) by which compliance with the provisions of Section 94509 will be achieved;
 - (3) a compliance report reasonably detailing the method(s) by which compliance will be achieved, and
 - (4) for applicants requesting a variance from the June 1, 1999, 55 percent VOC standard for hairspray products, the variance application shall also include a plan describing how the applicant will mitigate the excess VOC emissions that would be emitted during the period of the variance.
- (b) *Notices and public hearings for variances.* Upon receipt of a variance application containing the information required in subsection (a), the Executive Officer shall hold a public hearing to determine whether, under what conditions, and to what extent, a variance from the requirements in Section 94509 is necessary and will be permitted. A hearing shall be initiated no later than 75 days after receipt of a variance application. Notice of the time and place of the hearing shall be sent to the applicant by certified mail not less than 30 days prior to the hearing. Notice of the hearing shall also be submitted for publication in the California Regulatory Notice Register and sent to every person who requests such notice, not less than 30 days prior to the hearing. The notice shall state that the parties may, but need not be, represented by counsel at the hearing. At least 30 days prior to the hearing, the variance application shall be made available to the public for inspection. Interested members of the public shall be allowed a reasonable opportunity to testify at the hearing and their testimony shall be considered.
- (c) *Treatment of confidential information.* Information submitted to the Executive Officer by a variance applicant may be claimed as confidential, and such information shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022. The Executive Officer may consider such confidential information in reaching a decision on a variance application.
- (d) *Necessary findings for granting variances.* No variance shall be granted unless all of the following findings are made:
- (1) that, because of reasons beyond the reasonable control of the applicant, requiring compliance with Section 94509 would result in extraordinary economic hardship.
 - (2) that the public interest in mitigating the extraordinary hardship to the applicant by issuing the variance outweighs the public interest in avoiding any increased emissions of air contaminants which would result from issuing the variance.

(3) that the compliance report proposed by the applicant can reasonably be implemented, and will achieve compliance as expeditiously as possible.

- (e) *Variance orders.* Any variance order shall specify a final compliance date by which the requirements of Section 94509 will be achieved. Any variance order shall contain a condition that specifies increments of progress necessary to assure timely compliance, and such other conditions that the Executive Officer, in consideration of the testimony received at the hearing, finds necessary to carry out the purposes of Division 26 of the Health and Safety Code.
- (f) *Situations in which variances shall cease to be effective.* A variance shall cease to be effective upon failure of the party to whom the variance was granted to comply with any term or condition of the variance.
- (g) *Modification and revocation of variances.* Upon the application of any person, the Executive Officer may review, and for good cause, modify or revoke a variance from requirements of Section 94509 after holding a public hearing in accordance with the provisions of subsection (b).
- (h) *Special conditions in variance orders for hairspray products.*

In imposing conditions in variance orders granted from the June 1, 1990, 55 percent VOC standard for hairspray products, the Executive Officer, in addition to any other conditions that may be imposed, shall require the applicant to mitigate the excess VOC emissions that would be emitted during the period of the variance. If this mitigation requirement would result in an extraordinary economic hardship to the applicant, or if other good cause exists, the Executive Officer may waive all or part of this requirement.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

§ 94515. Test Methods.

- (a)(1) *VOC and GWP compound content determination using ARB Method 310.*
Testing to determine compliance with the requirements of this article, shall be performed using Air Resources Board Method 310, Determination of Volatile Organic Compounds (VOC) in Consumer Products, adopted September 25, 1997 and as last amended on [Date of Amendment] May 6, 2005, which is incorporated herein by reference. Alternative methods which are shown to accurately determine the concentration of VOCs in a subject product or its emissions may be used upon approval of the Executive Officer.
- (2) In sections 3.5, 3.6, and 3.7 of Air Resources Board (ARB) Method 310, a process is specified for the "Initial Determination of VOC Content" and the "Final

Determination of VOC Content". This process is an integral part of testing procedure set forth in ARB Method 310, and is reproduced below:

Sections 3.5, 3.6, and 3.7 of Air Resources Board Method 310

3.5 Initial Determination of VOC Content. The Executive Officer will determine the VOC content pursuant to sections 3.2 and 3.3. Only those components with concentrations equal to or greater than 0.1 percent by weight will be reported.

3.5.1 Using the appropriate formula specified in section 4.0, the Executive Officer will make an initial determination of whether the product meets the applicable VOC standards specified in ARB regulations. If initial results show that the product does not meet the applicable VOC standards, the Executive Officer may perform additional testing to confirm the initial results.

3.5.2 If the results obtained under section 3.5.1 show that the product does not meet the applicable VOC standards, the Executive Officer will request the product manufacturer or responsible party to supply product formulation data. The manufacturer or responsible party shall supply the requested information. Information submitted to the ARB Executive Officer may be claimed as confidential; such information will be handled in accordance with the confidentiality procedures specified in Title 17, California Code of Regulations, sections 91000 to 91022.

3.5.3 If the information supplied by the manufacturer or responsible party shows that the product does not meet the applicable VOC standards, then the Executive Officer will take appropriate enforcement action.

3.5.4 If the manufacturer or responsible party fails to provide formulation data as specified in section 3.5.2, the initial determination of VOC content under this section 3.5 shall determine if the product is in compliance with the applicable VOC standards. This determination may be used to establish a violation of ARB regulations.

3.6 Determination of the LVP-VOC status of compounds and mixtures. This section does not apply to antiperspirant and deodorants or aerosol coating products because there is no LVP-VOC exemption for these products.

3.6.1 Formulation data. If the vapor pressure is unknown, the following ASTM methods, which are incorporated by reference herein, may be used to determine the LVP-VOC status of compounds and mixtures: ASTM D 86-01 (Aug. 10, 2001), ASTM D 850-00 (Dec. 10, 2000), ASTM D 1078-01 (June 10, 2001), ASTM D 2879-97 (April 10, 1997), as modified in Appendix B to this Method 310, ASTM D 2887-01 (May

10, 2001) and ASTM E 1719-97 (March 10, 1997).

3.6.2 LVP-VOC status of "compounds" or "mixtures." The Executive Officer will test a sample of the LVP-VOC used in the product formulation to determine the boiling point for a compound or for a mixture. If the boiling point exceeds 216°C, the compound or mixture is an LVP-VOC. If the boiling point is less than 216°C, then the weight percent of the mixture which boils above 216°C is an LVP-VOC. The Executive Officer will use the nearest 5 percent distillation cut that is greater than 216°C as determined under 3.6.1 to determine the percentage of the mixture qualifying as an LVP-VOC.

3.6.3 Reference method for identification of LVP-VOC compounds and mixtures. If a product does not qualify as an LVP-VOC under 3.6.2, the Executive Officer will test a sample of the compound or mixture used in a product's formulation utilizing one or both of the following: ASTM D 2879-97 (April 10, 1997), as modified in Appendix B to this Method 310, and ASTM E 1719-97 (March 10, 1997), to determine if the compound or mixture meets the requirements of Title 17, CCR, section 94508(a)(94)(A).

3.7 *Final Determination of VOC Content.* If a product's compliance status is not satisfactorily resolved under sections 3.5 and 3.6, the Executive Officer will conduct further analyses and testing as necessary to verify the formulation data.

3.7.1 If the accuracy of the supplied formulation data is verified and the product sample is determined to meet the applicable VOC standards, then no enforcement action for violation of the VOC standards will be taken.

3.7.2 If the Executive Officer is unable to verify the accuracy of the supplied formulation data, then the Executive Officer will request the product manufacturer or responsible party to supply information to explain the discrepancy.

3.7.3 If there exists a discrepancy that cannot be resolved between the results of Method 310 and the supplied formulation data, then the results of Method 310 shall take precedence over the supplied formulation data. The results of Method 310 shall then determine if the product is in compliance with the applicable VOC standards, and may be used to establish a violation of ARB regulations.

(b) VOC content determinations using product formulation and records. Testing to determine compliance with the requirements of this article may also be demonstrated through calculation of the VOC content from records of the amounts of

constituents used to make the product pursuant to the following criteria:

- (1) Compliance determinations based on these records may not be used unless the manufacturer of a consumer product keeps accurate records for each day of production of the amount and chemical composition of the individual product constituents. These records must be kept for at least three years.
- (2) For the purposes of this section 94515(b), the VOC content shall be calculated according to the following equation:

$$\text{VOC Content} = \frac{B - C}{A} \times 100$$

where,

A = total net weight of unit (excluding container and packaging)

B = total weight of all VOCs, as defined in Section 94508(a), per unit

C = total weight of VOCs exempted under Section 94510, per unit

- (3) If product records appear to demonstrate compliance with the VOC limits, but these records are contradicted by product testing performed using ARB Method 310, the results of ARB Method 310 shall take precedence over the product records and may be used to establish a violation of the requirements of this article.
- (c) Determination of liquid or solid. Testing to determine whether a product is a liquid or solid shall be performed using ASTM D4359-90 (May 25, 1990), which is incorporated by reference herein.
- (d) Compliance determinations for charcoal lighter material products. Testing to determine compliance with the certification requirements for charcoal lighter material shall be performed using the procedures specified in the South Coast Air Quality Management District Rule 1174 Ignition Method Compliance Certification Protocol (February 28, 1991), which is incorporated by reference herein.
- (e) Testing to determine distillation points of petroleum distillate-based charcoal lighter materials shall be performed using ASTM D86-01 Aug. 10, 2001, which is incorporated by reference herein.
- (f) Fragrance content determinations for personal fragrance products. Testing to determine the percent by weight of fragrance in personal fragrance products shall be performed according to the Association of Official Analytical Chemists (AOAC) Official Method of Analysis No. 932.11, 1990, "Essential Oil in Flavor Extracts and Toilet Preparations, Babcock Method" (AOAC Official Methods of Analysis, 15th Edition, 1990), which is incorporated by reference herein.

(g) No person shall create, alter, falsify, or otherwise modify records in such a way that the records do not accurately reflect the constituents used to manufacture a product, the chemical composition of the individual product, and any other test, processes, or records used in connection with product manufacture.

(h) VOC and Aromatic compound content determination for Multi-purpose Solvent and Paint Thinner products using ARB Method 310.

(1) VOC content:

Testing to determine compliance with the requirements of this article, shall be performed using Air Resources Board Method 310, Determination of Volatile Organic Compounds (VOC) in Consumer Products, adopted September 25, 1997 and as last amended on [Date of Amendment], which is incorporated herein by reference. Alternative methods which are shown to accurately determine the concentration of VOCs in a subject product or its emissions may be used upon approval of the Executive Officer.

(2) Aromatic compound content:

Testing to determine aromatic compound content shall be conducted using ARB Method 310 in conjunction with product formulation data.

(A) Upon written notification from the Executive Officer, the Multi-purpose Solvent or Paint Thinner responsible party or manufacturer shall have 10 working days to provide to the Executive Officer, in writing, formulation data as specified in part (i) for products selected for compliance testing:

- (1) The weight fraction to the nearest 0.1 percent of each ingredient including: water, VOC, LVP-VOC, total inorganic compounds, and any compound specified in section 94508(a)(152). For hydrocarbon solvents the BIN number as listed in section 94701 (a) or (b), and the initial boiling point and dry point of the solvent shall be specified. Individual compounds present in an amount less than 0.1 percent by weight, are not required to be reported.
- (2) By March 1, 2010, and each year thereafter the responsible party shall provide to the Executive Officer contact information for the person who is to receive the letter.
- (3) For the purpose of this subsection a Material Safety Data Sheet does not meet the requirement for formulation data.

(B) A violation is established if:

- (1) the formulation data supplied by the responsible party or manufacturer shows that the product does not meet the applicable VOC or aromatic content standard, and/or
- (2) the responsible party or manufacturer fails to respond to the

notice and provide formulation data with the 10 day specified time frame specified in this subsection.

NOTE: Authority cited: Sections 39600, 39601, 39607, 41511, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 39607, 40000, 41511, and 41712, Health and Safety Code.

94516. Severability.

Each part of this article shall be deemed severable, and in the event that any part of this article is held to be invalid, the remainder of this article shall continue in full force and effect.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94517. Federal Enforceability.

For purposes of federal enforceability of this article, the Environmental Protection Agency is not subject to approval determinations made by the Executive Officer under Sections 94511, 94514, and 94515. Within 180 days of a request from a person who has been granted an exemption or variance under Section 94511 or 94514, an exemption or variance meeting the requirements of the Clean Air Act shall be submitted by the Executive Officer to the Environmental Protection Agency for inclusion in the applicable implementation plan approved or promulgated by the Environmental Protection Agency pursuant to Section 110 of the Clean Air Act, 42 U.S.C., Section 7410. Prior to submitting an exemption granted under Section 94511 as a revision to the applicable implementation plan, the Executive Officer shall hold a public hearing on the proposed exemption. Notice of the time and place of the hearing shall be sent to the applicant by certified mail not less than 30 days prior to the hearing. Notice of the hearing shall also be submitted for publication in the California Regulatory Notice Register and sent to the Environmental Protection Agency, every person who requests such notice, and to any person or group of persons whom the Executive Officer believes may be interested in the application. Within 30 days of the hearing the Executive Officer shall notify the applicant of the decision in writing as provided in Section 94511(f). The decision may approve, disapprove, or modify an exemption previously granted pursuant to Section 94511.

NOTE: Authority cited: Section 39600, 39601, 39602, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 39602, 40000, and 41712, Health and Safety Code.

California Environmental Protection Agency



Air Resources Board

METHOD 310

DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOC) IN CONSUMER PRODUCTS AND REACTIVE ORGANIC COMPOUNDS IN AEROSOL COATING PRODUCTS

(Including Appendices A and B)

Adopted: September 25, 1997
Amended: September 3, 1999
Amended: July 18, 2001
Amended: May 5, 2005
Amended: ****

DISCLAIMER: Mention of any trade name or commercial product in Method 310 does not constitute endorsement or recommendation of this product by the Air Resources Board.

2009 Proposed Amendments

METHOD 310

DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOC) IN CONSUMER PRODUCTS AND REACTIVE ORGANIC COMPOUNDS IN AEROSOL COATING PRODUCTS

1 APPLICABILITY

1.1 This method (Method 310) applies to the determination of the percent by weight of:

(1) volatile organic compounds (VOC) in consumer products, antiperspirant and deodorant products, and aerosol coatings products as those terms are defined in Title 17, California Code of Regulations (CCR), Division 3, Chapter 1, Subchapter 8.5 (Consumer Products), commencing with section 94500, and

(2) low vapor pressure-volatile organic compounds (LVP-VOC) as that term is defined in section 94508(a), and

(3) the reactive organic compounds (ROC) contained in aerosol coating products, as that term is defined in Title 17, CCR, section 94521.

1.2 Method 310 determines the total volatile material in a product and the presence of any compounds prohibited by ARB regulations ("prohibited compounds"). Components of the product that do not meet the definition of a VOC or are exempted by ARB regulations for a specific product category ("exempt compounds") are subtracted from the total volatile material to determine the final VOC content for the product. Method 310 is also used to determine the percent by weight of the ROCs contained in aerosol coating products, for the purpose of determining compliance with the Regulation for Reducing the Ozone Formed from Aerosol Coating Product Emissions, Title 17, CCR, sections 94520 to 94528 (the "Aerosol Coatings Regulation").

1.3 Method 310 does not apply to the determination of the composition or concentration of fragrance components in products.

1.4 The term "Executive Officer" as used in this document means the Executive Officer of the Air Resources Board or his or her authorized representative.

2 TEST METHODS

Method 310 incorporates by reference the following American Society for Testing and Materials (ASTM) International, National Institute for Occupational Safety and Health (NIOSH), and United States Environmental Protection Agency (US EPA) analytical test methods:

- 2.1 ASTM D 2369-01: Standard Test Method for Volatile Content of Coatings (January 10, 2001).
- 2.2 ASTM D 1426-98: Standard Test Methods for Ammonia Nitrogen in Water (December 10, 1998).
- 2.3 ASTM D 4017-96a: Standard Test Method for Water in Paints and Paint Materials by the Karl Fisher Titration Method (July 10, 1996).
- 2.4 ASTM D 3792-99: Standard Test Method for Water Content of Water-Reducible Paints by Direct Injection Into a Gas Chromatograph (May 10, 1999).
- 2.5 ASTM D 859-00: Standard Test Method for Silica in Water (determination of polymethylsiloxanes after digestion) (June 10, 2000).
- 2.6 ASTM D 3074-94: Standard Test Methods for Pressure in Metal Aerosol Containers (November 15, 1994) with the modifications found in Appendix A to this Method 310.
- 2.7 ASTM D 3063-94: Standard Test Methods for Pressure in Glass Aerosol Bottles (November 15, 1994) with the modifications found in Appendix A to this Method 310.
- 2.8 ASTM D 3064-97: Standard Terminology Relating to Aerosol Products (September 10, 1997).
- 2.9 NIOSH: Method 1400 Alcohols I (analysis of acetone and ethanol by gas chromatography). NIOSH Manual of Analytical Methods, Volume 1 (August 1994).
- 2.10 Gas Chromatography/Mass Spectrometry for Volatile Organics (analysis of exempt and prohibited compounds in the product by headspace/gas chromatography/mass spectrometry).
 - 2.10.1 US EPA Method 8240B, September 1994, Revision 2, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Test Methods for Evaluating Solid Waste, Volume 1 B, Chapter 4, Section 4.3.2: Laboratory Manual Physical/Chemical Methods, SW-846, September 1994.
 - 2.10.2 US EPA Method 8260B, December 1996, Revision 2, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Test Methods for Evaluating Solid Waste, Volume 1 B, Chapter 4, Section 4.3.2: Laboratory Manual Physical/Chemical Methods, SW-846, December 1996.

- 2.11 US EPA Reference Method 24, Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings: 40 Code of Federal Regulations (CFR) Part 60, Appendix A, as it existed on September 11, 1995.
- 2.12 US EPA Reference Method 24A, Determination of Volatile Matter Content and Density of Printing Inks and Related Coatings: 40 CFR Part 60, Appendix A, as it existed on July 1, 1994.
- 2.13 US EPA Reference Method 18, Measurement of Gaseous Organic Compound Emissions by Gas Chromatography: 40 CFR Part 60, Appendix A, as it existed on September 25, 1996.
- 2.14 US EPA Method 300.7, March 1986. Dissolved Sodium, Ammonium, Potassium, and Calcium in Wet Deposition by Chemically Suppressed Ion Chromatography.
- 2.15 ASTM D 86-01: Standard Test Methods for Distillation of Petroleum Products (August 10, 2001).
- 2.16 ASTM D 850-00: Standard Test Methods for Distillation of Industrial Aromatic Hydrocarbons and Related Materials (December 10, 2000).
- 2.17 ASTM D 1078-01: Standard Test Methods for Distillation Range of Volatile Liquids (June 10, 2001).
- 2.18 ASTM D 2879-97: Standard Test Method for Vapor-Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope (April 10, 1997) with the modifications found in Appendix B to this Method 310.
- 2.19 ASTM D 2887-01: Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography (May 10, 2001).
- 2.20 ASTM E 1719-97: Standard Test Method for Vapor Pressure of Liquids by Ebulliometry (March 10, 1997).

3 CONSUMER PRODUCTS TESTING PROCEDURE

- 3.1 The testing begins when the Executive Officer selects a product for analysis by Method 310. The Executive Officer will maintain sample chain of custody throughout the selection and analytical process.

3.2 Initial Testing of Aerosol Products

If the sample is an aerosol product, the aerosol propellant is separated from the non-propellant portion of the product by using ASTM D 3074-94 (as modified in Appendix A

for metal aerosol container) or ASTM D 3063-94 (as modified in Appendix A for glass aerosol container). The propellant portion is analyzed for exempt or prohibited compounds by using US EPA Reference Method 18. The remaining non-propellant portion of the product is then analyzed as specified in section 3.3.

3.3 Initial Testing of Non-Aerosol Products and the Non-Propellant Portion of Aerosol Products

The non-aerosol product or non-propellant portion of an aerosol product is analyzed to determine the total volatile material present in the sample and to determine the presence of any exempt or prohibited compounds. This analysis is conducted by performing the following tests:¹

- 3.3.1 Gravimetric analysis of samples to determine the weight percent of total volatile material, using US EPA Reference Methods 24/24A, ASTM D 2369-01.
- 3.3.2 Determination of sample water content. For determination of water content either ASTM D 4017-96a, or ASTM D 3792-99 may be used, or results from both procedures may be averaged and that value reported.
- 3.3.3 Determination of ammonium content using ASTM D 1426-98 or US EPA Method 300.7.
- 3.3.4 Determination of ketones and alcohol content using NIOSH Method 1400.
- 3.3.5 Analysis of exempt and prohibited compounds, if present (US EPA Reference Method 18, US EPA Method 8240B, US EPA Method 8260B, ASTM D 859-00, NIOSH Method 1400).
- 3.3.6 If LVP-VOC status is claimed or the analysis indicates the presence of an LVP-VOC component and the percent VOC is not in compliance, the Executive Officer will request formulation data as specified in Section 3.5.2.
- 3.3.7 For low level VOC content samples, direct determination using US EPA Reference Method 18, US EPA Method 8240B, US EPA Method 8260B, ASTM D 859-00, NIOSH Method 1400.

3.4 Prohibited Compounds

If the sample is found to contain compounds prohibited by ARB regulations (i.e., ozone-depleting compounds) at concentrations equal to or exceeding 0.1 percent by weight, the Executive Officer will reanalyze the sample for confirmation.

¹ Alternate test methods may be used, as provided in section 7.0

3.5 Initial Determination of VOC Content

The Executive Officer will determine the VOC content pursuant to sections 3.2 and 3.3. Only those components with concentrations equal to or greater than 0.1 percent by weight will be reported.

- 3.5.1 Using the appropriate formula specified in section 4.0, the Executive Officer will make an initial determination of whether the product meets the applicable VOC standards specified in ARB regulations. If initial results show that the product does not meet the applicable VOC standards, the Executive Officer may perform additional testing to confirm the initial results.
- 3.5.2 If the results obtained under section 3.5.1 show that the product does not meet the applicable VOC standards, the Executive Officer will request the product manufacturer or responsible party to supply product formulation data. The manufacturer or responsible party shall supply the requested information. Information submitted to the ARB Executive Officer may be claimed as confidential; such information will be handled in accordance with the confidentiality procedures specified in Title 17, California Code of Regulations, sections 91000 to 91022.
- 3.5.3 If the information supplied by the manufacturer or responsible party shows that the product does not meet the applicable VOC standards, then the Executive Officer will take appropriate enforcement action.
- 3.5.4 If the manufacturer or responsible party fails to provide formulation data as specified in section 3.5.2, the initial determination of VOC content under this section 3.5 shall determine if the product is in compliance with the applicable VOC standards. This determination may be used to establish a violation of ARB regulations.
- 3.6 Determination of the LVP-VOC status of compounds and mixtures. This section does not apply to antiperspirants and deodorants or aerosol coatings products because there is no LVP-VOC exemption for these products.
 - 3.6.1 Formulation data. If the vapor pressure is unknown, the following ASTM methods may be used to determine the LVP-VOC status of compounds and mixtures: ASTM D 86-01, ASTM D 850-00, ASTM D 1078-01, ASTM D 2879-97, as modified in Appendix B to this Method 310, ASTM D 2887-01 and ASTM E 1719-97.
 - 3.6.2 LVP-VOC status of "compounds" or "mixtures." The Executive Officer will test a sample of the LVP-VOC used in the product formulation to determine the boiling point for a compound or for a mixture. If the boiling point exceeds 216°C, the compound or mixture is an LVP-VOC. If the boiling point is less than 216°C, then the weight percent of the mixture which boils above 216°C is an LVP-VOC. The

Executive Officer will use the nearest 5 percent distillation cut that is greater than 216°C as determined under 3.6.1 to determine the percentage of the mixture qualifying as an LVP-VOC.

- 3.6.3 Reference method for identification of LVP-VOC compounds and mixtures. If a product does not qualify as an LVP-VOC under 3.6.2, the Executive Officer will test a sample of the compound or mixture used in a product's formulation utilizing one or both of the following: ASTM D 2879-97, as modified in Appendix B to this Method 310, and ASTM E 1719-97, to determine if the compound or mixture meets the definition of LVP-VOC as specified in Title 17, CCR, section 94508(a).

3.7 Final Determination of VOC Content

If a product's compliance status is not satisfactorily resolved under sections 3.5 and 3.6, the Executive Officer will conduct further analyses and testing as necessary to verify the formulation data.

- 3.7.1 If the accuracy of the supplied formulation data is verified and the product sample is determined to meet the applicable VOC standards, then no enforcement action for violation of the VOC standards will be taken.
- 3.7.2 If the Executive Officer is unable to verify the accuracy of the supplied formulation data, then the Executive Officer will request the product manufacturer or responsible party to supply information to explain the discrepancy.
- 3.7.3 If there exists a discrepancy that cannot be resolved between the results of Method 310 and the supplied formulation data, then the results of Method 310 shall take precedence over the supplied formulation data. The results of Method 310 shall then determine if the product is in compliance with the applicable VOC standards, and may be used to establish a violation of ARB regulations.

4 CALCULATION OF VOC CONTENT

This section specifies the procedure for determining the final VOC content of a product, which is reported as percent by weight of VOC.

4.1 Aerosol Products

- 4.1.1 For aerosol products, except those containing LVP-VOC, the percent VOC content shall be calculated using the following equation:

$$\% \text{ VOC} = \frac{\text{WL} (\text{TV} - \text{A} - \text{H} - \text{EL}) + \text{WP} - \text{EP}}{\text{WL} + \text{WP}} \times 100$$

Where²:

- WL = weight (gm) of the non-propellant portion, excluding container and packaging.
- TV = weight fraction of non-propellant total volatile material.
- A = weight fraction of ammonia (as NH_3) in the non-propellant portion.
- H = weight fraction of water in the non-propellant portion.
- EL = weight fraction of exempt compounds in the non-propellant portion.
- WP = weight (gm) of propellant.
- EP = weight (gm) of exempt compounds in propellant.

4.1.2 For aerosol products containing LVP-VOC, the percent VOC shall be calculated using the following equation:

$$\% \text{ VOC} = \frac{\text{WL} [(1 - \text{H}) \times (1 - \text{LVP}) - \text{EL}] + (\text{WP} - \text{EP})}{\text{WL} + \text{WP}} \times 100$$

Where:

- LVP = weight fraction of LVP-VOC compounds and/or mixtures in the non-propellant, non-aqueous portion.
- 1 - H = weight fraction of the non-propellant portion that does not contain water.
- 1 - LVP = weight fraction of the non-propellant, non-aqueous portion that is volatile.

4.2 Non-Aerosol Products

²Alternate test methods, as provided in section 7.0, or appropriate approved methods from section 2.0 may be used.

- 4.2.1 For non-aerosol products, except those containing LVP-VOC, the percent VOC content shall be calculated using the following equation:

$$\% \text{ VOC} = (TV - A - H - EL) \times 100$$

- 4.2.2 For non-aerosol products containing LVP-VOC, the percent VOC shall be calculated using the following equation:

$$\% \text{ VOC} = [(1 - H) \times (1 - \text{LVP}) - EL] \times 100$$

- 4.3 Consumer products subject to low VOC limits (below 5.0%) may have their VOC content characterized by a low level direct determination.

- 4.3.1 For aerosol products the percent VOC content may be calculated using the following equation:

$$\% \text{ VOC} = \frac{WL \left[\sum V_n \right] + WP - EP}{WL + WP} \times 100$$

Where:

V = weight fraction of non-exempted volatile organic compounds in the non-propellant portion.

n = number of non-exempted volatile organic compounds in the non-propellant portion.

WL = weight (gm) of the non-propellant portion, excluding container and packaging.

WP = weight (gm) of propellant.

EP = weight (gm) of exempt compounds in propellant.

- 4.3.2 For non-aerosol products the percent VOC content shall be calculated using the following equation:

$$\% \text{ VOC} = \left[\sum V_n \right] \times 100$$

5 TESTING TO DETERMINE REACTIVE ORGANIC COMPOUNDS IN AEROSOL COATING PRODUCTS

This section specifies the procedure for determining the percent by weight of the reactive organic compounds contained in aerosol coating products, for the purpose of determining compliance with the Aerosol Coatings Regulation.

- 5.1 The testing begins when the Executive Officer selects a product for analysis. The Executive Officer will maintain sample chain of custody throughout the selection and analytical process. When a product is selected for testing, the Executive Officer will request the product manufacturer or responsible party to supply the product formulation data specified in Title 17, CCR, section 94526(b)(2). The manufacturer or responsible party shall supply the requested information within 10 working days. Information submitted to the Executive Officer may be claimed as confidential; such information will be handled in accordance with the confidentiality procedures specified in sections 91000 to 91022, Title 17, CCR.

5.2 Initial Testing of the Propellant Portion of Aerosol Coating Products

The aerosol propellant is separated from the non-propellant portion of the product by using ASTM D 3074-94 (as modified in Appendix A for metal aerosol container) or ASTM D 3063-94 (as modified in Appendix A for glass aerosol container). The propellant portion is analyzed for reactive organic compounds and other compounds by using US EPA Reference Method 18. The remaining non-propellant portion of the product is then analyzed as specified in section 5.3.

5.3 Initial Testing of the Non-Propellant Portion of Aerosol Coating Products

The non-propellant portion of the product sample is analyzed to determine the reactive organic compounds in the sample, including the presence of any prohibited compounds. This analysis is conducted by performing the following tests:³

- 5.3.1 Gravimetric analysis of samples to determine the weight percent of total volatile material, using US EPA Reference Methods 24/24A, ASTM D 2369-01.
- 5.3.2 Determination of sample water content. For determination of water content either ASTM D 4017-96a, or ASTM D 3792-99 may be used, or results from both procedures may be averaged and that value reported.
- 5.3.3 Determination of ammonium content using ASTM D 1426-98 or US EPA Method 300.7.

³ Alternate test methods may be used, as provided in section 7.0

5.3.4 Determination of ketones and alcohol content using NIOSH Method 1400.

5.3.5 Analysis of reactive organic compounds and, if present, prohibited compounds (US EPA Reference Method 18, US EPA Method 8240B, US EPA Method 8260B, ASTM D 859-00, NIOSH Method 1400).

5.4 Prohibited Compounds

If the sample is found to contain compounds prohibited by the Aerosol Coatings Regulation (e.g., ozone-depleting compounds) at concentrations equal to or exceeding 0.1 percent by weight, the Executive Officer will reanalyze the sample for confirmation.

5.5 Initial Determination and Verification of Reactive Organic Compound Content

The Executive Officer will determine the reactive organic compound content by verifying formulation data pursuant to sections 5.2 and 5.3. Only those components with concentrations equal to or greater than 0.1 percent by weight will be reported.

5.5.1 Based on manufacturers formulation data and the analysis conducted under section 5, the Executive Officer will make an initial determination of whether the product meets the applicable requirements specified in the Aerosol Coatings Regulation. If initial results show that the product does not meet the applicable requirements, the Executive Officer may perform additional testing to confirm the initial results.

5.6 Final Determination of Reactive Organic Compound Content

If a product's status is not satisfactorily resolved under section 5.1 - 5.5, the Executive Officer may conduct additional analyses and testing as necessary to verify the formulation data.

5.6.1 If the Executive Officer is unable to verify the accuracy of the supplied formulation data, then the Executive Officer will request the product manufacturer or responsible party to supply additional information to explain the discrepancy.

5.6.2 If the additional information supplied by the manufacturer or responsible party shows that the product does not meet the applicable requirements, then the Executive Officer will take appropriate enforcement action.

5.6.3 If the manufacturer or responsible party fails to provide additional information as specified in section 5.6.1, the initial determination of reactive organic compound content under section 5.1 - 5.5 shall determine if the product is in compliance with the applicable reactive organic compound limits. This determination may be used to establish a violation of the Aerosol Coatings Regulation.

- 5.6.4 If there exists a discrepancy that cannot be resolved between the results of Method 310 and the formulation data or additional information supplied by the manufacturer or responsible party, then the results of Method 310 shall take precedence over the supplied formulation data or additional information. The results of Method 310 shall then determine if the product is in compliance with the applicable requirements, and may be used to establish a violation of the Aerosol Coatings Regulation.

6 METHOD PRECISION AND ACCURACY

- 6.1 The precision of Method 310 for determining VOC content was evaluated using seven representative products with known volatile organic compound (VOC) contents ranging from 6.2 to 81.2 percent VOC by weight. Each sample was divided into six portions, and each portion was separately analyzed to determine the VOC content. Based on the results of this analysis, the 95 percent confidence interval for Method 310 is 3.0 percent by weight (Wt/Wt%).
- 6.2 For determining the percent by weight of the individual ingredients in aerosol coating products, the precision and accuracy of the determination for each ingredient is governed by the precision and accuracy of the test method used to ascertain the percent by weight of each ingredient.

7 ALTERNATE TEST METHODS

Alternative test methods which are shown to accurately determine the concentration of VOCs or constituent components in antiperspirant/deodorants, consumer products, or aerosol coating products (or their emissions) may be used upon written approval of the Executive Officer.

Method 310 - Appendix A

PROPELLANT COLLECTION PROCEDURES

1 APPLICATION

The procedure applies to modify ASTM D 3074-94 and D 3063-94 to allow collection of the propellant for analysis and density measurement for metal aerosol containers and glass aerosol containers, respectively. These modified procedures also retain the aerosol standard terminology listed in ASTM D 3064-97.

2 LIMITATIONS

Nitrogen analysis: Nitrogen may be used as a component of the propellant system. Ambient air is 78 percent nitrogen and may be present as a contaminate in the system prior to sample collection. This is eliminated by sweeping out any connecting lines to the Tedlar bag with product before starting sample collection. This procedure will eliminate or reduce nitrogen contamination to less than 0.1% by weight of the sample and the analysis of the propellant gas will be unaffected.

3 APPARATUS AND MATERIALS

- 3.1 Propellant Collection System: See Figure 1 (metal containers) and Figure 3 (glass containers).
- 3.2 Tedlar Bags equipped with slip valve and septum
- 3.3 Density Measurement
 - 3.3.1 250 mL gas dilution bulb, or
 - 3.3.2 Density/Specific gravity meter meeting the following minimum specifications:
 - 3.3.2.1 Measurement Range: $0 - 3 \pm 0.00001 \text{ g/cm}^3$
 - 3.3.2.2 Measurement Temperature Range: $4^\circ\text{C} - 70^\circ\text{C}$.
- 3.4 Balance, capable of accurately weighing to 0.1 mg

- 3.5 Sample Venting Platform. See Figure 2 (metal containers)¹ and Figure 4 (glass containers)².
- 3.6 Platform Shaker, equivalent to Thermolyne M49125
- 3.7 Cork Rings, 80 x 32 mm

4 PROCEDURE

4.1 Propellant Collection for Metal Aerosol Containers

- 4.1.1 Close valves on Propellant Collection System (see Figure 1).
- 4.1.2 Remove the actuator from valve on the aerosol can and weigh can to the nearest 0.01 g.
- 4.1.3 Place the can in an inverted position onto the Sample Venting Platform, stabilized by cork rings.
- 4.1.4 Slowly raise the hydraulic jack until the can is pierced. Note the pressure of the can.
- 4.1.5 Vent the can until propellant is seen flowing from output 1. Collect the propellant in the Tedlar bag from output 1. Density is determined from this same Tedlar bag, as necessary.
- 4.1.6 After the propellant is collected, close and remove the Tedlar bag and vent the remainder of the propellant.
- 4.1.7 After the flow ceases from the can, it is removed from the assembly and allowed to vent overnight on a platform shaker, to vent the remainder of the propellant.
- 4.1.8 Reweigh the can to the nearest 0.01 gm and record weight loss (total gms propellant). The can may now be opened for analysis of the non-propellant portion of the sample.

4.2 Propellant Collection for Glass Aerosol Containers

¹ The metal piercing adaptor is available from Mid-West Screw Products, Inc., 3523 North Kenton Ave., Chicago, IL 60641. Interim Part Number: 8013A-3/4 45TAPER REV. The gasket is available from Alltech Associate 2051 Waukegan road, Deerfield, IL 60015, part number 80-16.

² The glass aerosol tapered adaptor is available from Armstrong Technologies, Inc. 12780 Earhart Ave., Auburn, CA 95602.

- 4.2.1 Remove the actuator from valve of the aerosol glass container and weigh container to the nearest 0.01 gm.
- 4.2.2 With container in an inverted position place the valve onto the tapered adaptor.
- 4.2.3 Pressurize the air cylinder to actuate the sample container valve onto the tapered adaptor. Note the pressure of the sample container.
- 4.2.4 Open the sample valve and collect propellant sample into the Tedlar bag. Density is determined from this same Tedlar bag, as necessary.
- 4.2.5 After the propellant is collected, close and remove the Tedlar bag and vent the remainder of the propellant.
- 4.2.6 Continue to vent the container on the platform assembly until no pressure registers on the sample gauge and there is no visible propellant flowing from the sampling tube.
- 4.2.7 Remove the container from the platform.
- 4.2.8 Loosen and remove the container valve assembly.
- 4.2.9 Place the container on a platform shaker to vent the remainder of the propellant.
- 4.2.10 Reweigh the container and valve assembly to the nearest 0.01 gm and record weight loss (total gms propellant). The non-propellant portion of the sample is ready to be analyzed.

FIGURE 1

PROPELLANT COLLECTION SYSTEM METAL AEROSOL CONTAINER

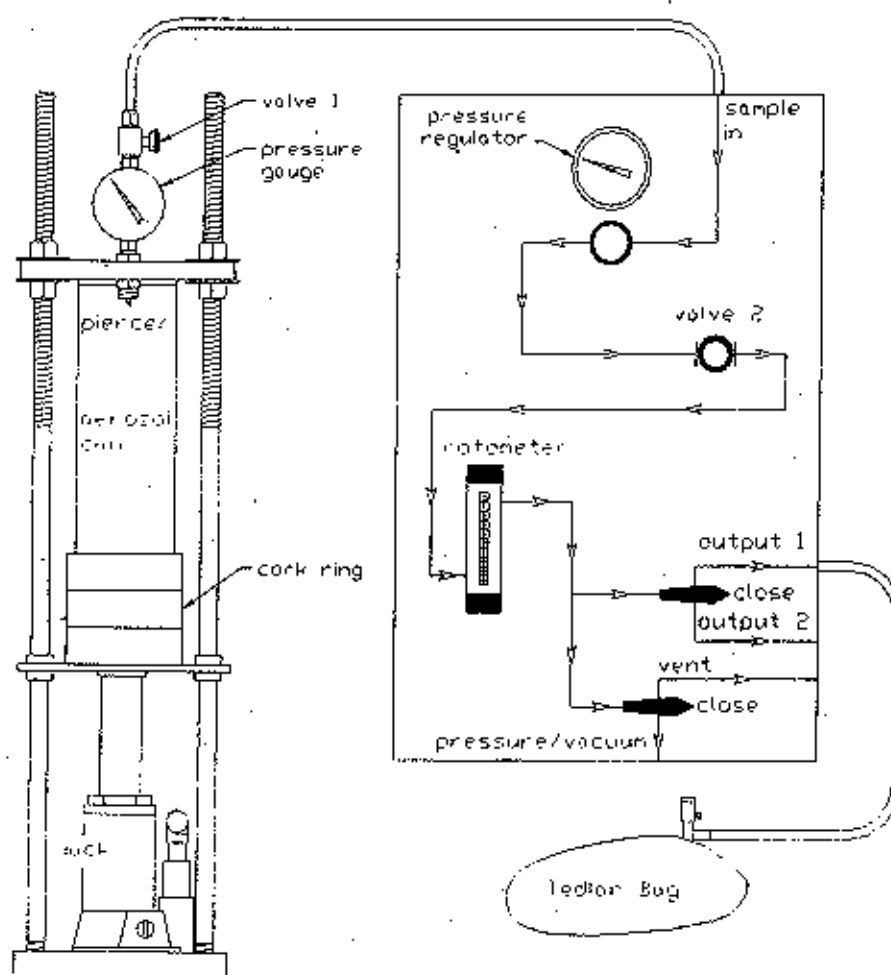


FIGURE 2

SAMPLE VENTING PLATFORM METAL AEROSOL CONTAINER

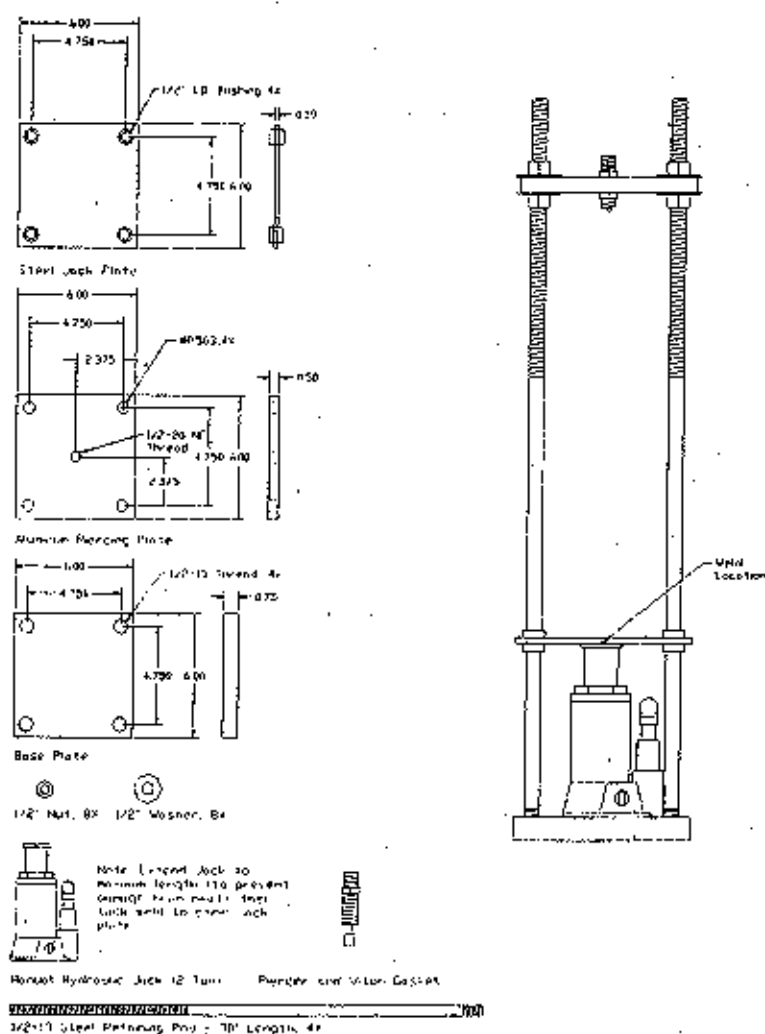
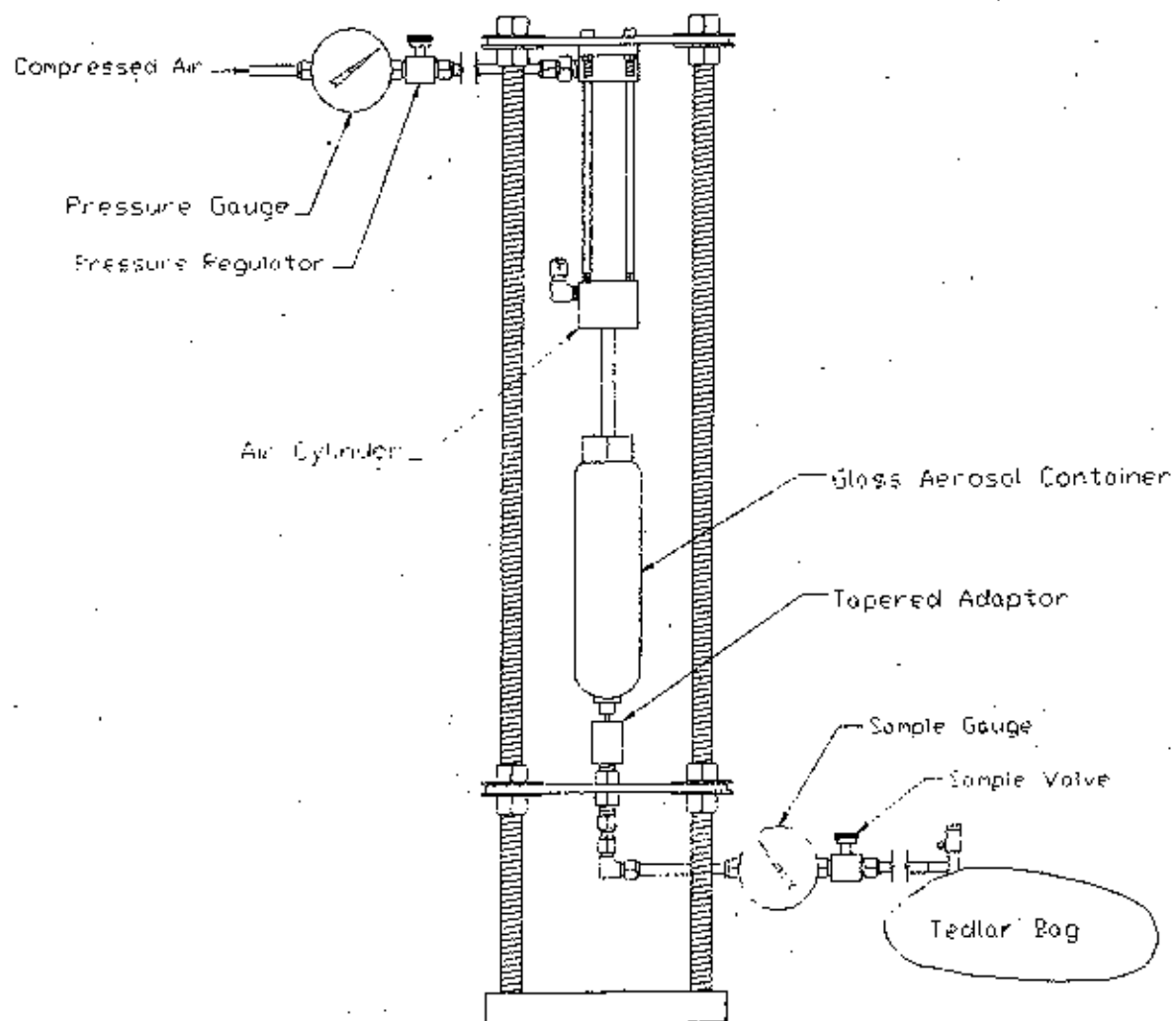


FIGURE 3

**PROPELLANT COLLECTION SYSTEM
GLASS AEROSOL CONTAINER**

Method 310 - Appendix B**MODIFICATIONS to ASTM D-2879-97**

This procedure modifies ASTM D-2879-97 as follows:

1. Modifications to the isoteniscope apparatus include:
 - a. capacitance manometers and digital readout
 - b. manifold system made of stainless steel and modified in design
 - c. Ultra-torr fittings and Ultra-torr flex-lines
 - d. ballast on the vacuum side of the isoteniscope manifold as depicted in ASTM D 2879-97 schematics, has been removed.
 - e. stainless steel liquid nitrogen trap (Cold Trap)
 - f. stainless steel high vacuum valves
 - g. recirculating cooling system (required for extremely low pressure work only)
 - h. diffusion pump (required for extremely low pressure work only)
 - i. hot ion cathode vacuum gauges (required for extremely low pressure work only)
2. A purge and degassing procedure consisting of lower pressures and a liquid nitrogen bath replaces the step of lightly boiling the sample as outlined in ASTM D 2879-97.
3. Purge and Degassing Cycle
 - a. With the U-tube connected, the system is evacuated to approximately 1.0 mm Hg. This readily removes most of the higher volatility gases from the sample.
 - b. The stainless steel, liquid nitrogen cold trap is filled. The manifold is now brought to approximately 300 mm Hg with the purified nitrogen, regulated through the needle valve.
 - c. The isoteniscope tube is carefully placed into a Dewar of liquid nitrogen. The $\frac{1}{2}$ atmosphere pressure of nitrogen prevents the sample from splashing while being frozen. After the sample freezes, the system is evacuated to 0.05 mm Hg.
 - d. The U-tube is removed from the Dewar, secured and allowed to warm to room temperature. The U-tube bulb head should be angled so the dissolved gases will be readily evacuated as the frozen sample starts to melt. When gases build up, it may be necessary to tilt the U-tube to release the gases.
 - e. Repeat the freeze and degas process once, reducing pressure each time to less than 0.05 mm Hg. After the sample has returned to room temperature, close valve #3. There

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should be minimal dissolved gases left once the frozen sample starts to melt. Tilt the tube to release any gas pockets (if necessary). Do not push nitrogen into the evacuated space between the sample in the arm and the sample in the reservoir. At this point, if the sample is properly degassed, a "natural break" should form in the sample. This creates a vapor space as the liquid level in the bulb leg of the manometer falls to a quasi-equilibrium position, usually with the fluid level higher in the long manometer leg. If there is no pendulum effect, and the liquid level in the long leg of the manometer is significantly higher than the level in the short leg (> 2 mm), degassing is probably incomplete, and the degassing procedure should be repeated.

4. Data Evaluation

The regression based on the plot of $\log P$ vs. $1/T$ as outlined in ASTM D 2879-97 has been removed and replaced with a nonlinear regression to generate the coefficients for an Antoine equation. The data analysis procedure assumes that the measured pressure is the sum of the compound's vapor pressure and a residual fixed gas pressure. The vapor pressure's dependence on absolute temperature is represented by an Antoine expression, and the fixed gas as pressure is directly proportional to absolute temperature as outlined in ASTM 2879. This leads to the model equations:

$$P_{\text{model}} = P_{\text{vapor}} + P_{\text{fixed gas}}$$

$$P_{\text{model}} = B0 * 10^{(B1/(T + B2))} + B3 * T$$

where T is the absolute temperature (K) and $B0$, $B1$, $B2$ and $B3$ are coefficients to be determined via a nonlinear regression which minimizes the sum of squares

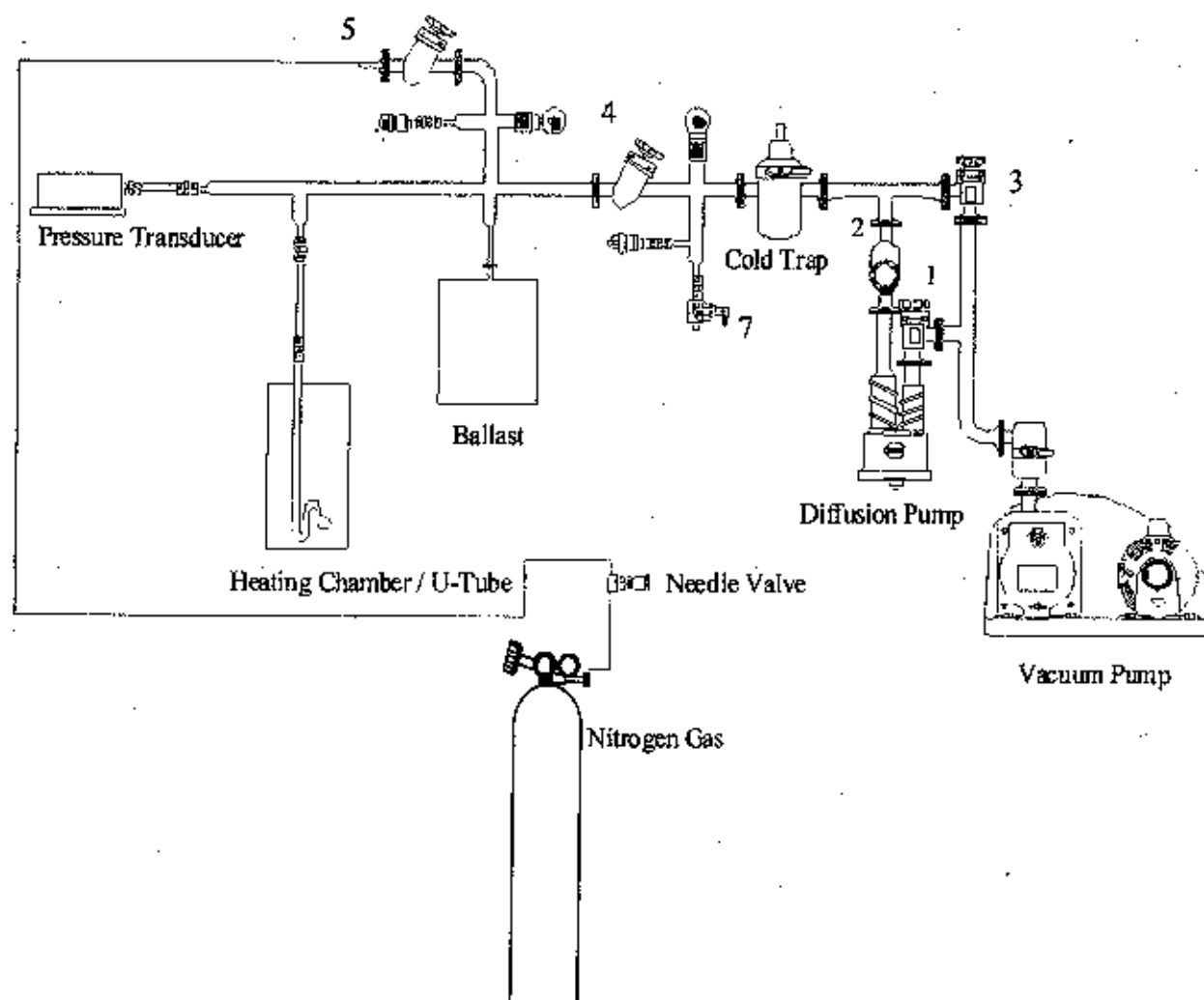
$\sum (P_{\text{meas}} - P_{\text{model}})^2$ for all experimental data points. The vapor pressure at 20°C is then calculated as:

$$P_{\text{vapor}} (293.15 \text{ K}) = B0 * 10^{(B1/(293.15 + B2))}$$

With a set of pressure vs. temperature measurements, the nonlinear regression can be performed using a statistical software packages. The following constraints are imposed to obtain meaningful Antoine equation coefficients for low vapor pressure samples:

- a. Pressures shall be measured at temperatures ranging from room temperature to about 180° C. Narrower ranges will not provide sufficient information to determine the Antoine curvature, i.e., B2 coefficient. Wider ranges can lead to experimental difficulties maintaining the vapor space in the isoteniscope. A minimum of 12 points is necessary to provide ample degrees of freedom for the calculations.
- b. Initial pressures at room temperature shall be less than 1 mm Hg. Higher values are indicative of significant levels of dissolved fixed gases. These will vaporize during the course of the experiment as temperature is increased and invalidate the model's assumption for the fixed gas contribution.
- c. $-235 \leq B_2 \leq 0$. Positive values of B2 imply that the heat of vaporization of the substance increases with increasing temperature. Thermodynamic data for many compounds suggests this is unrealistic. Large negative values can lead to unrealistically low vapor pressure values coupled with excessive fixed gas contributions. The -235(K) bound is chosen to be consistent with literature values of B2 for many pure compounds. For hydrocarbons in the LVP-VOC range, $B_2 \geq -100$ provides reasonable agreement between measured and literature vapor pressures.
- d. The fixed gas coefficient, B3, should normally be ≥ 0 .

Figure 1

ISOTENISCOPE VAPOR PRESSURE MEASUREMENT APPARATUS

Appendix C

Summary of Consumer Products Regulatory Actions

| Action Date/ (Effective Date) | Regulatory Action | Site | Comments |
|----------------------------------|---|--|---|
| 6/16/89 | Consumer Products Control Plan. | N/A | First Board action on consumer products. Board approved overall plan to fulfill H&SC Section 41712 mandate and a goal of achieving a 50 percent reduction in VOC emissions from consumer products. |
| 11/8/89/ (2/27/91) | Regulation to Reduce VOC Emissions from Antiperspirants and Deodorants. | Article 2, Sections 94500-94506, Title 17, CCR. | First consumer product regulation adopted pursuant to the CCAA. Established VOC content limits for aerosol and non-aerosol antiperspirants and deodorants. |
| 6/15/90 | Regulation for Reducing VOC Emissions from Consumer Products in the Bay Area AQMD. | Article 2, Consumer Products, Sections 94520-94527, Title 17, CCR. | This regulation was adopted to reduce VOC emissions from consumer products in the Bay Area AQMD and establishes VOC limits for 6 consumer products. |
| 10/11/90/ (10/21/91) | Regulation for Reducing VOC Emissions from Consumer Products - Phase I. | Article 2, Consumer Products, Sections 94507-94516 and 94503.5, Title 17, CCR Amendments to Article 2, Section 94505, Title 17, CCR | Establishes VOC limits for 16 consumer products, repeals the Bay Area consumer product regulation, and amends the AP/DO regulation to include an innovative product provision and a revised variance procedure. |
| 1/9/92/ (1/6/93) | Adoption of Amendments to the Regulation for Reducing VOC Emissions from Consumer Products - Phase II. | Article 2, Consumer Products, Sections 94507-94517, Title 17, CCR. | Establishes standards for 10 additional categories of consumer products and several amendments to the existing regulation for clarification and improvement. |
| 9/22/94/ (9/9/95) | Adoption of the Alternative Control Plan Regulation for Consumer Products. | Article 4, Sections 94540-94555, Title 17, CCR. | A voluntary market-based regulation which supplements the existing consumer products regulation by providing manufacturers with additional flexibility for formulating products. |
| 11/15/94/ (2/14/95) | Approval of the California State Implementation Plan for Ozone. | N/A | Board approval of Ozone SIP which includes consumer products element comprised of near, midterm, and long term measures. |
| 3/23/95/ (1/8/96) | Regulation for Reducing VOC Emissions from Aerosol Coating Products and Amendments to the Alternative Control (ACP) Plan. | Article 3, Sections 94520-94528, Title 17, CCR Amendments to Article 4, Sections 94540 to 94543, 94547, 94550, 94551, and 94553, Title 17, CCR. | Establishes VOC content limits for 35 categories of aerosol paints. Amendments to ACP to incorporate aerosol coating products. |

| Action Date/ (Effective Date) | Regulatory Action | Site | Comments |
|----------------------------------|---|---|--|
| 9/28/95/ (2/29/96) | Amendments to the California Regulations for Reducing VOC Emissions from Antiperspirants and Deodorants, Consumer Products, and Aerosol Coating Products. | Amendments to Article 1, Sections 94500-94504, Title 17, CCR, Article 2, Section 94508(a)(90), Title 17, CCR, and Article 3, Section 94521(a)(62), Title 17, CCR. | The amendments to the AP/DO regulation address fairness concerns, preserves projected emission reductions required by the SIP, ensures that manufacturers will continue their efforts to develop zero percent products and provides a vehicle to monitor progress and to make the VOC definition more consistent with EPA's VOC definition. The consumer products regulation and the aerosol coatings regulation is modified to revise the VOC definition consistent with EPA's. |
| 11/21/96/ (11/18/97) | Amendments to the California Regulations for Reducing VOC Emissions from Consumer Products and Aerosol Coating Products. | Amendments to Article 2; Sections 94508, 94515, 94517 and Article 3; Section 94521, Title 17, CCR. | The amendments to the consumer products regulation address postponement of the 25 percent standard for aerosol adhesives, modification to the VOC definition, amendment of various regulatory provisions to enhance clarity and compliance, and amendment to the test methods sections. The proposed amendments also modify the VOC definition in the aerosol coatings regulation. |
| 3/27/97/ (8/24/98) | Amendments Pertaining to Hairspray in the California Consumer Products Regulation. | Amendments to Article 2, Sections 94509, 94513, and 94514, Title 17, CCR. | Postpones the hairspray 55 percent VOC standard from 1/1/98 to 6/1/99, require plans demonstrating progress toward compliance from manufacturers selling hairspray not meeting the 55 percent VOC standard from 1/1/98 to 6/1/99, and modifies the variance provision to include a requirement for VOC emissions mitigation when granting a variance request for hairsprays from the 6/1/99 standard. |
| 7/24/97/ (7/1/98) | Amendments to the Consumer Products Regulation, Mid-term Measures I. | Amendments to Article 2, Sections 94508, 94509, 94510, 94512, 94513, and 94514, Title 17, CCR. | All VOC standards with 1/1/2000, effective dates were extended to 1/1/2001; First tiers of the two-tiered VOC standards and additional reporting requirements for four product categories were eliminated; Effective dates of the VOC standard were changed for five product categories. |
| 11/19/98/ (6/24/99) | Amendments to the Aerosol Coating Products, the Antiperspirants and Deodorants Regulation, and the Consumer Products Regulation. | Amendments to Article 3, Section 94521, 94522, and 94524, Title 17, CCR; Article 1, Section 94501, Title 17, CCR; and to Article 2, Section 94508(a)(124), Title 17, CCR. | Relaxation of the second-tier VOC limits of the Aerosol Coating Products Regulation. Exemption of methyl acetate from the VOC definition in the Antiperspirants and Deodorants Regulation, the Consumer Products Regulation, and the Aerosol Coating Products Regulation. |

| Action Date/ (Effective Date) | Regulatory Action | Site | Comments |
|----------------------------------|--|---|--|
| 10/28/99/ 11/19/2000 | Amendments to the Consumer Products Regulation, Mid-term Measures II. | Amendments to Article 2, Section 94508, 94509, and 94513. | Amends the Consumer Products Regulation by adding product category definitions, VOC limits for two new categories, more stringent VOC limits for fifteen existing categories, and adding subcategories for some of the existing product categories with separate VOC limits for each subcategory. New or modified VOC limits become effective from 12/31/2000, to 12/31/2004. Amendments consolidates and expands the existing reporting requirements for products containing methylene chloride or perchloroethylene. |
| 5/25/2000/ (5/18/2001) | Amendments to the Consumer Products Regulation relating to Aerosol Adhesives. | Amendments to Article 1, Sections 94508, 94509, 94512, and 94513, Title 17, CCR. | Amendments eliminate the 25 percent VOC limit and establish new VOC limits for three new categories of aerosol adhesives, effective January 1, 2002. Amendments also include labeling and other requirements to facilitate compliance and enforcement of the new standards. Effective 1/1/2002, amendments also prohibit the use of methylene chloride, perchloroethylene, and trichloroethylene, which are toxic air contaminants, in aerosol adhesives manufactured for use in California. |
| 6/22/2000/ (7/18/2001) | Consumer Products Relating to Aerosol Coating Products, Proposed Tables of Maximum Incremental Reactivity (MIR) Values, and Amendments to Method 310. | Amendments to Article 3, Sections 94521, 94522, 94523, 94524, and 94526. Added new sections 94700 and 94701, to Title 17, CCR. | Amendments replace the second tier mass-based VOC limits for 35 product categories with equivalent reactivity-based limits. In addition, a new subchapter, Subchapter 8.6, in title 17, CCR was adopted. New Subchapter 8.6, in sections 94700 and 94701, contains Tables of MIR Values that are used to set reactivity-based limits and determine compliance. |
| 10/26/2000/ (4/24/2001) | Amendments to the Regulation to Reduce VOC Emissions from Antiperspirants and Deodorants. | Amendments to Article 2, Sections 94502 and 94504, Title 17, CCR. | Amendments increased the HVOC limit for aerosol antiperspirants to 40 percent from the current zero percent limit, beginning 1/1/2001. The MVOC limit of 10 percent remains unchanged. |
| 6/24/2004/ (7/20/2005) | Amendments to the Consumer Products, Test Method 310, Antiperspirants and Deodorants, Aerosol Coating Products, and an Airborne Toxic Control Measure (ATCM) for Para- | Amendments to sections 94501, 94506, 94507, 94508, 94509, 94510, 94512, 94513, 94515, and 94526, title 17, California Code of Regulations (CCR) and adoption of | Amendments established new VOC limits for 15 product categories. Regulatory action also prohibited the use of three toxic air contaminants—methylene chloride, perchloroethylene, and trichloroethylene—in seven product categories. The ATCM prohibits the use of para-dichlorobenzene in toilet/urinal care products and solid air fresheners. Amendments also modified and updated Method 310 used to determine the |

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| Action Date/ (Effective Date) | Regulatory Action | Site | Comments |
|----------------------------------|---|--|---|
| Continued | Dichlorobenzene | amendments to ARB Method 310, which is incorporated by reference in sections 94506, 94515, and 94526, title 17, CCR. | percent by weight of reactive organic compounds in aerosol coating products and VOCs in consumer products and AP/DO products. |
| 6/24/2004/ (7/20/2005) | Amendments to the Consumer Products, Test Method 310, Antiperspirants and Deodorants, Aerosol Coating Products, and an Airborne Toxic Control Measure (ATCM) for Para-Dichlorobenzene | Amendments to sections 94501, 94506, 94507, 94508, 94509, 94510, 94512, 94513, 94515, and 94526, title 17, California Code of Regulations (CCR) and adoption of amendments to ARB Method 310, which is incorporated by reference in sections 94506, 94515, and 94526, title 17, CCR. | Amendments established new VOC limits for 15 product categories. Regulatory action also prohibited the use of three toxic air contaminants—methylene chloride, perchloroethylene, and trichloroethylene—in seven product categories. The ATCM prohibits the use of para-dichlorobenzene in toilet/urinal care products and solid air fresheners. Amendments also modified and updated Method 310 used to determine the percent by weight of reactive organic compounds in aerosol coating products and VOCs in consumer products and AP/DO products. |
| 11/16/2006/ (12/08/2007) | Amendments to the Aerosol Coating Products Regulation and the Consumer Products Regulation | Amendments to sections 94508, 94509, 94510, 94513, and 94523 to title 17, California Code of Regulations (CCR). Non-substantial or solely grammatical changes are also proposed to sections 94507, 94511, 94512, 94514, 94515, 94516, and 94517. | Consumer Products Regulation amended by adding and modifying product category definitions and by establishing new VOC limits for 16 product categories. For some of the categories, separate VOC limits are specified for different product forms. New or modified VOC limits become effective on December 31, 2008, remainder become effective on December 31, 2010. Regulatory action also prohibits use of three toxic air contaminants—methylene chloride, perchloroethylene, and trichloroethylene—in the following products categories: "Bathroom and Tile Cleaner," "Construction, Panel, and Floor Covering Adhesive," "General Purpose Cleaner," and "Oven Cleaner." Amendment was also adopted to section 94523 (Exemptions) of the Aerosol Coatings Regulation. Amendment clarifies several product categories are exempt from regulation under the Aerosol Coatings Regulation. |

| Action Date/ (Effective Date) | Regulatory Action | Site | Comments |
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| 11/16/2006/ (12/08/2007) | Amendments to the Aerosol Coating Products Regulation and the Consumer Products Regulation | Amendments to sections 94508, 94509, 94510, 94513, and 94523 to title 17, California Code of Regulations (CCR). Non-substantial or solely grammatical changes are also proposed to sections 94507, 94511, 94512, 94514, 94515, 94516, and 94517. | Consumer Products Regulation amended by adding and modifying product category definitions and by establishing new VOC limits for 16 product categories. For some of the categories, separate VOC limits are specified for different product forms. New or modified VOC limits become effective on December 31, 2008, remainder become effective on December 31, 2010. Regulatory action also prohibits use of three toxic air contaminants—methylene chloride, perchloroethylene, and trichloroethylene—in the following products categories: "Bathroom and Tile Cleaner," "Construction, Panel, and Floor Covering Adhesive," "General Purpose Cleaner," and "Oven Cleaner." Amendment was also adopted to section 94523 (Exemptions) of the Aerosol Coatings Regulation. Amendment clarifies several product categories are exempt from regulation under the Aerosol Coatings Regulation. |
| 6/26/2008/ (7/18/2009) | Amendments to the Consumer Products Regulation | Amendments to sections 94508, 94509, 94510, 94512, 94513, and 94515 to title 17, California Code of Regulations. | Regulation was amended by adding and modifying product category definitions and by establishing new or lower VOC limits for 19 product categories. A mass limit was adopted for fabric softener products used in clothes dryers. An additional amendment removed the "grandfather" clause that pertains to Personal Fragrance Products with 20 percent or less fragrance. Removal of this clause requires all Personal Fragrance Products with 20 percent or less fragrance to meet a single VOC limit. The new or modified VOC limits become effective between December 31, 2010 and December 31, 2015. This action also prohibits the use of three toxic air contaminants—methylene chloride, perchloroethylene, and trichloroethylene—in the following product categories: "Carpet/Upholstery Cleaner," "Fabric Protectant," "Multi-Purpose Lubricant," "Penetrant," "Sealant or Caulking Compound," and "Spot Remover." Use of methylene chloride and perchloroethylene are also prohibited in "Pressurized Gas Duster" products. To partially fulfill the Discrete Early Action Measure for consumer products, the amendments will reduce the use of compounds with high GWP in Pressurized Gas Duster products. These products can only use compounds with GWP factors below 150. The |

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| Date | Regulatory Action | Site | Comments |
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| Continued | | | GWP values used to determine compliance are those set forth in the Intergovernmental Panel on Climate Change, Second Assessment Report. The Board also adopted a modification to the definition of VOC. This modification excludes hydrofluoroether 7200 from the definition based on its negligible impacts on ground-level ozone formation. |

Appendix D

Summary of Ingredient Reformulation Costs

Methodology of Recurring Cost Research and Analysis

For each category proposed for regulation staff evaluates formulations of complying and non-complying products. These formulations are then used to develop example, non-confidential formulas that are representative of the category. These representative complying and non-complying formulas are used to estimate the cost of raw materials to produce each formulation. The difference in cost between a pound of complying and noncomplying formula is then calculated. Next, the average unit size is used to calculate the cost to comply per unit. The average unit size is the predominant unit size in a category as reported in the survey.

To assign costs, distributor-level ingredient prices from *ICIS Chemical Business* website (ICIS, 2008), and chemical materials distributors were used to calculate the baseline and compliant material costs for these formulations. Low and high cost scenarios are calculated for each category. In the low cost scenario, the cost per pound of product is calculated using the low end estimate of the cost of each raw material. In the high cost scenario, the high end of the raw material price range is used. Other than compounds that were to be quantified, the 2006 Survey did not ask for specific ingredient details for exempt compounds, fragrance materials, some low vapor pressure VOCs, and inorganic compounds. Therefore, unspecified ingredients or ingredients for which prices were unknown were grouped into an "all others" classification and assigned a default low and high cost of \$3.50 and \$7.00 per pound, respectively (ARB, 1997c), low and high cost for fragrance materials were estimated at \$5.00 and \$10.00 per pound respectively. Inorganic compounds were assigned a low and high cost of \$0.09 and \$0.91 per pound, respectively, based on the costs found of the most common inorganic compounds found in the product categories.

In some cases, the compliant formula is less expensive than the typical non-compliant formula. This is true, for example, when some amount of VOC solvent is replaced with water. Also, if the high cost estimate of the solvent is significantly higher than the low cost estimate, the net savings to reformulate will *increase* in the high cost scenario, because the cost per pound of the water did not increase in the high cost scenario.

The costs calculated here are then copied into Table VII-1a in Chapter VII, Economic Impacts and used to determine total costs of the proposed amendments.

Air Freshener: Double Phase Aerosol

Category: Air Freshener
 Subcategory: Aerosol - Double Phase
 Typical non-compliant: 24.5 % by weight
 Proposed Limit: 20 % by weight
 Average Unit Size: 9.00 wt. oz.

LOW COST

Formulation and Cost Comparison

| Component (A) | Unit Cost \$/lb (B) | Typical Non-compliant | | VOC Compliant | |
|-----------------------------------|---------------------------|-----------------------|---------------------|---------------|---------------------|
| | | Wt. % (C) | Cost (B)x(C)/100 | Wt. % (D) | Cost (B)x(D)/100 |
| Water | 0.002 | 72.80 | 0.00 | 77.80 | 0.00 |
| HC Propellant | 0.700 | 24.00 | 0.17 | 19.00 | 0.13 |
| Alcohol | 0.457 | 1.00 | 0.00 | 1.00 | 0.00 |
| Glycols | 0.620 | 1.00 | 0.01 | 1.00 | 0.01 |
| Inorganics | 0.090 | 0.50 | 0.00 | 0.50 | 0.00 |
| Fragrance | 5.000 | 0.70 | 0.04 | 0.70 | 0.04 |
| Total Cost, \$/pound: | | | 0.22 | | 0.18 |
| Total Cost, \$/Unit: | | | 0.12 | | 0.10 |
| Cost increase to comply, \$/unit: | | | | | (0.02) |

HIGH COST

| Component (A) | Unit Cost \$/lb (B) | Typical Non-compliant | | VOC Compliant | |
|-----------------------------------|---------------------------|-----------------------|---------------------|---------------|---------------------|
| | | Wt. % (C) | Cost (B)x(C)/100 | Wt. % (D) | Cost (B)x(D)/100 |
| Water | 0.002 | 72.80 | 0.00 | 77.80 | 0.00 |
| HC Propellant | 1.050 | 24.00 | 0.25 | 19.00 | 0.20 |
| Alcohol | 0.940 | 1.00 | 0.01 | 1.00 | 0.01 |
| Glycols | 0.960 | 1.00 | 0.01 | 1.00 | 0.01 |
| Inorganics | 0.910 | 0.50 | 0.00 | 0.50 | 0.00 |
| Fragrance | 10.000 | 0.70 | 0.07 | 0.70 | 0.07 |
| Total Cost, \$/pound: | | | 0.35 | | 0.29 |
| Total Cost, \$/Unit: | | | 0.20 | | 0.17 |
| Cost increase to comply, \$/unit: | | | | | (0.03) |

Multi-purpose Solvent/Paint Thinner – Tier 1

Category: Multi-purpose Solvent/Paint Thinner
 Subcategory: Non-aerosol
 Typical non-compliant: 100 % by weight
 Proposed Limit: 30 % by weight
 Average Unit Size: 93.40 wt. oz.

LOW COST

Formulation and Cost Comparison

| Component (A) | Unit Cost \$/lb (B) | Typical Non-compliant | | VOC Compliant TIER 1 – 30% | |
|---------------------|---------------------|-----------------------|------------------|----------------------------|------------------|
| | | Wt. % (C) | Cost (B)x(C)/100 | Wt. % (D) | Cost (B)x(D)/100 |
| Hydrocarbon solvent | 0.540 | 100.00 | 0.54 | 25.00 | 0.13 |
| Water | 0.002 | 0.00 | 0.00 | 37.00 | 0.00 |
| VOC Glycol Ether | 1.150 | | | 5.00 | 0.06 |
| Acetone | 0.402 | | | 25.00 | 0.10 |
| Exempt Compound | 2.000 | | | 5.00 | 0.10 |
| Non-solvent LVP | 3.500 | | | 3.00 | 0.11 |

Total Cost, \$/pound: 0.54 0.50

Total Cost, \$/Unit: 3.15 2.91

Cost Increase to comply, \$/unit: (0.24)

HIGH COST

| Component (A) | Unit Cost \$/lb (B) | Typical Non-compliant | | VOC Compliant TIER 1 – 30% | |
|---------------------|---------------------|-----------------------|------------------|----------------------------|------------------|
| | | Wt. % (C) | Cost (B)x(C)/100 | Wt. % (D) | Cost (B)x(D)/100 |
| Hydrocarbon solvent | 0.800 | 100.00 | 0.80 | 25.00 | 0.20 |
| Water | 0.002 | 0.00 | 0.00 | 37.00 | 0.00 |
| VOC Glycol Ether | 1.200 | | | 5.00 | 0.06 |
| Acetone | 0.459 | | | 25.00 | 0.12 |
| Exempt Compound | 3.000 | | | 5.00 | 0.15 |
| Non-solvent LVP | 7.000 | | | 3.00 | 0.21 |

Total Cost, \$/pound: 0.80 0.74

Total Cost, \$/Unit: 4.67 4.29

Cost increase to comply, \$/unit: (0.38)

Multi-purpose Solvent/Paint Thinner – Tier 2

Category: Multi-purpose Solvent/Paint Thinner
 Subcategory: Non-aerosol
 Typical non-compliant: 30 % by weight
 Proposed Limit: 3 % by weight
 Average Unit Size: 93.40 wt. oz.

LOW COST

Formulation and Cost Comparison

| Component (A) | Unit Cost \$/lb (B) | Typical Non-compliant | | VOC Compliant TIER 2 – 3% | |
|---------------------|---------------------|-----------------------|------------------|---------------------------|------------------|
| | | Wt. % (C) | Cost (B)x(C)/100 | Wt. % (D) | Cost (B)x(D)/100 |
| Hydrocarbon solvent | 0.540 | 25.00 | 0.13 | 0.00 | 0.00 |
| Water | 0.002 | 37.00 | 0.00 | 0.00 | 0.00 |
| VOC Glycol Ether | 1.150 | 5.00 | 0.06 | 0.00 | 0.00 |
| Acetone | 0.402 | 25.00 | 0.10 | 0.00 | 0.00 |
| Exempt Compound | 2.000 | 5.00 | 0.10 | 0.00 | 0.00 |
| Non-solvent LVP | 3.500 | 3.00 | 0.11 | 0.00 | 0.00 |
| VOC Mixture | 0.845 | 0.00 | 0.00 | 3.00 | 0.03 |
| Exempt/LVP Emulsion | 0.461 | 0.00 | 0.00 | 97.00 | 0.45 |

Total Cost, \$/pound: 0.50 0.47

Total Cost, \$/Unit: 2.91 2.76

Cost increase to comply, \$/unit: (0.16)

HIGH COST

| Component (A) | Unit Cost \$/lb (B) | Typical Non-compliant | | VOC Compliant TIER 2 – 3% | |
|---------------------|---------------------|-----------------------|------------------|---------------------------|------------------|
| | | Wt. % (C) | Cost (B)x(C)/100 | Wt. % (D) | Cost (B)x(D)/100 |
| Hydrocarbon solvent | 0.800 | 25.00 | 0.20 | 0.00 | 0.00 |
| Water | 0.002 | 37.00 | 0.00 | 0.00 | 0.00 |
| VOC Glycol Ether | 1.200 | 5.00 | 0.06 | 0.00 | 0.00 |
| Acetone | 0.459 | 25.00 | 0.12 | 0.00 | 0.00 |
| Exempt Compound | 3.000 | 5.00 | 0.15 | 0.00 | 0.00 |
| Non-solvent LVP | 7.000 | 3.00 | 0.21 | 0.00 | 0.00 |
| VOC mixture | 1.000 | 0.00 | 0.00 | 3.00 | 0.03 |
| Exempt/LVP emulsion | 0.816 | 0.00 | 0.00 | 97.00 | 0.79 |

Total Cost, \$/pound: 0.74 0.82

Total Cost, \$/Unit: 4.29 4.80

Cost increase to comply, \$/unit: 0.50

REFERENCES

1. Air Resources Board. Initial Statement of Reasons for Proposed Amendments Pertaining to Hairspray in the California Consumer Products Regulation. February 7, 1997. (ARB, 1997c)
2. ICIS. ICIS Chemical Business. <http://icispricing.com>. April 11, 2008. (ICIS, 2008)

Appendix E

Nonrecurring Costs Calculations

Appendix E contains the methodology and costs staff used to assign nonrecurring costs for each category. Nonrecurring costs are those associated with research and development to reformulate complying products and are independent of, and in addition to, the costs of ingredients to produce a product. For each category proposed for regulation, staff estimated a low cost and a high cost.

For both low and high cost scenarios, the initial statement of development goals to final delivery of the new product to the marketplace shelves was divided into eight phases. The phases are: product development, including reformulation and development of a new delivery system if necessary; stability testing; efficacy testing; safety testing; labeling modification; registration with regulatory agencies, if necessary; manufacturing change; and marketing.

A detailed description of each of the nonrecurring cost factors listed on the tables follows:

Product Development

Given a set of new product requirements, develop a laboratory prototype for product evaluation and testing. This includes formulating the contents and specifying the packaging and raw materials. New packaging and chemical formula components might need to be sourced.

Stability Testing

Stability testing ensures that the newly formulated chemical composition and/or package are compatible with each other and with product function for a reasonable period of time. FDA and EPA regulated products require extra steps to ensure the stability of active ingredients and kill claims of products such as disinfectant for bacteria and germs, for example.

Efficacy testing

Efficacy testing seeks to ensure that the product maintains the ability to perform label claims and to meet customer expectations. For EPA registered products (for example, those which make bacterial kill claims) this will require extensive testing by a specialized laboratory (most likely not the manufacturer's own laboratory). The testing must be documented with and meet the approval of the EPA.

Safety Test

This includes testing of the new product to ensure safety to manufacturing personnel during fabrication, logistics personnel during transit and to consumers during use and storage.

Labeling Modifications

Labeling modifications are required when product qualities or use instructions change.

Registration Fees

Registration expenses are incurred for products requiring EPA registration or FDA regulation whenever changes are made to the label or formula.

Marketing

The factors for marketing include: focus group testing, conducting surveys, advertising and design and publication of print and internet materials.

Manufacturing

This includes technology and infrastructure required to mass-produce a product.

A new VOC limit which must be met by changes to these production requirements will incur a manufacturing cost proportional to the magnitude of the change. Manufacturing cost to comply with proposed standards can include 'pilot plant' testing and/or retooling of production lines or construction of completely new facilities.

A pilot plant test is a small scale version of full scale production which is large enough to approximate the physical characteristics and challenges which will be encountered in the full-scale version. A pilot test run consumes considerably less resources and raw materials than a full scale run to produce a batch of product which will not necessarily be ready or suitable for a commercial market.

Literature

Literature costs are incurred when new sales and marketing and/or technical literature need to be developed and distributed in order to inform customers of the attributes of a new product.

Since 1999, a set of per product reformulation costs in 1991 dollars had been established for each phase of bringing a reformulated product into the market. The costs are adjusted to 2008 dollars using a well-established method of rationing chemical engineering plant cost indices as follows (Peters and Timmerhaus, 1980):

$$\text{Non - Recurring Costs (in 2008 dollars)} = \text{Non - Recurring Costs (in 1991 dollars)} \times \frac{\text{C.E. 2008 Index}}{\text{C.E. 1991 Index}}$$

where,

$$\text{C.E. 2008 index} = 2008 \text{ Chemical Engineering Plant Cost Index} = 592.0 \\ (\text{Chemical Engineering, 2009}).$$

$$\text{C.E. 1991 index} = 1991 \text{ Chemical Engineering Plant Cost Index} = 361.3 \\ (\text{Chemical Engineering, 1997}).$$

Table Appendix E-1 shows the cost assigned to each phase for the low and high cost scenario for a "household product." Both categories in this rulemaking are considered "household products".

To develop the costs shown in Table Appendix E-1, personnel costs are assigned. Beyond personnel costs, additional cost elements were considered at each phase and added as appropriate. These cost elements are facility; equipment; tool; jig; fixture and miscellaneous materials handling equipment; purchased material; packaging; distribution; warehousing; technical data; research studies and tests; promotional literature; residual inventory and disposal; consumer tests; general and administrative expense; patent; registration fees; and computer support. The result of these considerations is a per-product cost for developing a reformulated product and bringing it to market.

The length of time in each phase was estimated based on an industry analysis of 80 new product innovations. Most of the phases occur in sequence; however, there is some time overlap in each phase.

Next, estimated personnel resources were allocated against each phase considering the most probable types of skills needed including general engineering; technician; drafting; packaging engineering; specification engineering; model making; chemical engineering; technical publication; production support; quality assurance; marketing; warehousing; word processing; and clerical. For high cost elements, additional personnel were allocated to each phase.

Staff used different assumptions for the low and high cost analyses, and considered the specific likelihood that each of the cost elements would occur for each product category individually.

Table Appendix E-1
Assigned Costs for Product Development
Generic Per Product Reformulation Costs (low and high cost approach)

| Household | Low Cost | High Cost |
|---------------------------------|--------------------|---------------------|
| Product Development Material | \$163.85 | \$819.26 |
| Computer Support | \$163.85 | \$983.12 |
| Personnel/Formulation | \$6,062.55 | \$20,809.30 |
| Personnel/Delivery System | \$0.00 | \$26,544.15 |
| Prototype Equipment | \$0.00 | \$1,638.53 |
| Testing Material | \$491.56 | \$491.56 |
| Computer Support | \$0.00 | \$491.56 |
| Personnel/Stability Test | \$1,310.82 | \$7,373.37 |
| Personnel/Efficacy Test | \$1,310.82 | \$6,062.55 |
| Personnel/Safety Test | \$3,277.06 | \$10,978.13 |
| Labeling Modifications Material | \$163.85 | \$327.71 |
| Technical Data | \$327.71 | \$983.12 |
| Personnel | \$983.12 | \$5,898.70 |
| Registration/Fees | \$327.71 | \$491.56 |
| Personnel | \$655.41 | \$4,915.58 |
| Manufacturing Equipment | \$0.00 | \$40,963.19 |
| Technical Data | \$163.85 | \$819.26 |
| Computer Support | \$0.00 | \$163.85 |
| Other | \$0.00 | \$1,146.97 |
| Personnel | \$1,474.67 | \$33,753.67 |
| Marketing Studies | \$327.71 | \$1,638.53 |
| Literature | \$163.85 | \$819.26 |
| Inventory | \$0.00 | \$3,277.06 |
| Computer Support | \$0.00 | \$163.85 |
| Personnel | \$327.71 | \$13,435.93 |
| TOTAL | \$17,696.10 | \$184,989.77 |

2008 C.E. Plant Cost Index = 592 (Final Oct. '08)

1991 C.E. Plant Cost Index = 361.3

i. Low Cost Scenario

In the low cost scenario it is assumed that only minor modification to the current formulation is necessary to come into compliance. Therefore, for the low cost analysis no major costs were added for changing delivery systems or other product attributes.

In addition, it is common that large companies having significant market share and broad product lines offer both low VOC complying products and higher VOC non-complying products. In many cases, relatively low costs would be incurred where these companies could increase sales and distribution of complying products and discontinue non-complying products.

If products do not change significantly, it is assumed that major retooling of manufacturing equipment would not be required, technical data changes would be minor, and the change in marketing costs would be small. It was also assumed that these reformulated products would be marketed nationally.

ii. High Cost Scenario

Each category was analyzed individually to determine which of the elements, discussed above, and shown in Table Appendix E-1, manufacturers would likely include in their reformulation efforts. High costs for specific steps of the reformulation process were only included in the cost analysis where staff believed they were likely to occur. If staff believed a markedly different product would be needed to comply with the proposed limit, such as a new delivery system, then high personnel and capital resources, especially in product development and manufacturing changes, were assumed. In addition, a new delivery system would require investment for prototypes, new filling machines training, and technical data, so these high costs were also included in these scenarios. Additional costs were also added for packaging, distribution and warehousing. In areas where it was expected that little or no reformulation would occur, or that the cost of reformulation would be minimal, the value for low cost was used.

For especially challenging limits, it was assumed for the high cost approach that, because of a markedly different product, there would also be additional marketing costs, including research studies and tests, promotional literature, and consumer tests. These costs vary by the type of product, however the household products being proposed for further regulation typically having a larger expense in this area. The cost analysis did not include the costs for an extensive advertising campaign. New products are regularly brought onto the market, and the advertising for a new product, whether reformulated or not, would replace the advertising for the existing product, and would be a normal cost. It was assumed that the new product would be marketed nationally.

The staff also recognized that development of a new product does not occur in isolation. Few companies have only one product line; for those that have more than one product line, the product lines can be very similar. Development and production tasks, from the initial concept through marketing, would be proceeding simultaneously on more than

one product line, with a transfer of information and work-sharing between the products. For these companies, this "technology transfer" would substantially reduce the cost of developing and marketing a new product on a per product basis. For categories where the majority of products were held by a few companies it was assumed that this "technology transfer" would occur, and high costs adjusted accordingly.

iii. Other Assumptions

Staff considered only nonrecurring costs that are likely to occur on a per category basis. Costs are adjusted from those determined in 1991 by using the Chemical Engineering Plant Cost Index. If it was determined that for a majority of products in the category, the most likely scenario was that only minor changes to the product's reformulation were necessary to comply with the new proposed limit then only the lower end of the nonrecurring cost was included. For some categories, it was appropriate, based on the variety of products and reformulation approaches needed to meet the proposed limit, that certain high cost factors be included in the analysis, but not others, on a case-by-case basis. We believe that this approach gives a more realistic estimate of the costs of a given limit.

The high and low nonrecurring cost assumptions for each category are shown in Tables Appendix E-2, E-3, and E-4.

Table Appendix E-2
Air Freshener Per Product Reformulation Costs (low and high cost approach)

| Household | Low Cost | High Cost |
|---------------------------|--------------------|--------------------|
| Product Development | \$163.85 | \$409.63 |
| Material | | |
| Computer Support | \$0.00 | \$0.00 |
| Personnel/Formulation | \$6,062.55 | \$10,404.65 |
| Personnel/Delivery System | \$0.00 | \$13,272.07 |
| Prototype Equipment | \$0.00 | \$819.26 |
| Testing | \$245.78 | \$245.78 |
| Material | | |
| Computer Support | \$0.00 | \$0.00 |
| Personnel/Stability Test | \$1,310.82 | \$3,686.69 |
| Personnel/Efficacy Test | \$1,310.82 | \$3,031.28 |
| Personnel/Safety Test | \$0.00 | \$0.00 |
| Labeling Modifications | \$0.00 | \$0.00 |
| Material | | |
| Technical Data | \$0.00 | \$0.00 |
| Personnel | \$0.00 | \$0.00 |
| Registration/Fees | \$0.00 | \$0.00 |
| Personnel | \$0.00 | \$0.00 |
| Manufacturing | \$0.00 | \$0.00 |
| Equipment | | |
| Technical Data | \$163.85 | \$409.63 |
| Computer Support | \$0.00 | \$0.00 |
| Other | \$0.00 | \$0.00 |
| Personnel | \$1,474.67 | \$16,876.83 |
| Marketing | \$327.71 | \$819.26 |
| Studies | | |
| Literature | \$0.00 | \$0.00 |
| Inventory | \$0.00 | \$0.00 |
| Computer Support | \$0.00 | \$0.00 |
| Personnel | \$163.85 | \$163.65 |
| TOTAL | \$11,223.90 | \$50,138.93 |

2008 C.E. Plant Cost Index = 592 (Final Oct. '08)

1991 C.E. Plant Cost Index = 361.3

Table Appendix E-3
Multi-purpose Solvent and Paint Thinner –
Tier 1 Per Product Reformulation Costs (low and high cost approach)

| Household | Low Cost | High Cost |
|---------------------------|--------------------|--------------------|
| Product Development | \$163.85 | \$819.26 |
| Material | | |
| Computer Support | \$163.85 | \$983.12 |
| Personnel/Formulation | \$6,062.55 | \$20,808.30 |
| Personnel/Delivery System | \$0.00 | \$0.00 |
| Prototype Equipment | \$0.00 | \$0.00 |
| Testing | \$491.56 | \$491.56 |
| Material | | |
| Computer Support | \$0.00 | \$491.56 |
| Personnel/Stability Test | \$1,310.82 | \$7,373.37 |
| Personnel/Efficacy Test | \$1,310.82 | \$6,062.55 |
| Personnel/Safety Test | \$3,277.06 | \$10,978.13 |
| Labeling Modifications | \$163.85 | \$327.71 |
| Material | | |
| Technical Data | \$327.71 | \$983.12 |
| Personnel | \$983.12 | \$5,898.70 |
| Registration/Fees | \$0.00 | \$0.00 |
| Personnel | \$0.00 | \$0.00 |
| Manufacturing | \$0.00 | \$0.00 |
| Equipment | | |
| Technical Data | \$0.00 | \$0.00 |
| Computer Support | \$0.00 | \$0.00 |
| Other | \$0.00 | \$0.00 |
| Personnel | \$0.00 | \$0.00 |
| Marketing | \$327.71 | \$1,638.53 |
| Studies | | |
| Literature | \$163.85 | \$819.26 |
| Inventory | \$0.00 | \$3,277.06 |
| Computer Support | \$0.00 | \$163.85 |
| Personnel | \$327.71 | \$13,435.93 |
| TOTAL | \$16,074.46 | \$74,553.01 |

2008 C.E. Plant Cost Index =

1991 C.E. Plant Cost Index =

| |
|-------|
| 592 |
| 361.3 |

Table Appendix E-4
Multi-purpose Solvent and Paint Thinner –
Tier 2 Per Product Reformulation Costs (low and high cost approach)

| Household | Low Cost | High Cost |
|---------------------------|--------------------|--------------------|
| Product Development | \$163.85 | \$819.26 |
| Material | | |
| Computer Support | \$163.85 | \$983.12 |
| Personnel/Formulation | \$6,062.55 | \$20,809.30 |
| Personnel/Delivery System | \$0.00 | \$0.00 |
| Prototype Equipment | \$0.00 | \$0.00 |
| Testing | \$491.58 | \$491.58 |
| Material | | |
| Computer Support | \$0.00 | \$491.58 |
| Personnel/Stability Test | \$1,310.82 | \$7,373.37 |
| Personnel/Efficacy Test | \$1,310.82 | \$6,062.55 |
| Personnel/Safety Test | \$3,277.06 | \$10,978.13 |
| Labeling Modifications | \$163.85 | \$327.71 |
| Material | | |
| Technical Data | \$327.71 | \$983.12 |
| Personnel | \$983.12 | \$5,898.70 |
| Registration/Fees | \$0.00 | \$0.00 |
| Personnel | \$0.00 | \$0.00 |
| Manufacturing | \$0.00 | \$0.00 |
| Equipment | | |
| Technical Data | \$0.00 | \$0.00 |
| Computer Support | \$0.00 | \$0.00 |
| Other | \$0.00 | \$0.00 |
| Personnel | \$0.00 | \$0.00 |
| Marketing | \$327.71 | \$1,638.53 |
| Studies | | |
| Literature | \$163.85 | \$819.26 |
| Inventory | \$0.00 | \$3,277.06 |
| Computer Support | \$0.00 | \$163.85 |
| Personnel | \$327.71 | \$13,435.93 |
| TOTAL | \$15,074.46 | \$74,553.01 |

2008 C.E. Plant Cost Index =

1991 C.E. Plant Cost Index =

| |
|-------|
| 592 |
| 361.3 |

REFERENCES

1. Chemical Engineering magazine. Chemical Engineering Plant Cost Index. February, 2009. (Chemical Engineering, 2009)
2. Chemical Engineering magazine. Chemical Engineering Plant Cost Index. April, 1997. (Chemical Engineering, 1997)
3. Peters, M. S. and Timmerhaus, K. D. Plant Design and Economics for Chemical Engineers. 3rd Edition, McGraw-Hill Book Company, 1980, pp. 159-162 (Peters and Timmerhaus, 1980)

Appendix F

Chemical Characteristics of Conventional and Potential Replacement Solvents/Products

)

/

A

B

| Conventional Solvents Sold Today – Phased Out with Rule Implementation | | | | | | | |
|--|-------------------|-------------------------------|---------------------------|------------------|----------------------------------|--------------------------------|-------------------------------|
| Chemical Compound | M.W. ^a | Boiling Point (@760 mmHg, °F) | Evaporation Rate (@25 °C) | Flash Point (°F) | LEL/UEL ^b (% by Vol.) | Auto-ignition Temperature (°C) | Vapor Pressure (mmHg @ 20 °C) |
| Denatured Alcohol (Ethanol) | 46 | 78 | 2.3 | 56 | 3.3/19 | 435 | 44 |
| Isopropyl Alcohol | 60 | 180 | 2.3 | 53 | 2/12.7 | 399 | 33 |
| Lacquer Thinner ^f | — | 212.6 | 2.7 | 7.4 | 2/18.4 | 238 | 97.7 |
| MEK | 72 | 80 | 4.0 | 25 | 1.8/11.5 | 474 | 8.7 |
| Mineral Spirits (Stoddard) | 144 | 154-188 | 0.1 | 109-113 | 1.0/7 | 232 | 1.1 |
| Paint Thinner ^g | — | 299.6 | 1.4 | 81-117 | 1.0/7.3 | 229 | 2 |
| Toluene | 92 | 111 | 2.0 | 41 | 1.3/7 | 538 | 22 |
| Turpentine | 136 | 323.7 | 0.7 | 94.3 | 0.8/ n/a | 253 | 5 |
| VM&P Naphtha | 87 | 266.9 | 1.2 | 53.1 | 1.2/6 | 288 | 20 |
| Xylene | 106 | 139 | 0.8 | 81 | 1.0/6.6 | 499 | 6 |
| Exempt Solvents Used Today, with possible increase in use | | | | | | | |
| Chemical Compound | M.W. ^a | Boiling Point (@760 mmHg, °F) | Evaporation Rate (@25 °C) | Flash Point (°F) | LEL/UEL ^b (% by Vol.) | Auto-ignition Temperature (°C) | Vapor Pressure (mmHg @ 20 °C) |
| Acetone | 58 | 56 | 6.1 | -4 | 2.6/12.8 | 538 | 180 |
| Methyl Acetate | 74 | 56 | 5.3 | 15 | 3/16 | 501 | 171 |
| PCBTF ^h | 181 | 282 | 0.9 | 109 | 0.9/10.5 | 97 | 5.3 |
| Other Technologies Used Today, with possible increase in use | | | | | | | |
| Chemical Compound | M.W. ^a | Boiling Point (@760 mmHg, °F) | Evaporation Rate (@25 °C) | Flash Point (°F) | LEL/UEL ^b (% by Vol.) | Auto-ignition Temperature (°C) | Vapor Pressure (mmHg @ 20 °C) |
| Aqueous Based - Ethoxylates | | 211.7 | 1.0 | 208 | | | |
| Soy-Based Products | | 516.2 | 2.0 | 254.9 | | | |

^a Molecular Weight

^b Lower Explosive Limit / Upper Explosive Limit

^f Lacquer thinner is manufactured from petroleum distillates and blended with other solvents, such as xylene, toluene, isopropyl alcohol, acetone, methanol, and light aliphatic solvent naphtha. Exact blending ratios vary widely.

^g While paint thinner is predominantly referred to as "mineral spirits" or "Stoddard solvent" (listed elsewhere in this table, paint thinner is broadly described as being manufactured from petroleum distillates and can be a blend of multiple solvents, including but not limited to, mineral spirits, naphtha, nonanes (mixture), 1,2,4-trimethyl benzene, ethyl benzene, diacetone alcohol, n-butyl acetate, methyl isobutyl ketone, cumene and xylene.

^h Source: OxyChem Specialty Business Group

*Table Derived from SCAQMD Final Environmental Assessment for: Proposed Rule 1143

REFERENCES

1. South Coast Air Quality Management District (SCAQMD). Final Environmental Assessment for Proposed Rule 1143 – Consumer Paint Thinners and Multi-Purpose Solvents. February 2009.

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED AMENDMENTS TO NEW PASSENGER MOTOR VEHICLE GREENHOUSE GAS EMISSION STANDARDS

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider proposed amendments to California's greenhouse gas emission standards that the Board approved in September, 2004 pursuant to Assembly Bill 1493 (Pavley) (Chap. 200, Stats. 2002). These standards apply on a fleetwide basis to large-volume manufacturers of 2009 through 2016 model year new passenger motor vehicles certified for sale in California. The proposed amendments would provide affected manufacturers with the ability to demonstrate compliance based on their fleet average of vehicles produced and delivered for sale in California and all other U.S. States that have adopted and can enforce California's greenhouse gas emissions standards pursuant to section 177 of the Clean Air Act. The proposed amendments further provide manufacturers with additional flexibility to use data generated from other federal test procedures for demonstrating compliance with the Pavley standards. At the hearing ARB staff will also discuss potential future amendments for the 2012-2016 model years that would allow manufacturer compliance with planned United States Environmental Protection Agency (U.S. EPA) standards to be deemed as compliance with California's standards.

DATE: September 24, 2009

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, California 91765

This item will be considered at a two-day hearing of the Board, which will commence at 9:00 a.m., September 24, 2009, and may continue at 8:30 a.m., on September 25, 2009. This item may not be considered until September 25, 2009. Please consult the agenda for the hearing, which will be available at least 10 days before September 24, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to California Code of Regulations (CCR), title 13, sections 1961 and 1961.1, and to the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" incorporated by reference in CCR, title 13, section 1961(d) (as last amended May 2, 2008).

Background:

Citing compelling and extraordinary air quality and other impacts California faces from global warming, in 2002 the Legislature passed and the Governor signed Assembly Bill (AB) 1493. This bill required ARB to develop and adopt regulations to achieve the maximum feasible and cost-effective reduction of heat-trapping greenhouse gas emissions from passenger motor vehicles, beginning with the 2009 model year. The Board approved those regulations at its September 2004 hearing, and they were adopted in their final form in August 2005.

The AB 1493 regulations set separate greenhouse gas emissions levels for both passenger cars and light-duty trucks (PC/LDT1) and heavier light-duty trucks and medium-duty passenger vehicles (LDT2/MDV). The standards are effective beginning in the 2009 model year and become more stringent each year through 2016. The levels are measured in grams per mile of carbon dioxide-equivalent emissions, targeting carbon dioxide (CO₂) as the main greenhouse pollutant and other greenhouse gases including refrigerants used in automotive air conditioners. Compliance is determined on a fleetwide basis, meaning that while each individual model can be above or below the standard, the average of a manufacturers' fleet must meet the standard or else the manufacturer incurs debits that must be equalized within five model years. Manufacturers can also accrue and trade credits between their PC/LDT1 and LDT2/MDV segments, bank credits from over compliance for use in later model years, and trade credits with other manufacturers. Manufacturers may also obtain additional credit for selling vehicles fueled by other than conventional gasoline or diesel and demonstrating use of that fuel.

The greenhouse gas emission reductions to be achieved by the Pavley regulations are substantial. By 2016, the regulations require a 30% reduction in greenhouse gas emissions compared to 2009 model year vehicles. The AB 1493 regulations provide about 27.7 million metric tons in greenhouse gas reductions, or about 16 % of the 174 million metric ton CO₂-equivalent reductions needed to meet 1990 levels by 2020. They are the single largest emission reduction measure identified in the Scoping Plan adopted by the Board in December 2008 to chart ARB's course toward meeting AB 32, the Global Warming Solutions Act of 2006 (Chap. 488, Stats. 2006).

Since Board approval in 2004, motor vehicle manufacturers and their trade associations have challenged the regulations in numerous federal and State court proceedings and have opposed California's request for an U.S. EPA waiver of preemption under the

federal Clean Air Act to allow California to enforce its adopted standards. On May 19, 2009, challenging parties, individual automakers, California, and the federal government reached agreement on a series of actions that would resolve these current and potential future disputes over the California standards through model year 2016. A summary of those actions is contained in a document published in the Federal Register at 74 Fed. Reg. 24,007 (May 22, 2009) and in commitment letters by California and other parties that are available at www.epa.gov/otaq/climate/regulations.htm. On June 30, 2009, EPA granted California's waiver request for all model years 2009-2016. 74 Fed. Reg. 32744 (July 8, 2009).

In some of the aforementioned court and administrative proceedings, parties opposed to California's standards claimed that an U.S. EPA waiver would raise compliance issues in the other states that have adopted California's standards as their own pursuant to section 177 of the Clean Air Act. While the actual scope and type of claimed compliance issues could not be fully evaluated until additional compliance demonstrations are made in the various opt-in states, the Board committed to providing a compliance option that addresses potential issues for the 2009-2011 model years while preserving the greenhouse gas emission reductions ARB projected in 2004.

The proposed amendments would provide affected manufacturers with the ability to demonstrate compliance based on their fleet average of vehicles produced and delivered for sale in California, the District of Columbia, and in all states that have adopted and can enforce California's greenhouse gas emission standards, pursuant to section 177 of the Clean Air Act. The other states are: Connecticut, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington. Due to the timing of their respective state's adoption, Maryland and New Mexico sales would not be part of this multi-state compliance averaging option until the 2011 model year. Arizona sales would also be part of the average beginning in the 2012 model year, should any manufacturer choose to continue complying using this proposed multi-state option rather than the planned U.S. EPA 2012-2016 model year standards compliance option that will be the subject of a future ARB rulemaking. The amendments would ensure that for each model year 2009 through 2011, under any combination of manufacturers exercising the new compliance option, the California new motor vehicle fleet would achieve equivalent or greater greenhouse gas emission reductions than under the existing regulations.

The May 2009 commitment letters also express California's commitment to review 2009 through 2011 model year certification requirements to either confirm that manufacturers may use data generated by federal Corporate Average Fuel Economy Program (CAFE) test procedures, vehicle selection, and other testing protocols – including substitution of federal data for data previously submitted to ARB – or to revise our regulations as necessary. The proposed amendments address these flexibilities.

Finally, the proposed amendments make minor changes not directly tied to the May 2009 commitment letters by updating the incorporated federal test procedure sections referenced in the light-duty test procedures.

COMPARABLE FEDERAL REGULATIONS

There are currently no federal greenhouse gas emission standards for the subject new motor vehicles. In response to *Massachusetts v. EPA*, 549 U.S. 497 (2007) (holding greenhouse gases are pollutants subject to regulation under the Clean Air Act), on April 24, 2009 U.S. EPA took a necessary first step toward setting such a standard by issuing its Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act. 74 Fed. Reg. 18886 (April 24, 2009). There the U.S. EPA Administrator proposed finding that current and projected atmospheric levels of six key greenhouse gases endanger the public health and welfare of current and future generations (p.18898), and that emissions of four of these gases by individual and collective section 202(a) (i.e., on-road vehicular) source categories cause or contribute to that atmospheric pollution. Pp.18906-09. U.S. EPA would need to finalize an endangerment finding before or concurrent with finalizing greenhouse gas emission standards.

As part of the May 2009 announcement U.S. EPA and the federal Department of Transportation issued a Notice of Intent to conduct a joint rulemaking (Joint NOI) to propose a coordinated federal greenhouse gas and fuel economy program for light-duty vehicles, referred to as the National Program. 74 Fed. Reg. 24007 (May 22, 2009). U.S. EPA is considering proposing greenhouse gas standards, conditioned on a finalized endangerment finding, that would achieve on average 250 grams/mile of CO₂ in model year 2016 across the light duty fleet. ARB's preliminary view is that this fleet average would provide roughly equivalent greenhouse gas reductions in the 2016 model year from the California fleet currently subject to the AB 1493 (Pavley) regulations.

At the hearing ARB Staff will discuss the Joint NOI and its import for the Pavley regulations. Should U.S. EPA provide more detail on the proposed federal greenhouse gas emission standards by issuing a Notice of Proposed Rulemaking (NPRM) during the comment period on this regulatory item, staff will also update the Board on the federal NPRM. While California has committed to revise its standards for the 2012 through 2016 model years provided the federal standards are substantially as described in the Joint NOI, that revision will be the subject of separately proposed amendments in the near future.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: "NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED AMENDMENTS TO NEW PASSENGER MOTOR VEHICLE GREENHOUSE GAS EMISSION STANDARDS."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on ARB's website listed below, or may be obtained from the Public

Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing on September 24, 2009.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Mr. Paul Hughes, Manager, Low-Emission Vehicle Implementation Section, at (626) 575-6977, or Ms. Sarah Carter, Staff Air Pollution Specialist, at (626) 575-6845.

Further, the agency representative and designated back-up contact persons, to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Lori Andreoni, Manager, Board Administration and Regulatory Coordination Unit, (916) 322-4011, or Ms. Trini Balcazar, Regulations Coordinator, (916) 445-9564. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at www.arb.ca.gov/regact/2009/ghgpv09/ghgpv09.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any local agency or school district, whether or not reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary cost or savings to State or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. The proposal is not expected to affect the cost of compliance for vehicle manufacturers that are subject to the requirements of California's passenger vehicle greenhouse gas regulations. These manufacturers are already required to conduct emission testing to measure the CO₂ emissions from their passenger fleet as part of the federal CAFE program. So, allowing a manufacturer to use these data to demonstrate compliance with California's greenhouse gas requirements could reduce the number of emission tests that will need

to be conducted solely for the California program. However, this economic impact, while positive, is expected to be minimal.

The proposed amendments may also impose additional reporting requirements. While manufacturers are currently required to report California sales data that is used to demonstrate compliance with the Pavley regulations, the amendments will require manufacturers to also report sales data from the other states that have adopted the Pavley regulations. The additional cost due to this amendment is not expected to be significant, since in implementing the current regulations other states already require manufacturers to submit sales data for their state. The proposed amendments will simply require these data to also be submitted to the Air Resources Board.

For both the CAFE data and multi-state pooling option amendments proposed, manufacturers retain the option to comply with the regulations as they are currently written (i.e., manufacturers need not use CAFE data to demonstrate compliance with the regulations and they may continue to comply with the fleet average greenhouse gas requirements on a state-by-state basis), in which case these amendments would produce no economic or reporting impacts.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to CCR, title 1, section 4, that the proposed regulatory action would not affect small businesses, because it does not apply to any businesses that fall under the definition of "small business."

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the hearing, and may also be submitted by postal mail or electronic submittal before the hearing. To be considered by the Board, written comments, not physically submitted at the hearing, must be received **no later than 12:00 noon, September 23, 2009**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require, that 20 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Sections 39500, 39600, 39601, 43013, 43018, 43101, 43104, and 43105, Health and Safety Code. This action is proposed to implement, interpret and make specific 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43018.5, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43204, 43205, and 43211, Health and Safety Code.

HEARING PROCEDURES

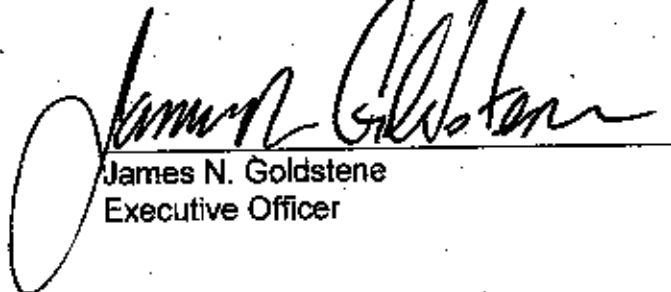
The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice and that the regulatory language as modified could result from the

proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15-days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstene
Executive Officer

Date: July 28, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

State of California
AIR RESOURCES BOARD

**STAFF REPORT: INITIAL STATEMENT OF REASONS FOR
RULEMAKING**

**NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED
AMENDMENTS TO NEW PASSENGER MOTOR VEHICLE
GREENHOUSE GAS EMISSION STANDARDS**

Date of Release: August 7, 2009

Scheduled for Consideration: September 24-25, 2009

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

State of California
AIR RESOURCES BOARD

**Staff Report: Initial Statement of Reasons
for Proposed Rulemaking**

**PUBLIC HEARING TO CONSIDER PROPOSED AMENDMENTS TO
NEW PASSENGER MOTOR VEHICLE GREENHOUSE GAS
EMISSION STANDARDS**

Date of Release: August 7, 2009

Scheduled for Consideration: September 24-25, 2009

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I. INTRODUCTION AND BACKGROUND

Climate change is critically important to California. If left unchecked, its far-reaching consequences will dramatically affect many aspects of our lives including public health, the economy, and the environment. In 2002, in response to the threat of global warming, California adopted AB 1493 (Pavley (Chap. 200, Stats.2002)), which directed the Air Resources Board (ARB) to develop regulations to reduce greenhouse gas emissions from the new passenger vehicle fleet (passenger vehicles are responsible for approximately 30 percent of the total greenhouse gas emissions in California).

In September 2004, the ARB adopted regulations (known as the "Pavley regulations") requiring significant reductions in greenhouse gas emissions from passenger cars and light-duty trucks (i.e., vehicles less than 8,500 lbs. gross vehicle

weight) and sport utility vehicles (i.e., medium-duty passenger vehicles). These requirements, which are phased-in from 2009 through 2016, will reduce emissions from the new vehicle fleet by 30 percent within this timeframe.

The Pavley regulations reduce greenhouse gas emissions from new passenger vehicles by requiring that each year between 2009 and 2016, manufacturers meet separate increasingly stringent fleet average greenhouse gas levels based on the size of the vehicles – a lower one for passenger cars and the smallest of the light-duty trucks (PC + LDT1), and a higher one for larger light-duty trucks and medium-duty passenger vehicles (LDT2 + MDPV). The greenhouse gas emissions that are included within the scope of the Pavley regulations include carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). In addition a manufacturer may earn credits toward complying with the requirements by equipping vehicles with an advanced "low-leak" air conditioning system or one that uses a refrigerant with a lower global-warming potential than HFC-134a, which is most commonly used today.

To demonstrate compliance with the fleet average greenhouse gas requirements, a manufacturer must first group the vehicles in its fleet based on similarities, such as engine, transmission type, or weight, that impact greenhouse gas emissions. A manufacturer must then conduct testing to determine the greenhouse gas emissions from each group of vehicles. Using this data, and applying any emission credits that may be earned for vehicles that are equipped with advanced air conditioning systems, the average grams per mile of "CO₂ – equivalent" emissions is calculated for each vehicle group. A manufacturer must then calculate its overall fleet average greenhouse gas level by calculating the sales – weighted average CO₂ – equivalent emissions from its PC + LDT1 fleet and from its LDT2 + MDPV fleet. Manufacturers are required to submit emissions testing data and sales data in sufficient detail to allow staff to verify a manufacturer's fleet average greenhouse gas levels for each model year.

II. DESCRIPTION OF PUBLIC PROBLEM, ADMINISTRATIVE CIRCUMSTANCE PROPOSAL IS INTENDED TO ADDRESS; PROPOSED SOLUTIONS AND RATIONALE FOR EACH REGULATORY PROVISION

Since Board approval in 2004, motor vehicle manufacturers and their trade associations have challenged the Pavley regulations in numerous federal and state court proceedings and have opposed California's request to (U.S. EPA) for a required waiver of preemption under the federal Clean Air Act to allow California to enforce its adopted standards. In the waiver context and elsewhere they have also argued that other states, exercising their right under section 177 of the Clean Air Act to adopt California's vehicle emission standards, will create an unmanageable "patchwork" of different programs due to variations in the mix of vehicles sold in each of the states.

On May 19, 2009, challenging parties, automakers, California, and the federal government reached agreement on a series of actions that would resolve these current and potential future disputes over the standards through model year 2016. In summary, the U. S. Environmental Protection Agency and the U. S. Department of

Transportation agreed to adopt a federal program to reduce greenhouse gases and improve fuel economy, respectively, from passenger vehicles, to achieve equivalent or greater greenhouse gas benefits as the Pavley regulations for the 2012 – 2016 model years. Manufacturers agreed to ultimately drop current, and forego similar future legal challenges, including challenging a waiver grant, which occurred June 30, 2009. 74 Fed.Reg. 32744 (July 8, 2009). For its part, California committed to: (1) revise its standards to allow manufacturers to demonstrate compliance with the fleet average greenhouse gas emission standard by "pooling" California and Section 177 State vehicle sales; (2) revise its standards for 2012-16 model year vehicles such that compliance with EPA-adopted greenhouse gas standards would serve as compliance with California's standards; and (3) revise its standards as necessary to allow manufacturers to use emission data from the federal Corporate Average Fuel Economy (CAFE) program to demonstrate compliance with the Pavley regulations. The current proposed amendments to the Pavley regulations, which are discussed in greater detail below, address the first and third commitments made by California. Amendments to the regulations that will be needed to implement the second commitment are scheduled for presentation to the Board for consideration in December of this year.

As to the second commitment, revising the standards to allow compliance with the EPA-adopted greenhouse gas standards in lieu of compliance with California standards, EPA is anticipated to issue a Notice of Proposed Rulemaking (NPRM) on the national program in August 2009. While the particulars of the federal program are unknown at this time, we anticipate that its compliance provisions will be similar to California's in that manufacturers will be required to meet a fleet average greenhouse gas requirement and will accrue credits for over compliance with the fleet average and debits for under compliance.

Under either the existing regulations requiring California-only sales data or under the proposed pooling option, we foresee compliance and no debits in 2009 and 2010, and for most manufacturers, none in 2011 either. However, in the unlikely event that debits are incurred they must be equalized within the five model years provided in the regulation, at which time California will be participating in the federal program with its own scheme for the generation of credits and debits. In order to ensure that debits incurred in the 2009 through 2011 model years are equalized, California will likely require that manufacturers opting into the federal program will offset any debits incurred in California by earning a commensurate number of credits in the federal program and retiring those credits rather than using them to meet their federal obligations. Staff will consider amending the Pavley regulations at the December Board hearing, to address this issue. Manufacturers that do not equalize debits within the five model years provided in the regulations shall be subject to penalties under the provisions of section 43211 of the Health & Safety Code. Under the proposed pooling option, debits that are not equalized in the time specified must be apportioned between California and the Section 177 states according to their new vehicle sales in the model year the debits are first accrued. However, as EPA indicated in granting California's waiver, (74 Fed.Reg. 32744, 32778 (July 8, 2009)), while debits from model year 2009 may offset credits generated in later years and reduce available credits, noncompliance or civil penalties cannot be based on 2009 MY debits. While it is currently unknown exactly how credits earned under the

Pavley program in the 2009 through the 2011 model years will be treated under the federal program, this issue will presumably be address by EPA in their final rule.

III. SUMMARY OF RECOMMENDED ACTION

Consistent with the aforementioned agreement, staff is proposing two types of modifications to the Pavley regulations to address manufacturers' concerns.

Allow Manufacturers to Meet the Fleet Average Greenhouse Gas Emission Standard by "Pooling" the California and Section 177 State Vehicles

First, staff proposes to allow a manufacturer to comply with the fleet average greenhouse gas requirement based on the combined sales of passenger cars and light-duty trucks in California and the other states that have adopted California's vehicle regulations ("Section 177" states). Manufacturers have stated that this approach will allow them to reduce overall compliance costs and implementation concerns, since they will be able to develop a compliance plan for all states subject to the Pavley requirements, without having to address the particular vehicle mix in each individual state.

Accordingly, manufacturers that choose to comply with the fleet average GHG requirements by pooling GHG emissions for California and Section 177 states must state their intention to do so prior to the start of the model year. Since the certification process for model year 2009 and 2010 is already underway, manufacturers must notify the Executive Officer of their intent to comply by pooling emissions in writing within 30 days of the effective date of the amendments. Beginning with the 2011 model year, manufacturers must notify the Executive Officer in writing prior to the start of the applicable model year. A manufacturer choosing emission pooling as a compliance option must commit to pooling emissions from California and all Section 177 states. A manufacturer that chooses to pool GHG emissions for any model year may not opt-out for that model year, however, it may opt out for future model years.

Any manufacturer that chooses to comply with the Pavley regulations by meeting the fleet average greenhouse gas requirements based on the combined sales of new passenger vehicles in California and the Section 177 states will be required to submit emission testing data and sales data for the combined fleet. The data must be submitted in sufficient detail to allow staff to verify the manufacturer's average greenhouse gas levels for each model year. This is an additional reporting requirement. A manufacturer must still provide to the Air Resources Board California-specific test data and sales data in sufficient detail to allow staff to easily calculate the fleet average greenhouse gas emissions for new passenger cars and light-duty trucks sold in California in each model year. This data is needed in order to track progress in meeting the targeted GHG emission reductions from the transportation sector called for in AB 32. Manufacturers must also provide state-specific test data and sales data for each of the Section 177 states. In many cases, these states have their own GHG programs similar to California's AB 32 program that require emission reductions from sectors other than the transportation sector.

Accordingly, these states too will need to track progress in reducing GHG emission data from the transportation sector. The state-specific test and sales data must be submitted separately from the combined California plus Section 177 state data.

Allow the Use of Data from the Federal CAFE Program to Demonstrate Compliance with the Pavley Regulations

The second change that staff is proposing is to allow manufacturers to use emission test data from the federal CAFE program to demonstrate compliance with California's Pavley regulations. This change will also reduce costs to the manufacturers, by reducing the number of tests that must be conducted solely for the purpose of California's regulations.

To demonstrate compliance, manufacturers must submit GHG emission data for the worst case vehicle for each test group. Manufacturers may submit additional test data for vehicles within the test group with lower GHG emissions than the worst case configuration. Consistent with the May 19, 2009 agreement, manufacturers may use emission data from tests conducted as part of the federal CAFE program. When submitting emission data from the federal CAFE program, manufacturers must make a demonstration that the appropriate vehicle emission test data, consistent with the regulatory requirements, has been selected. A manufacturer that elects to use CAFE Program data to demonstrate compliance with the greenhouse requirements must use all acceptable data from the program, and may forego testing of the "worst-case" configuration.

Furthermore, because manufacturers are not required to measure methane (CH₄) and nitrous oxide (N₂O) emissions under the CAFE Program, a manufacturer that uses CAFE data to demonstrate compliance with the greenhouse gas requirements will be allowed to substitute the term 1.9 CO₂-equivalent grams per mile for the terms "296 x N₂O + 23 x CH₄" in the following equation, which is used to calculate the CO₂-equivalent values for the vehicles.

$$\text{CO}_2\text{-Equivalent Value} = \text{CO}_2 + 296 \times \text{N}_2\text{O} + 23 \times \text{CH}_4 - \text{A/C Direct Emissions Allowance} - \text{A/C Indirect Emissions Allowance}$$

The 1.9 CO₂-equivalent grams per mile value was derived from EMFAC, California's inventory model for on-road vehicles. Specifically, an emission rate of 0.005 grams of CH₄ per mile was derived from the EMFAC emission rate for CH₄ for 2019 model year light-duty vehicles. An emission rate of 0.006 grams of N₂O per mile driven was derived from the ratio of N₂O to oxides of nitrogen (NO_x) determined from emission test data generated at ARB's vehicle test facility (Behrentz, E., Ling, R., Rieger, P., and Winer, A.M. Measurements of nitrous oxide emissions from light-duty motor vehicles: a pilot study. Submitted to Journal of Atmospheric Environment, April 2004). This ratio was then applied to the EMFAC emission rate for NO_x for 2019 model year light-duty vehicles. These values, expressed as CO₂-equivalent, were then used to establish the fleet average greenhouse gas values (Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions From Motor Vehicles," August 6, 2004). Therefore, for CAFE vehicles, it is appropriate to allow

use of this default value to account for N₂O and CH₄ emissions, when no actual N₂O and CH₄ test data is available.

Adopt Minor Changes to the Test Procedures

Staff is also proposing a number of minor amendments to the test procedures for light- and medium-duty vehicles, to align them with current federal requirements. These amendments consist primarily of updating the test procedures to ensure that the applicable dates of the sections of the Code of Federal Regulations that are referenced therein are current.

IV. AIR QUALITY, ENVIRONMENTAL, AND ECONOMIC IMPACTS

A. Air Quality

Pooling emissions for all states may result in minor changes in greenhouse gas reductions within the individual states due to the portability of credits and debits incurred by the manufacturers. Because exactly how manufacturers will comply under an emission pooling scheme is unknown at this time, staff is unable to quantify the emissions impact for the individual states. Nonetheless, staff anticipates that there will be no significant emissions impact from this proposal because it does not fundamentally change the fleet average greenhouse gas requirements to which a manufacturer must certify its fleet.

B. Economic Impact

The proposed amendments will provide vehicle manufacturers that are subject to the requirements of California's passenger vehicle greenhouse gas regulations with an optional method for complying with the Pavley regulations. Staff expects that the proposed amendments could reduce the cost of compliance for vehicle manufacturers that choose to meet these alternative requirements. In any instances where the proposed amendments would increase compliance costs, manufacturers retain the option to comply with the regulations as originally written.

Manufacturers are already required to conduct emission testing to measure the CO₂ emissions from their passenger fleet as part of the CAFE program. So, allowing a manufacturer to use these data to demonstrate compliance with California's greenhouse gas requirements would reduce the number of emission tests that will need to be conducted solely for the California program. However, this economic impact, while positive, is expected to be minimal. If a manufacturer chooses to comply with the Pavley regulations as they currently are written, there would be no economic impact from these amendments on that manufacturer.

Similarly, staff does not expect there to be any economic impacts due to the test procedure revisions, since manufacturers will continue to use the same test procedures for both California and federal purposes rather than having to conduct two different procedures.

The proposed amendments also may impose additional reporting requirements if manufacturers choose to calculate fleet average emissions across all states that have adopted the Pavley regulations. While manufacturers are currently required to report California sales data that are used to demonstrate compliance with the Pavley regulations, the amendments would require manufacturers to also report sales data from the other states that have adopted the Pavley regulations. The additional reporting requirements are needed as part of the multi-state pooled sales compliance option, the proposal of which is an essential element in the May 2009 commitments. This and the other commitments best ensure that California achieves the greenhouse gas emission reductions required by AB 1493 and assumed toward meeting AB 32. Thus with this Initial Statement of Reasons staff proposes that the Board find it is necessary for the health and welfare of the people of the State that any additional reporting required by the proposed amendments apply to the affected businesses.

The additional cost due to this amendment is not expected to be significant, since under the current regulations, each state already requires manufacturers to submit sales data for each of these states. The proposed amendments will simply require this data to also be submitted to the Air Resources Board. Manufacturers may choose to submit only California sales data and comply with the regulations on an individual state basis as they currently are written, in which case there would be no economic impact from these amendments on that manufacturer.

There will be no fiscal impacts to the State from the proposed amendments, either in terms of tax revenue or personnel requirements. These amendments are not expected to change vehicle prices in a way that would alter vehicle purchase decisions. The inclusion of alternative compliance options does not substantially increase the volume of data to review that would justify hiring additional staff.

C. Alternatives

1. Evaluation of alternatives considered and reasons for rejecting them

Staff considered the following regulatory alternative to the proposed amendments.

Do not amend current Pavley regulations. The significant proposed changes to the Pavley regulations (allowing manufacturers to comply with a single greenhouse gas fleet average level for California and all the other states that have adopted our regulations, and allowing manufacturers to demonstrate compliance with the Pavley regulations using data from the federal CAFE program) are, according to manufacturers, needed to reduce their costs and simplify their compliance demonstration. These changes could provide cost benefits for manufacturers, and they would maintain the emission benefits of the current regulations. The proposed changes to the test procedure – in addition to those changes simply implementing proposed changes in the regulatory text – are needed to maintain alignment with federal testing requirements.

This alternative was rejected because California committed to making the proposed amendments as part of the agreement that was signed by California, the federal government, and other parties on May 19, 2009, as discussed in section II. Furthermore, maintaining the Pavley regulations in their current form would provide no greater emissions benefit than the proposed changes, but at a likely higher cost to the affected industry.

2. Description of reasonable alternatives considered that would lessen impact on small business

No alternatives were considered to lessen the impact on small business, because small businesses will not be impacted by these proposed amendments.

3. Evidence relied upon to support initial determination in the notice that the regulation will not have a significant adverse economic impact on business

The proposed amendments will not significantly affect businesses, since vehicle purchase price and model availability will not be adversely impacted. Vehicle manufacturers will not be required to expend any money to comply with the new requirements. Rather, this proposal could save them money.

4. Justification for adoption regulations different from federal regulations contained in the Code of Federal Regulations

There are currently no federal regulations to reduce greenhouse gas emissions from passenger vehicles. However, climate change threatens California's public health, water resources, agricultural industry, ecology, and economy. Due to this threat Chapter 200, Statutes of 2002 (AB 1493, Pavley) specifically directed the Air Resources Board to adopt regulations to control greenhouse gas emissions from motor vehicles.

V. ENVIRONMENTAL JUSTICE

"Environmental Justice" is defined 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 (Government Code §65040.12(c)).

Staff does not believe that this proposal will have any adverse environmental justice impacts because the stringency of California's passenger vehicle greenhouse gas requirements is not affected by the proposed changes to the regulations. Furthermore, since the criteria pollutant regulations must still be met on an individual state-by-state basis, there will be no increase in criteria pollutants in California due to mix shifting of vehicles between California and other states.

VI. LIST OF APPENDICES

Appendix A: Proposed Regulation Order

Appendix B: Proposed Amendments to the California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles

VII. REFERENCES

1. Alliance of Automobile Manufacturers, Letter from The Honorable David McCurdy, President and Chief Executive Officer, to The Honorable Ray LaHood, Secretary, United States Department of Transportation and The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency, May 18, 2009
2. American Honda Motor Company, Inc., Letter from John Mendel, Executive Vice President, Automobile Sales, American Honda Motor Company, Inc., to The Honorable Ray LaHood, Secretary, United States Department of Transportation and The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency, May 17, 2009
3. Behrentz, E., Ling, R., Rieger, P., and Winer, A.M. Measurements of nitrous oxide emissions from light-duty motor vehicles: a pilot study. Submitted to Journal of Atmospheric Environment, April 2004
4. BMW, Letter from Dr.-Ing. Norbert Reithofer, Chairman of the Board of Management, BMW, to The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency and The Honorable Ray LaHood, Secretary, United States Department of Transportation, May 18, 2009
5. California Air Resources Board, Letter from Mary D. Nichols, Chairman, to The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency and The Honorable Ray LaHood, Secretary, United States Department of Transportation, May 18, 2009
6. Chrysler LLC, Letter from Robert L. Nardelli, Chairman and Chief Executive Officer, Chrysler LLC to The Honorable Ray LaHood, Secretary, United States Department of Transportation and The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency, May 17, 2009
7. Daimler AG, Letter from Dr. Dieter Zetsche, Chairman of the Board of Management of Daimler AG and Head of Mercedes-Benz Cars, and Dr. Thomas Weber, Member of the Board of Management, Group Research & Mercedes-Benz Cars Development, to The Honorable Ray LaHood, Secretary, United States Department of Transportation and The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency, May 18, 2009
8. EMFAC, 2003. Version 2.2, Updated April 23, 2002.
9. Federal Register, Volume 74, No. 129 / Wednesday, July 8, 2009 / Notice, Environmental Protection Agency, "California State Motor Vehicle Pollution Control Standards; Notice of Decision Granting a Waiver of Clean Air Act Preemption for California's 2009 and Subsequent Model Year Greenhouse Gas Emission Standards for New Motor Vehicles."

10. Ford Motor Company, Letter from Alan R. Mulally, President and Chief Executive Officer, Ford Motor Company, to The Honorable Ray LaHood, Secretary, United States Department of Transportation and The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency, May 17, 2009
11. General Motors Corporation, Letter from Frederick A. Henderson, Chief Executive Officer, General Motors Corporation, to The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency and The Honorable Ray LaHood, Secretary, United States Department of Transportation, May 17, 2009
12. Mazda North American Operations, Letter from Jim O'Sullivan, President and Chief Executive Officer, Mazda North American Operations, to The Honorable Ray LaHood, Secretary, United States Department of Transportation and The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency, May 18, 2009
13. State of California, Air Resources Board, "Initial Statement of Reasons for proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions From Motor Vehicles," August 6, 2004
14. State of California, Letter from Governor Arnold Schwarzenegger to The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency and The Honorable Ray LaHood, Secretary, United States Department of Transportation, May 18, 2009
15. State of California, Office of the Attorney General, Letter from Edmund G. Brown, Jr., Attorney General, State of California, to The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency and The Honorable Ray LaHood, Secretary, United States Department of Transportation, May 18, 2009
16. Toyota Motor Sales, Letter from James E. Lentz, President, Toyota Motor Sales, to The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection Agency and The Honorable Ray LaHood, Secretary, United States Department of Transportation, May 17, 2009
17. U.S. Environmental Protection Agency and U.S. Department of Transportation, "Notice of Upcoming Joint Rulemaking to Establish Vehicle GHG Emissions and CAFE Standards,"
http://www.nhtsa.gov/staticfiles/DOT/NHTSA/Rulemaking/Rules/Associated%20Files/Joint_CAFE_GHG_Emissions.pdf
18. Volkswagen Group of America, Letter from Stefan Jacoby, President and Chief Executive Officer, Volkswagen Group of America, to The Honorable Lisa P. Jackson, Administrator, United States Environmental Protection

Agency and The Honorable Ray LaHood, Secretary, United States
Department of Transportation, May 17, 2009

CALIFORNIA AIR RESOURCES BOARD**NOTICE OF PUBLIC MEETING TO CONSIDER ADOPTION OF THE CLIMATE ACTION RESERVE UPDATED FOREST PROJECT PROTOCOL FOR GREENHOUSE GAS ACCOUNTING**

The Air Resources Board (ARB or Board) will conduct a public meeting at the time and place noted below to consider the adoption of the Climate Action Reserve (Reserve) updated Forest Project Protocol for greenhouse gas accounting.

DATE: September 24, 2009
TIME: 9:00 a.m.
PLACE: South Coast Air Quality Management District
Auditorium
21865 Copley Drive
Diamond Bar, California 91765-4182

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 24, 2009, and may continue at 8:30 a.m., September 25, 2009. This item may not be considered until September 25, 2009. Please consult the agenda for the meeting, which will be available at least 10 days before September 24, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

In October 2007, the Board adopted the Reserve's Forest Protocols (version 2.1) for use in voluntary greenhouse gas reduction projects. During that Board meeting, the Board also directed staff to initiate a process to update the forest protocols with additional accounting procedures in order to encourage greater participation in forest projects by other types of landowners, particularly publicly-owned lands and industrial working forests. ARB staff contracted with the Reserve to develop the updates to the protocol. On September 1, 2009, the Climate Action Reserve adopted the updated Forest Project Protocol (version 3.0). ARB staff is recommending that the Board adopt the updated Climate Action Reserve Forest Project Protocol (version 3.0) as a technically sound quantification methodology for greenhouse gas accounting for voluntary reduction projects.

ARB staff will present a written report and make an oral presentation at the meeting. Copies of the report may be obtained from ARB's Public Information Office at 1001 I Street, First Floor, Environmental Services Center, Sacramento, California, 95814, (916) 322-2990, September 15, 2009. The report may also be obtained from ARB's website at <http://www.arb.ca.gov/cc/forestry/forestry.htm>.

Interested members of the public may also present comments orally or in writing at the meeting and may be submitted by postal mail or by electronic submittal before the meeting. To be considered by the Board, written comments submissions not physically submitted at the meeting must be received **no later than 12:00 noon, September 23, 2009**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require 20 copies of any written submission. Also, ARB requests that written and email statements be filed at least 10 days prior to the meeting so that ARB staff and Board members have time to fully consider each comment. Further inquiries regarding this matter should be directed to Ms. Shelby Livingston, Manager, Special Projects Section, (916) 324-7156, or Mr. Erik Winegar, Air Pollution Specialist, Climate Change Verification & Protocols Section, (916) 324-0594.

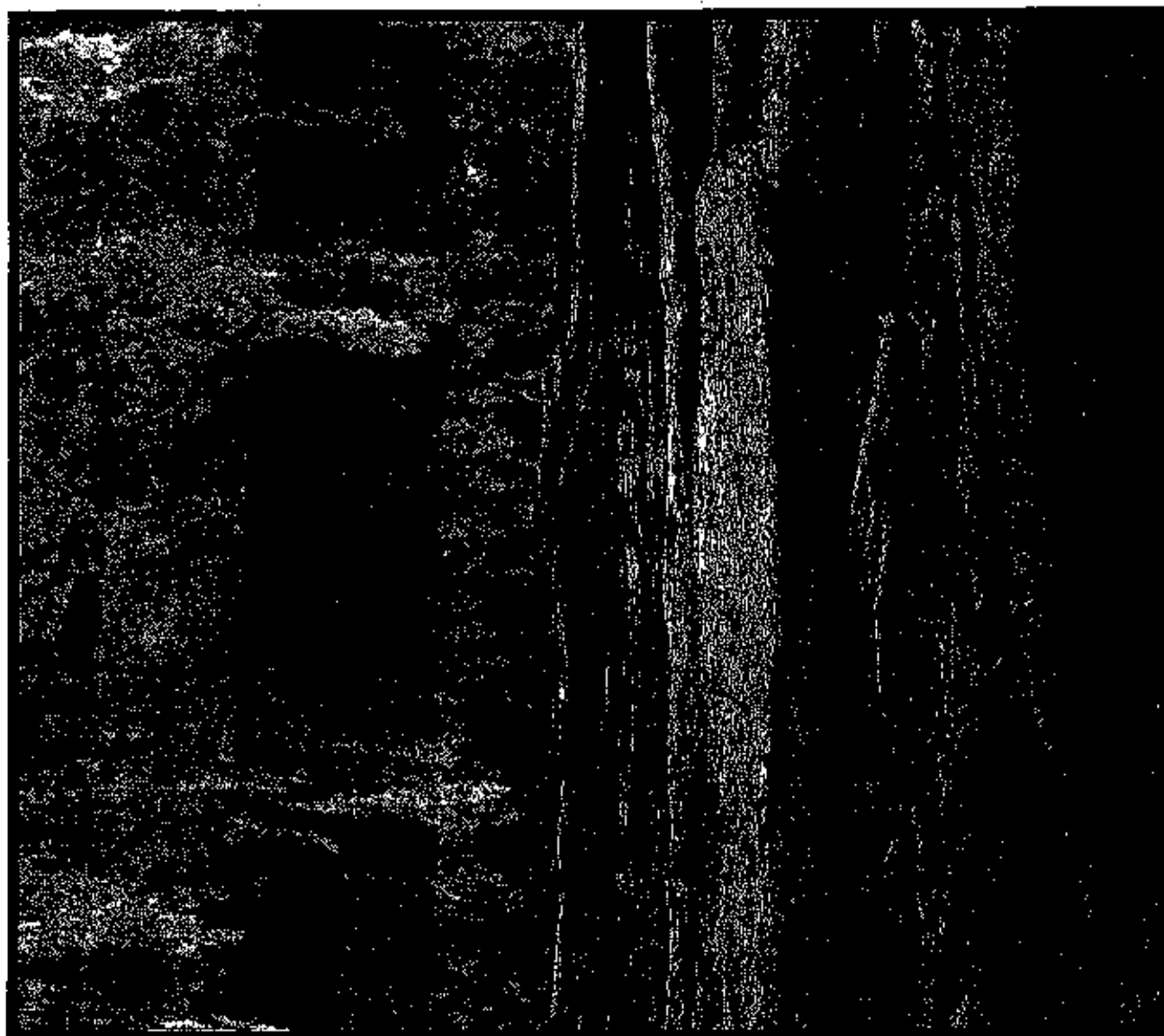
CALIFORNIA AIR RESOURCES BOARD



James N. Goldstene
Executive Officer

Date: September 2, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.



Staff Report:
Proposed Adoption of the Updated Climate Action Reserve
Forest Project Protocol

Planning and Technical Support Division
Emissions Inventory Branch

Release date: September 10, 2009

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**State of California
AIR RESOURCES BOARD**

STAFF REPORT

**PROPOSED ADOPTION OF THE UPDATED CLIMATE ACTION RESERVE
FOREST PROJECT PROTOCOL**

To be considered by the Air Resources Board September 24-25, 2009, at:

South Coast Air Quality Management District Auditorium
21865 Copley Drive
Diamond Bar, California 91765-4182

Acknowledgements

ARB staff would like to thank the:

Forest Protocol Workgroup members
Climate Action Reserve

September 10, 2009

This report has been prepared by the staff of the Air Resources Board. Publication does not signify that the contents reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

**ARB Staff Report:
Proposed Adoption of the Updated Climate Action Reserve
Forest Project Protocol**

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Executive Summary

In October 2007, the Air Resources Board (ARB or Board) adopted the California Climate Action Registry forest protocols (sector, project, and certification protocols) as a cohesive and rigorous accounting framework for voluntary purposes. By adopting the forest protocols, the Board recognized the value of the protocols for early participation in forest projects that achieve greenhouse gas emission reductions. The Board also recognized the need to develop additional methods to encourage greater participation in forest projects.

The Board directed ARB staff to initiate a process to update the forest protocol to reduce barriers to participation, especially for public lands and industrial working forests, while still maintaining the sound accounting principles of the protocol. ARB staff contracted with the California Climate Action Registry – now the Climate Action Reserve (the Reserve) – to lead the update process. A Forest Project Protocol Workgroup was formed to identify and work through major issues to update the protocol. The Workgroup consisted of stakeholders representing the forest industry, public lands, non-governmental organizations, government agencies, and academia.

The Reserve staff and the Workgroup made significant improvements to the forest protocol, both reducing barriers to participation and further improving protocol quality and efficiency. Barriers to participation have been removed for private commercial forests not associated with a land trust, private non-timber forests (oak woodlands), public lands, and for small landowners. The update also improves methods for calculating baselines and additionality, better addresses permanence and leakage accounting, improves cost-effectiveness, includes harvested wood products, and more clearly defines natural forest management. Efficiencies were made to both forest inventory and verification requirements where these did not diminish the protocol's rigor.

The forest carbon accounting methods in the updated Forest Project Protocol represent accurate and conservative methods that generate real, additional, permanent, and verifiable forest carbon credits for the voluntary market. The conditions and criteria for the use of protocols in complying with AB 32 are still being developed as part of California's cap-and-trade program regulation.

The Climate Action Reserve Board of Directors adopted the Forest Project Protocol (version 3.0) at their September 1, 2009 meeting. In consideration of the complexity and dynamic nature of carbon accounting protocols, the Reserve Board of Directors understands further updates may occur on technical issues still under review.

The ARB staff is recommending that the Air Resources Board, at their September 24-25, 2009 meeting, adopt the Forest Project Protocol (version 3.0) for use in voluntary forest greenhouse gas reduction projects.

I. Background

In October 2007, the Air Resources Board (ARB or Board) adopted the California Climate Action Registry forest protocols (sector, project, and certification protocols) as a cohesive accounting framework for voluntary purposes. The protocols provide quantification methods that ensure that reductions are real, additional, permanent, and verifiable as required by the Global Warming Solutions Act of 2006 (AB 32). By adopting the forest protocols, the Board recognized the value of the protocols for early participation in forest projects that achieve greenhouse gas emission reductions. The Board also recognized the need to develop additional methods to encourage greater participation in forest projects.

The Board directed ARB staff to initiate a process to develop additional approaches for forest carbon accounting and return to the Board with protocol updates after the process was completed. Specifically, the Board sought to reduce barriers for participation by private commercial forests not associated with a land trust, private non-timber forests (oak woodlands), and public lands, while still maintaining protocol quality. ARB staff contracted with the California Climate Action Registry – now the Climate Action Reserve (the Reserve) – to lead the update process and create a workgroup to develop an update to the Forest protocols. A Forest Project Protocol Workgroup was formed to identify and work through major issues to update the protocol.

The updated Forest Project Protocol is for project accounting for voluntary purposes to generate credits for use in a *voluntary* market. The conditions and criteria for the use of protocols for complying with AB 32 are still being developed as part of California's cap-and-trade program regulation.

II. Key Improvements to the Forest Project Protocol

Based on recommendations from the Protocol Workgroup, the Reserve has updated the Forest Project Protocol to include numerous improvements, which will provide greater opportunities for landowners to participate in forest projects. The key improvements include that the updated protocol:

- Expands applicability for other landowner types, especially public lands and private commercial forests;
- Improves methodologies to calculate baseline emissions;
- Better addresses permanence and replacement of carbon lost from reversals;
- Better leakage accounting;
- Improves cost-effectiveness (less burdensome forest inventory requirements);
- Improves co-benefits (refines definition of "natural forest management" and requires sustainable harvesting practices); and
- Includes harvested wood product accounting

III. The Forest Protocol Workgroup Process

In updating the Forest Project Protocol, the Reserve created a Forest Protocol Workgroup (Workgroup), a group of 28 people, representing large and small private landowners, public landowners, environmental organizations, scientists and academics, state and federal government agencies, and verifiers (participants are listed in Table A-1 in the Appendix). The Workgroup discussions, led by a professional facilitator, were held in all-day sessions at least every 3 weeks from November 2007 through January 2009, and less frequently through July 2009. These sessions were open to the public. In addition, outside speakers were invited to share perspectives and expertise during several of the meetings.

To make efficient use of time and move issues forward, the Workgroup created subcommittees to tackle the details of the following specific issues:

- Improved Forest Management Baseline
- Public Lands Forest Management Baseline
- Reforestation Baseline
- Avoided Conversion Baseline
- Permanence
- Leakage
- Co-Benefits
- Quantification

Subcommittees met and reported back to the broader group for discussion and decisions. Subcommittee leads are listed in Table A-2 in the Appendix.

IV. Updated Forest Project Protocol: Areas of Improvement

The process to update the Forest Project Protocol provided an opportunity to make numerous improvements to the previous protocol, including updates to methods to better address baseline calculations, address permanence and leakage; improve guidance for calculations; reflect current science; and improve the efficiency and cost-effectiveness of methods. Specific areas of improvement are listed below and discussed in more detail in this report:

- *Baseline and additionality*
 - Revised and improved methodologies for calculating baselines and additionality for all project types
- *Permanence*
 - Mechanisms established to replace all carbon lost in reversals enforced through a project implementation agreement (PIA)

- *Leakage*
 - Standardized discount factors developed for significant risks of emission leakage for all project types
- *Co-benefits*
 - Definition of natural forest management clarified
 - Requirement to demonstrate sustainable harvesting practices
- *Harvested Wood Products*
 - Wood product accounting now included for all project types
- *Monitoring and Verification*
 - Annual monitoring reports required
 - Less burdensome forest inventory requirements
 - Verification with site visits required every six years
- *Applicability*
 - Protocol can now be applied to projects throughout the US, including projects on public lands and oak woodlands

A. Baseline and Additionality

Baselines establish the "business-as-usual" scenario against which to compare forest project activity. This makes it possible to quantify additional emissions reductions or enhanced sequestration resulting from project activity. Correctly establishing a baseline is important to ensure that only emission reductions beyond what would have occurred in absence of the project are credited. The baseline should result in reductions that err on the conservative side, in other words, they should underestimate project emission reductions (additionality) rather than overestimate them.

Baselines described in the protocol vary first by project type – improved forest management, avoided conversion, and reforestation – and within that by land ownership classification (public or private).

1. *Improved Forest Management Baseline - Private Lands*

Improved forest management projects allow forest owners to be credited for emission reductions or removals that result from forest practices that go beyond what is expected to occur under the baseline scenario. The current version of the protocol (version 2.1) uses California forestry regulations as a reference to model the baseline scenario. The updated protocol expands upon this by also taking into account common forestry practice in establishing a baseline.

Current Method:

The approach to baseline modeling in the current protocol uses the "maximum legally allowable harvest" under the California Forest Practice Rules Option C. This provides a standardized approach for forest project proponents to model forest harvest and growth for 100 years and to establish the project baseline. The baseline is not

averaged, but represents the expected trend of forest management activity over time. Project activity above this baseline is considered additional, and reductions are calculated based on the difference between the project activity and the baseline.

However, these baseline assumptions may not be appropriate for a large proportion of forest timberland acreage because the legal requirements for larger landowners are more restrictive than Option C, including a requirement for "sustained yield," and requiring different management projections. Though Option C provides the benefit of a standardized approach, it does not necessarily represent common practice.

New Approach:

The updated baseline approach takes into account the forest entity's legal and financial constraints, and uses the average of the actual forest management practices in the project's assessment area. The assessment area is defined as a geographical area consisting of distinct forest community types within regulatory and political boundaries that affect forest management as represented in the US Forest Service forest inventory and analysis plots (FIA).

To calculate the new baseline, the proponent's legal and financial constraints are projected over 100 years. For example, the requirements of the Forest Practice Rules, based on an entity's budget, establish a 100-year projection of growth and harvest activity. The projection is averaged over the 100-year period to create a flat line. Constraints are placed on the projection, however, depending on how a project's initial carbon stocks compare to average carbon stocks in the project's assessment area. If initial stocks are above the regional average, then the projected 100-year baseline may not fall below the average (even where legally this might be permitted). This allows projects to receive credit for maintaining above-average stocking levels, but only to the extent they exceed common practice, not a legally permissible minimum. If initial carbon stocks are below average, then the projected 100-year baseline may not fall below the initial stocking level. There is also a requirement for an historic review of stocks that prevents the practice of reducing stocks just prior to starting a project. In all cases, credits are issued annually based on the increase in stored carbon (both in the project area and in harvested wood products) relative to the baseline scenario. If stored carbon decreases in a given year, then it is treated as a reversal that must be compensated for by the project proponent.

2. Improved Forest Management Baseline - Public Lands

Roughly half of the State's 34 million acres of forest land is public land. The current protocol is not applicable to public lands, which creates an insurmountable barrier to participation by a vast acreage of the State. The Board directed staff, during the protocol adoption hearing, to update protocol with methodologies appropriate to public lands.

Current Method:

The current protocol does not include a public lands forest management baseline.

New Approach:

The updated protocol includes a new baseline approach that allows public lands to quantify a baseline based on an historic, 10-year review of retention standards, rotations, and other practices determined by a public entity's statute, regulation, policy, and budgets. For project areas with declining stocks, the baseline is the 10-year average, projected as a flat line for the next 100 years. For projects with increasing stocks, the baseline is the increasing growth trajectory over the next 100 years.

In general, any project developed on public lands requires approval from the appropriate government agency and must include a public vetting process. Projects on federal lands are required to be approved through a federal legislative or regulatory/rulemaking process.

3. Reforestation Baseline - Public and Private Lands

Extensive reforestation opportunities exist in California. Reforestation projects on public and private lands, from oak woodlands to timberlands could significantly enhance forest sequestration capacity.

Current Method:

The current Protocol allows reforestation projects only if they occur on currently non-forested land which has been non-forested for at least 10 years, but has historically supported forest cover. Afforestation projects, planting trees where historically trees have not grown naturally, are not allowed.

New Approach:

The updated Protocol still requires reforestation projects to be out of forest cover for 10 years; however the requirement is waived if the project land base has undergone a significant natural disturbance and the landowner is not required by law to reforest. An example of a newly eligible project type is Cuyamaca State Park, which experienced an exceptionally hot, catastrophic fire in 2003 that sterilized the soils

and prevented natural regeneration. Reforestation is not required by law, but will stabilize the barren slopes against erosion, recondition soils, and begin to return forest ecosystem function to the landscape.

To ensure additionality, an economic evaluation of the project is required to determine that reforestation activity would not have otherwise happened. The baseline is the simulated future characterization of carbon stocks assuming there is no tree planting or removal of barriers to natural regeneration. Reforestation projects on lands that have recently experienced timber harvesting are not eligible; however, projects on active timberlands would be eligible if a significant natural disturbance as described previously were to occur.

4. *Avoided Conversion Baseline*

Deforestation, degradation, and conversion of forested land to non-forest uses is one of the largest sources of GHG emissions in the world, accounting for roughly 20% of current global emissions. As California's population increases, and as the development value of forest land rises, there is increased pressure to convert forest land to non-forest uses. This development pressure is felt in the oak woodlands as well as in timber lands.

Current Method:

Projects that seek to protect forest land from conversion must demonstrate a site-specific immediate threat such as a current development plan or demonstrate conversion risk using county-specific conversion rate look-up tables.

New Approach:

The baseline projection for Avoided Conversion Projects involves two steps:

- Characterizing and projecting the baseline
- Discount for the uncertainty of conversion probability

The baseline is forecast over the 100-year timeframe based on an appraisal of the highest value land use, and the consequent rate of conversion of onsite carbon stocks. Avoided conversion projects must demonstrate that an alternative land use is legally permissible, and demonstrate through a real estate appraisal that the area is suitable for conversion and that the alternative land use has a significantly higher market value.

Conversion rates are estimated either from referencing planning documents, or from use of a default look-up table provided in the protocol. If the latter method is used, then a discount is applied based on the uncertainty of conversion for a given land type.

B. Permanence

Carbon sequestration projects face a large variety of risks that may compromise the permanence of achieved or transacted reductions and/or may lead to increased leakage (i.e., displacement of GHG emissions outside the project boundary). Permanence is an offset criteria that is generally required in most offset programs, and is required by AB 32.

Permanence refers to the duration of an emission reduction, and is defined relative to the residence time of an emitted GHG in the atmosphere. Permanence for carbon dioxide is defined by the Reserve as a period of 100 years. Emissions from disturbances – such as fire, insects and disease – and from project mismanagement or failure, can return stored carbon to the atmosphere (reversal). The possibility of reversal imposes a risk to the permanence of reductions from sequestration projects. For this reason, the Protocol invokes mechanisms to ensure replacement of lost carbon in the event of a reversal. Permanence can be addressed through both *ex ante* (up-front commitment) and *ex post facto* (commitment to replace lost carbon in the case of a loss) legal instruments.

The current Protocol uses a single *ex ante* legal instrument, a conservation easement requirement, as a mechanism to ensure permanence. A conservation easement reduces certain types of reversal risks, such as conversion risk, but not all, for example wildfire. The “in perpetuity” clause of the conservation easement obligation was a barrier to participation by many private landowners. Because stored forest carbon can be released back to the atmosphere through various processes, such as fire, insects and disease, permanence of transacted tons is only achieved by guaranteeing replacement of lost tons. In practice, forest project proponents have negotiated *ex post facto* obligations outside the scope of the forest protocol. –

The updated Protocol addresses permanence through four separate requirements:

- The requirement to monitor onsite carbon stocks, submit annual monitoring reports, and submit to annual third-party verification of those reports along with periodic verifier site visits;
- The requirement to sign a Project Implementation Agreement (PIA) with the Reserve, which obligates Forest Owners to retire reductions (Climate Reserve Tonnes or CRTs) to compensate for reversals of GHG reductions and removals; and
- The maintenance of a Buffer Pool to provide insurance against reversals of GHG reductions and removals due to unavoidable causes (including natural disturbances such as fires, pest infestations, or disease outbreaks).
- For Avoided Conversion projects, the requirement to obtain a conservation easement or transfer lands to public ownership.

These requirements are discussed below.

1. Monitoring and Verification Requirements

Protocol updates now require the project developer to monitor onsite carbon stocks, submit annual monitoring reports, and submit to annual third-party verification of those reports. Any reversals of stored carbon must be quantified and reported in the annual monitoring reports. Forest owners are required to notify the Reserve when any reversals occur, and verification of onsite carbon stocks must take place following a reversal.

2. Project Implementation Agreement

To be eligible, a forest owner is required to enter into a Project Implementation Agreement (PIA) with the Reserve. The PIA is an agreement between the Reserve and a landowner setting forth: (i) the landowner's obligation (and the obligation of succeeding landowners) to comply with the Forest Project Protocol for the 100-year period that defines permanence, and (ii) the rights and remedies of the Reserve in the event of any failure of a landowner to comply with their obligations. The PIA must be signed when the project is registered with the Reserve.

Remedies for unintentional and intentional reversals, including early project termination, are detailed in the PIA and in the protocol. A reversal is defined in the protocol as a decline in the difference between the project and the baseline carbon stock in one year. In the updated protocol, an avoidable reversal is defined as a reversal that results from the forest owner's negligence or willful intent (such as harvesting), while an unavoidable reversal is the result of natural causes such as wildfire or disease. In general, a forest owner is liable for avoidable reversals, while the Reserve will compensate for unavoidable reversals through the Buffer Pool mechanism.

3. Project risk assessment and the Buffer Pool

The Buffer Pool acts as a general insurance mechanism against unavoidable reversals for all Forest Projects registered with the Reserve. The Buffer Pool is a holding account for Forest Project CRTs, and is administered by the Reserve. All Forest Projects must contribute a percentage of CRTs to the Buffer Pool determined by a project-specific risk rating. For example, a project that has qualified conservation easement or deed restriction in place is considered lower risk and therefore is required to contribute less to the Buffer Pool than a project that does not have one. If a Forest Project experiences an unavoidable reversal of GHG reductions and removals, the Reserve will retire a number of CRTs from the Buffer Pool equal to the total amount of carbon that was reversed (measured in metric tonnes of CO₂-equivalent).

In the event of an avoidable reversal, including harvesting, development, and early project termination, the forest owner is required to replace obligated CRTs with forest CRTs either from their own account or from the Reserve. Compensation rates are project- and timing-specific, and are detailed in the protocol. It is possible for projects to temporarily decrease carbon storage due to planned harvesting or thinning cycles (normal silviculture cycles), while continuing to increase carbon storage over time. Planned thinning that results in a decrease in the difference between actual and baseline carbon storage is treated as an avoidable reversal that requires compensation in the year it occurs; however, this would not affect the project's ability to credit reductions in future years (provided all reversals have been compensated for).

The protocol requires that actual standing live carbon stocks cannot fall below baseline carbon stocks. If a reversal lowers actual onsite carbon stocks below its approved baseline carbon stocks, the project will automatically be terminated by the Reserve. If this was the result of an unavoidable reversal, the Reserve would compensate for the lost carbon from the buffer pool; if the result of an avoidable reversal, the forest owner would be required to compensate.

4. *Avoided Conversion*

An additional requirement exists to ensure that forest lands protected through avoided conversion projects are not converted at a later time and are dedicated to continuous forest cover in perpetuity. In Version 2.1., the conservation easement required applied to avoided conversion projects in the same manner as other project types. In Version 3.0, avoided conversion projects are required to obtain either a conservation easement or transfer to public ownership. The option for public ownership reduces a barrier to participation for public agencies.

C. Leakage

Leakage occurs when a project displaces business-as-usual activities from within the project boundary to another location outside the project boundary, which can reduce or negate the overall net GHG benefit. In forest projects, leakage could include increased harvesting outside the project boundary in the case of a forest management project, or displaced conversion of forest land to a different site in the case of an avoided conversion project. Reforestation projects could also result in leakage if the reforestation displaces other land uses such as grazing or agricultural land.

Current Method: Carbon accounting on all of a forest owner's lands is required to monitor carbon stocks for leakage outside the project boundary, including discontinuous properties, as detailed in the Reserve's "Forest Sector" Protocol. The Forest Sector Protocol details requirements for reporting carbon stocks from all an entity's lands, not just those within

the project area. This is expensive and time-consuming, and has been a significant barrier to large landowners. Leakage risk is not limited to a single forest entity, and leakage outside the forest entity boundary is not addressed in Version 2.1.

New Approach: The Forest Sector Protocol has been replaced by a rigorous leakage risk assessment to determine risk of shifting project emissions elsewhere. Reforestation projects, for example, must consider the potential for shifting land use effects when projects take place on land used for grazing or agriculture. Improved forest management projects must consider market leakage impacts where reducing harvesting on project lands may lead to an increase in harvesting elsewhere. Avoided conversion projects must apply a leakage discount based on the risk that other forest lands may be converted.

Each project type has its own worksheet that assesses the risk of leakage annually, both within the property and outside of the property, and provides a corresponding leakage risk penalty. The penalty is deducted from the calculations of net emission reductions. Leakage risk discounts are applied using standard default factors depending on the project type and the type of leakage risk. For example, improved forest management projects have a default leakage risk of 20%, where each ton of reduced harvesting below baseline levels is expected to result in a 0.2 ton increase in harvesting outside the project area.

D. Improvement of Co-Benefits Terms

The updated Protocol has added the requirement that projects, in addition to creating climate benefits, also improve or sustain natural ecosystem processes. Projects must demonstrate environmentally responsible, long-term, sustainable forest management certified by a nationally recognized program or approved by a state or federal agency, or they must use uneven-aged management practices as defined in the protocol. Standing live carbon stocks in the project area are now required to be maintained or increased over the life of the project.

The requirement for "native" forest species is better defined in the updated Protocol as being in reference to a scientifically-accepted State-wide native species authority. In California, the native-species reference is the Jepson Manual, and includes a database managed and updated by the University of California (The Jepson Manual Project). Where supported by scientific peer-reviewed research, planting native species outside their current distribution is allowed as a climate adaptation strategy, but must be done in concert with a state or federally approved adaptation plan, or a local plan that has the support of the appropriate state or federal forestry authority.

"Natural forest management" is also better defined to include a spatial scale for management activities. The management of the diverse age classes must ensure that the forest can support all endemic plant and wildlife species and does not preclude even-age management; provided the project includes multiple age classes and mixed species at a watershed scale. Furthermore, it includes a requirement to: maintain or increase live tree biomass, manage for diversity of native species, manage for diversity of age classes to support functioning habitat, and manage to conserve structural elements (snags). The updated protocol contains an evaluation criteria worksheet to determine if the project meets the definition of natural forest management, and specifies what ramifications or corrective actions must be taken if these requirements are not met.

E. Harvested Wood Products

Harvested wood products can represent a significant pool of forest carbon. Wood products have been omitted from most forest accounting frameworks because of the concerns that crediting carbon stored in harvested wood could incentivize harvesting and because of complicated policy issues around chain-of-custody accounting and carbon ownership. When designing an approach, the Workgroup followed the principles of accurate accounting and conservative crediting.

Current Method: In the current Protocol, carbon stored in wood products is considered an optional carbon pool and is not required to be reported. Harvesting activity is reported as a loss of carbon stock and is thus calculated as an immediate emission. This simplifies accounting, however, it is not a quantitatively accurate representation of what actually happens to sequestered/harvested carbon. In the course of its life cycle, harvested biomass can provide long-term carbon storage in durable wood products. It can also provide substitution benefits as biofeedstock to offset fossil fuel emissions, and provide an alternative to more energy-intensive construction materials in the building industry; however, these benefits are more indirect and are not currently evaluated in either version of the forest protocol.

The current approach also is not necessarily conservative; including harvested wood products may either increase or decrease the net reductions depending on whether the project increases or decreases harvesting relative to the baseline scenario. If baseline harvesting levels were higher than under the project activity, including wood products would result in a lower estimate of reductions relative to the baseline.

New Approach: Accounting methodologies were added for harvested wood products as a required element for both the baseline and project activity calculations for all project types. The guiding principles for developing an accounting method for harvested carbon included 1) the

need for accurate and conservative assessment of the climate benefits of forest management activities, 2) recognition that the forest sector is responsible for the activities which lead to the initial sequestration of carbon, and that 3) quantification needs to be technically sound.

Harvested wood products were considered by the Workgroup to be a significant carbon pool that should be included in order to have more complete accounting of relevant sources and sinks. Because the updated protocol requires onsite carbon stocks to increase over time, the inclusion of wood products will not result in project developers being rewarded for increased harvesting at the expense of onsite carbon storage. Also, because carbon storage in wood products is discounted to reflect average carbon stored in long-term wood products over 100 years, increased onsite carbon storage in forest stocks will always result in greater crediting than increased wood product production.

The Department of Energy 1605(b) [1605(b)] method for harvested wood product accounting was chosen by the Forest Protocol Workgroup because of its international acceptance, national application, and comprehensive approach. 1605(b) tables specify national statistics of wood-product end-use in various carbon pools through the wood product life-cycle. There are two primary long-term storage pools for harvested wood product carbon – long-term wood products and landfills. This approach was tailored to the forest protocol to estimate the percentage of a project's wood products that remain in long-term end-use and landfill pools after 100 years (defined by the Reserve as "permanent"). All other pools lead to short-term wood products and are calculated as immediate CO₂ emissions.

The updated protocol requires that carbon in long-term wood products be accounted for in all project types. Accounting for carbon storage from wood products in landfills is handled differently to reflect uncertainties in quantifying landfill carbon storage and complications of cross-sector crediting. For these reasons, the updated protocol does not account for or credit increasing wood product storage in landfills. However, when wood product storage in landfills is expected to decrease as a result of decreased harvesting, the reduced carbon storage in landfills is estimated and accounted for. This is included as a conservative approach to ensure net reductions are not over-estimated.

F. Monitoring and Verification

Accompanying the updated Forest Project Protocol is a revised Forest Project Verification Protocol. Forest owners are required to submit annual monitoring reports including the updated forest carbon inventory, annual harvest volumes, and other information. All reports that reference carbon stocks must be submitted with the oversight of a professional forester. The forest

inventory must have been completed within the last 12 years, and in general, plots used in the forest inventory must be sampled at least every 12 years.

Verification is required before any credits will be issued by the Reserve. Verification requires a site visit at least every six years, but may be based on a desk review of the annual monitoring report in interim years. The verification protocol provides guidelines to verifiers about how to assess and independently verify the data reported in the annual monitoring reports which is used as the basis for issuing CRTs. The verification protocol is used as a supplement to the Reserve's Verification Program Manual, available at <http://www.climateactionreserve.org/how-it-works/program/program-manual/>. All verifiers must be accredited by the Reserve to verify forest-sector projects.

The Board previously adopted the Forest Verification Protocol Version 2.0 in October 2007. The updated Forest Project Verification Protocol reflects the significant updates that have been made to the Forest Project Protocol and the change that entity-level reporting in the forest sector is no longer required.

G. Applicability

The updated forest protocol was developed for use in California, though the language and methodologies were designed to be general enough to apply to projects outside of California. The Reserve Board adopted the forest protocol for use anywhere in the United States. However, before projects can be developed outside California, the Reserve will need to approve common practice forest stocking data and appropriate growth models for use in other states and regions. Because the updated protocol relies on US-specific data sets, projects outside the country are not currently eligible.

Reducing barriers to participation for public lands was one of the key areas of improvement the Board directed the Workgroup to address. The updated protocol also now allows for reforestation and improved forest management projects to be developed on public lands. Avoided conversion projects that involve a transfer of land from private to public ownership are also eligible.

Barriers to participation for private working forests have also been reduced in the updated protocols. Conservation easements are no longer required for reforestation and improved forest management projects, with permanence now ensured through the Project Implementation Agreement. The updated protocol also contains less burdensome forest inventory requirements and removes the requirement to inventory a forest owner's lands outside of the project area.

Oak woodland land managers have been concerned that the forest protocols do not apply to oak woodlands because woodlands, while they can be managed for forest improvement, are very different than timberlands. The

protocols as they exist are appropriate for oak woodlands. Woodlands should incorporate the baseline approaches as described appropriate for their needs.

V. Projects Using the Previous CCAR Forest Protocol (Ver. 2.1)

The Board and the Reserve continue to fully support projects registered under the previous version of the Forest Project Protocol (Version 2.1, September 2007) and believe that those projects will continue to achieve real emission reductions quantified using rigorous accounting methods into the future. The forest protocol represents a sound and rigorous approach to quantifying the benefits of voluntary forestry projects. For purposes of generating credits for the voluntary market, projects that are registered under the previous protocols will continue to be verified under the protocol in place at the time the project was registered for the life of the project. New projects will be accepted for registration under the previous protocols for a period of up to three months after the updated protocol is adopted by the Climate Action Reserve's Board of Directors. Project proponents using older versions of the protocol have the option to switch to the updated protocol.

VI. Public Comments

The Reserve and ARB held joint public workshops over the course of the protocol update process. Workshops were held in July 2008, December 2008, February 2009 and April 2009. In addition, the Reserve Board listened to public comments at their July 1, 2009 Board meeting.

Public comments were solicited for the project protocol update, for the harvested wood products approach, and for the Project Implementation Agreement. The Reserve responded to comments on the Forest Project Protocol and posted them on the Reserve website at:

<http://www.climateactionreserve.org/how-it-works/protocols/adopted-protocols/forest/forest-project-protocol-update/>

VII. Conclusion

The proposed updated Forest Project Protocol (version 3.0) has achieved the goals as set forth by the Board resolution in October 2007. Barriers to participation have been addressed for private commercial forests not associated with a land trust, private non-timber forests (oak woodlands), and for public lands. The proposed updates further improve protocol quality and efficiency by also updating the accounting methods to reflect current science, improving guidance for calculations, better addressing risk factors associated with leakage and permanence, improving the baselines associated with each of the project types, and clarifying co-benefits terms. Finally, the updated protocol is the first forest protocol internationally to include harvested wood product accounting and crediting. The methods represent accurate and conservative accounting, which

generate real, additional, permanent, and verifiable forest carbon reduction credits for voluntary markets.

Staff recommends the Board adopt the Forest Project Protocol (version 3.0) for use in voluntary markets.

Appendix

Table A - 1.
Forest Protocol Work Group Members

| | |
|-------------------|---|
| Connie Best | The Pacific Forest Trust |
| Dave Bischel | California Forestry Association |
| Louis Blumberg | The Nature Conservancy |
| Steve Brink | California Forestry Association |
| Ann Chan | The Pacific Forest Trust |
| Anton Chiono | The Pacific Forest Trust |
| Florence Daviet | World Resources International |
| George Gentry | California Board of Forestry |
| Bruce Goines | United States Forest Service |
| Katie Goslee | Winrock International |
| Greg Giusti | University of California Extension (<u>Facilitator</u>) |
| Caryl Hart | California State Parks |
| Eric Holst | Environmental Defense Fund |
| Robert Hrubes | Scientific Certification Systems |
| Nick Martin | Winrock International |
| Ed Murphy | Sierra Pacific Industries |
| Mark Nechodom | United States Forest Service |
| John Nickerson | Climate Action reserve (<u>Workgroup Lead</u>) |
| Jeanne Panek | California Air Resources Board |
| Michelle Passero | The Nature Conservancy |
| Tim Pearson | Winrock International |
| Tim Robards | California Department of Forestry and Fire Protection |
| Emily Russell Roy | The Pacific Forest Trust |
| Bob Ryneerson | WM Beaty and Associates |
| Gary Ryneerson | Green Diamond Resources |
| Jayant Sathaye | University of California, Berkeley |
| Kimberly Todd | United States Environmental Protection Agency |
| Doug Wickizer | California Department of Forestry and Fire Protection |

Table A - 2. Subcommittee Topics and Leads

| Subcommittee | Lead |
|---|---|
| Improved Forest Management Baseline | Eric Holst, Environmental Defense Fund |
| Public Lands Forest Management Baseline | Bruce Goines, US Forest Service |
| Reforestation Baseline | Doug Wickizer, CAL FIRE |
| Avoided Conversion Baseline | Michelle Passero, The Nature Conservancy |
| Permanence | Ed Murphy, Sierra Pacific Industries |
| Leakage | Katie Goslee, Winrock |
| Co-Benefits | Robert Hrubes, Scientific Certification Systems |
| Quantification | Tim Robards, CAL FIRE |

NOTICE OF POSTPONEMENT**TITLE 17, CALIFORNIA AIR RESOURCES BOARD****NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF A PROPOSED
AB 32 COST OF IMPLEMENTATION FEE REGULATION AND PROPOSED
AMENDMENT TO THE EXISTING REGULATION FOR THE MANDATORY
REPORTING OF GREENHOUSE GAS EMISSIONS**

The Air Resources Board (ARB or Board) will conduct a continuation of public hearing at the time and place noted below to consider the adoption of a new regulation to impose fees on sources of greenhouse gas (GHG) emissions to carry out Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006, and to consider the adoption of an amendment to the existing regulation for the Mandatory Reporting of GHG Emissions. This item was originally heard at the June 25, 2009, Board hearing and was continued to the July 23, 2009, Board hearing. Please be advised the item will not be heard at the July 23, 2009, Board hearing and is being postponed to our September 24, 2009, Board hearing at the date, time, and place listed below.

DATE: September 24, 2009

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 E. Copley Drive
Diamond Bar, California 91765

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 24, 2009, and may continue at 8:30 a.m., September 25, 2009. This item may not be considered until September 25, 2009. Please consult the agenda for the meeting, which will be available at least 10 days before September 24, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

THE CONTINUED HEARING

The continued hearing will be conducted as described in the original notice, except that written submissions must be addressed to and received by the Clerk of the Board as described below. All comments submitted for the June 25, 2009, hearing will remain part of the rulemaking record. At the continued hearing, the Board will again take testimony from the public.

The original notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at <http://www.arb.ca.gov/regact/2009/feereg09/feereg09.htm> and are available as described in the original notice.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting and may be submitted by postal mail or by electronic submittal before the meeting. To be considered by the Board, written comments, not physically submitted at the meeting, must be received **no later than 12:00 noon, September 23, 2009**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

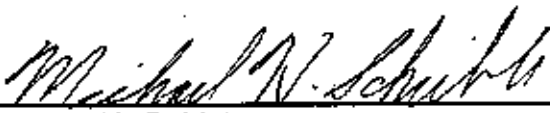
Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

The Board requests, but does not require, that 20 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

Please note that under the California Public Records Act (Gov. Code § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Mr. Jon Costantino, Manager of the Climate Change Planning Section, at (916) 324-0931, or Ms. Jeannie Blakeslee, Air Pollution Specialist, at (916) 445-8286.

CALIFORNIA AIR RESOURCES BOARD


for James N. Goldstone
Executive Officer

Date: July 13, 2009

**State of California
Air Resources Board**

**STAFF REPORT:
INITIAL STATEMENT OF REASONS FOR RULEMAKING**

**PROPOSED AB 32 COST OF IMPLEMENTATION FEE REGULATION
AND
PROPOSED AMENDMENT TO THE REGULATION FOR THE MANDATORY
REPORTING OF GREENHOUSE GAS EMISSIONS**

**Date of Release: May 8, 2009
Scheduled for Consideration: June 25, 2009**

This report has been reviewed by the staff of the California Air Resources Board and approved for publication.

Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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ACKNOWLEDGMENTS

This report was prepared with the assistance and support from the other divisions and offices of the Air Resources Board. In addition, we would like to acknowledge the assistance and cooperation that we have received from many individuals and organizations.

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**Proposed AB 32 Cost of Implementation Fee Regulation
and
Proposed Amendment to the Regulation for the Mandatory
Reporting of Greenhouse Gas Emissions**

Initial Statement of Reasons

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Executive Summary

Introduction

The California Global Warming Solutions Act of 2006, Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006) requires California to reduce its greenhouse gas emissions to 1990 levels by 2020. On December 11, 2008, the Air Resources Board (ARB) approved a Scoping Plan (Plan), which is California's plan for meeting the greenhouse gas emissions reductions required by AB 32. The administration, implementation and enforcement of the Plan's measures that were designed to achieve the emissions reduction goals will require a stable and continuing source of funding.

AB 32 also authorizes ARB to adopt a schedule of fees to be paid by sources of greenhouse gas emissions to support the costs of carrying out AB 32. The AB 32 Cost of Implementation Fee (the Fee) is included in the Scoping Plan, and is authorized in Health and Safety Code Section (HSC) 38597, which states,

"The state board may adopt by regulation, after a public workshop, a schedule of fees to be paid by the sources of greenhouse gas emissions regulated pursuant to this division, consistent with Section 57001. The revenues collected pursuant to this section, shall be deposited into the Air Pollution Control Fund and are available upon appropriation, by the Legislature, for purposes of carrying out this division."

Using this section as the basis for its authority, ARB proposes to establish a fee schedule to support implementation of AB 32 by ARB and other state agencies.

This Proposed Regulatory Order combines two regulatory actions: adoption of a Proposed AB 32 Cost of Implementation regulation, and adoption of an amendment to the existing Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (Mandatory Reporting Regulations).

Cost of Implementation Fee

This staff report summarizes the development of the regulation, discusses the Fee structure and the affected entities and includes a justification for the proposed Fee regulation. It also describes ARB's approach used to determine the necessary revenue requirements to support State agency implementation of AB 32. It presents staff's proposed approach to balance the goals of applying the fee to greenhouse gas emissions as broadly as possible while minimizing the administrative burden of the regulation.

A design principle for this regulation has been to assess the fee "upstream" whenever possible in order to minimize the number of entities subject to the fee and reduce the complexity and the administrative burden of the regulation. For the purposes of this regulation, "upstream" is the point in California's economy where fuel delivery or production is intended for eventual delivery to consumers. This leads

to subsequent combustion or use and results in greenhouse gas emissions. When it is not feasible to assess fees "upstream", fees are assessed on entities that consume or produce fuels in California.

Staff designed this proposed Fee to cover greenhouse gas emissions as broadly as possible to spread the cost burden over the majority of emission sources. This fee would cover three different groups of emissions sources that together comprise approximately 85 percent of California's total greenhouse gas emissions. First, it will be assessed on fossil fuels that are combusted in California, including fuels used for transportation, and electricity generation, by industry, and in residences and commercial buildings. Second, it will cover the major sources of industrial process greenhouse gas emissions. Finally, in a manner consistent with AB 32 emissions accounting provisions, the Fee will cover imported electricity, based on the fuels used for its generation.

The revenues from the assessed fees would be used to pay the ongoing AB 32 program costs incurred by ARB and other state agencies, beginning in the 2009-2010 fiscal year, currently estimated at approximately \$36.2 million per year. During the first four years, the revenues would also be used to repay loans included in the adopted State Budget. These loans were used to pay a significant portion of the AB 32 implementation costs of ARB and the California Environmental Protection Agency (Cal/EPA) for the 2007/2008 and 2008/2009 fiscal years. This staff report also includes a discussion of ongoing revenue requirements for ARB, Cal/EPA and other state agency AB 32 implementation activities in Appendix C.

It is important to note that California's AB 32 program is still under development. As the program continues to mature, staff intends to periodically re-evaluate the sources covered by this fee to determine whether the additional sources of greenhouse gas emissions should also be included in the Fee regulation. Staff will also continue to evaluate how the state's AB 32 program can best be funded. For example, if a cap-and-trade program were adopted that generated revenue and covered a sufficiently broad range of the state's greenhouse gas emissions, it would be appropriate to evaluate funding the State's implementation of AB 32 from that revenue instead of this fee.

Mandatory Greenhouse Gas Emissions Reporting

On December 6, 2007, ARB adopted the Mandatory Reporting Regulation as required by AB 32. The regulation requires major sources of greenhouse emissions, such as operators of power plants, cogeneration facilities, cement plants, refineries, hydrogen plants, retail providers and marketers of electricity, and general stationary combustion facilities emitting 25,000 metric tons of carbon dioxide in a calendar year to report those emissions to the State of California annually beginning in 2009. To facilitate reporting, ARB contracted for the development of the California Greenhouse Gas Reporting Tool (Reporting Tool) that was completed in spring of 2009. Technical assistance and guidance is available on ARB's internet website.

The use of the Reporting Tool has been voluntary. The proposed amendment to the regulation would make use of the Reporting Tool mandatory.

Economic Impacts Associated with the Proposed Regulatory Order

In developing the Fee regulation, ARB evaluated the potential economic impacts on representative private persons or businesses and consumers. ARB staff believes that if such a pass through occurs, the cost impacts from the proposed regulatory action would result in average product price increases of less than one-tenth of one percent. ARB has determined that representative private persons would be affected by the cost impacts from the proposed regulatory action at an estimated cumulative cost of \$ 4.00 per household per year when the marginally increased utility and fuel costs are passed through to the consumer.

I. Introduction and Background

This report presents ARB staff's proposed Cost of Implementation Fee (Fee) Regulation pursuant to the California Global Warming Solutions Act of 2006, Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006). The broad scope of AB 32 requires an extensive effort to reduce the state's greenhouse gas emissions, and provides ARB with the authority to adopt a fee to be paid by sources of greenhouse gas emissions to cover the costs of carrying out AB 32.

On December 11, 2008, ARB approved a Scoping Plan¹ that provides a blueprint for California to meet the greenhouse gas emissions reductions required by AB 32. The Scoping Plan indicates that administration, implementation and enforcement of the emissions reduction measures will require a stable and continuing source of funding. The Fee is authorized in Health and Safety Code Section (HSC) 38597, which states,

"The state board may adopt by regulation, after a public workshop, a schedule of fees to be paid by the sources of greenhouse gas emissions regulated pursuant to this division, consistent with Section 57001. The revenues collected pursuant to this section, shall be deposited into the Air Pollution Control Fund and are available upon appropriation, by the Legislature, for purposes of carrying out this division."

Using this section as the basis for its authority, ARB proposes to establish a fee schedule to support implementation of AB 32 by ARB and other state agencies. Funds collected would be deposited in the Air Pollution Control Fund and would be available upon appropriation by the Legislature.

Because greenhouse gas emissions and their subsequent impacts on global warming affect all Californians, staff has developed the Fee so that state government costs to implement the AB 32 program are streamlined and these costs are equitably distributed among a broad range of greenhouse gas sources. This approach will also minimize the burden the Fee may place on individual entities or sectors of the economy. This proposed regulation was developed through an extensive public process involving a broad range of stakeholders.

Staff expects the regulation to take effect before January 1, 2010. Entities will report to ARB the quantity of fuels and emissions subject to the Fee by January 2, 2010 for calendar year 2008 using ARB's Reporting Tool. ARB is also proposing to amend the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (Mandatory Reporting Regulation) to require use of the reporting tool for data submittal. Beginning in January 2010, ARB will determine the fee amounts for each entity based on the reported quantities of fuel or emissions, using the fee calculation methodology described in this staff report and the proposed regulation. ARB would

¹ California Air Resources Board, Climate Change Scoping Plan: A Framework for Change, released October, 2008

notify the fee paying entities by February 1, 2010. The fee paying entities would be required to submit payment within 60 days after receipt of the notification.

This fee is intended to cover two areas of costs for implementing AB 32:

- Staff related expenditures for the start-up and ongoing implementation of the AB 32 program that have been approved through budget change proposals (BCPs) after AB 32 was signed into law (September 2006).
- Other post AB 32 BCPs approved costs directly related to the administration of AB 32 programs to reduce greenhouse gas emissions, such as contracts, administrative overhead, and research directly related to the implementation of the AB 32 program.

II. Description of Proposed Regulation

The proposed regulation assesses fees on sources of greenhouse gas emissions from the most widely used fossil fuels, including gasoline, diesel, coal, refinery gases and natural gas. The Fee would also be assessed on non-combustion greenhouse gas process emissions from refineries and cement manufacturers. Finally, the Fee would be imposed on the greenhouse gas emissions associated with the generation of imported electricity. Together, emissions from fuel combustion, refining and manufacturing process emissions, and imported electricity account for over 85 percent of California's greenhouse gas emissions.

ARB is also proposing to amend the Mandatory Reporting Regulation by requiring the use of the Reporting Tool. The Mandatory Reporting Regulation was approved by ARB in December, 2007.

A. Fee Regulation Development

ARB staff engaged in an extensive outreach process during development of the proposed regulation. In accordance with HSC section 38561, ARB staff consulted with other state agencies that have jurisdiction over sources of greenhouse gas emissions. ARB consulted with the Public Utilities Commission, the State Energy Resources Conservation and Development Commission, and other departments and agencies. Staff held public workshops on January 27, 2009, February 25, 2009, and April 20, 2009 to obtain stakeholder input, and provided concept papers and draft regulations for stakeholder comment. Staff met with stakeholders from each sector covered by the proposed regulation on numerous occasions and considered comments received during this process.

In addition, ARB is proposing to amend the Mandatory Reporting Regulations to require the use of the reporting tool to report data.

B. Approach to Regulation

Generally, the proposed Fee regulation pursues an "upstream" approach. The regulated entity would be assessed a fee for the greenhouse gas emissions from fuel an entity introduces into commerce in California, or the direct greenhouse gas emissions as a result of an industrial process. The upstream approach minimizes the administrative burdens associated with the regulation since it decreases the number of entities that must pay fees, and simplifies the reporting needed to determine the fees.

ARB staff reviewed each category of sources of greenhouse gas emissions and evaluated whether or not it was technically and economically feasible to include them under the proposed regulation. Sources that are not included in the proposed regulation could potentially be included in the future.

One major goal of the proposed regulation is to equitably impose fees on the widest possible spectrum of greenhouse gas sources in an administratively feasible manner. This cannot be done unless some type of administrative mechanism is used to impose a fee on upstream entities, which can then pass on the cost of the fee by increasing the cost of the fuel supplied to downstream entities. An important question was just how far upstream to impose such a fee. ARB has chosen an approach that reaches as far upstream as possible. This approach both minimizes the number of individual entities that must be billed and helps ensure that almost all of the greenhouse gas emissions resulting from the consumption of gasoline, diesel, and natural gas in California are subject to the Fee. There are other possible collection points for fees. The various fee collection options, and ARB's reasons for rejecting them, are discussed in the "Alternatives" section of this Initial Statement of Reasons.

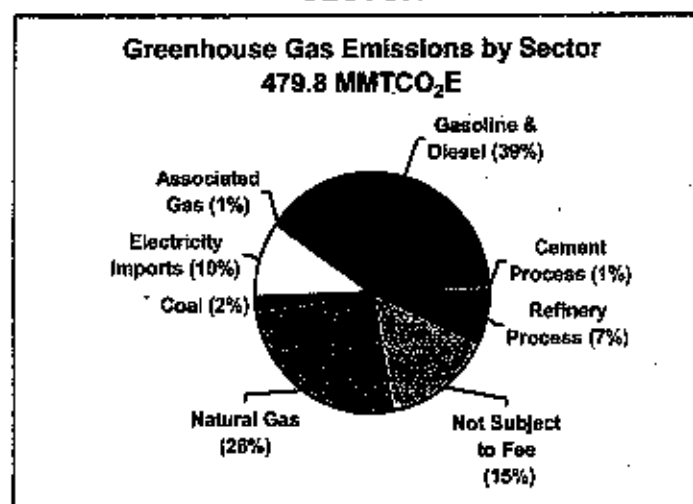
C. Emission Sources Subject to the Proposed Fee

The 2006 Greenhouse Gas Emission Inventory estimates total greenhouse gas emissions in California at 479.8 million metric tons (MMT) of CO₂E. Figure 1 below illustrates the sources of greenhouse gas emissions in California and their respective proportions of emissions. Most greenhouse gas emissions in California result from the combustion of gasoline and diesel (39 percent) and natural gas (26 percent). These emissions are associated with fuel use activities ranging from transportation, manufacturing and refining processes to electricity generation to heating buildings. Two percent of the in-state emissions are from combustion of coal. Thus, 67 percent of the state's total greenhouse gas emissions are from the four major fuels that are subject to the proposed regulation. Approximately 10 percent of the state's total emissions are associated with imported electricity, which ARB proposes to include in this regulation, and is discussed in the next section of this ISOR. Cement and refinery processes account for more than eight percent of greenhouse gas emissions in California, but 95 percent of the state's industrial greenhouse gas process emissions.²

At this time, ARB proposes not to assess fees on the remaining 15 percent of greenhouse gas emissions in the emissions inventory in the Fee regulation. These emissions include emissions from high global warming potential gases (which are anticipated to be covered by a separate fee currently under development), some agricultural sources (such as dairy methane), emissions from the forest sector, select fuels which are used in small quantities such as aviation gas, jet fuel, kerosene, biodiesel, and fuels exported out of state.

² ARB Greenhouse Gas Inventory Database

Figure 1. TOTAL STATEWIDE GREENHOUSE GAS EMISSIONS BY SECTOR



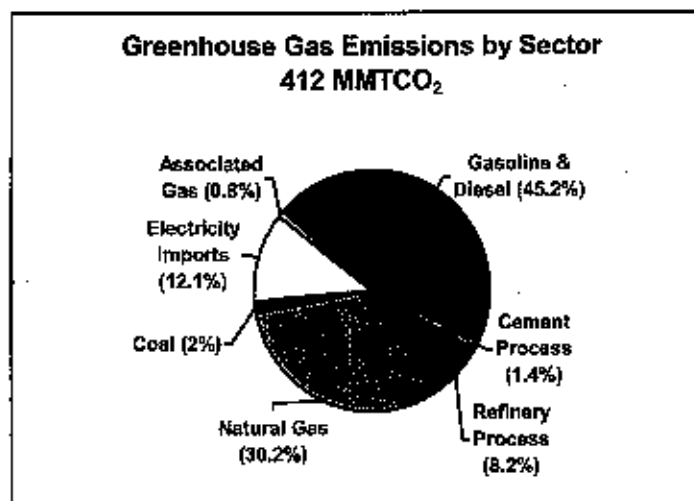
Source: 2006 Greenhouse Gas Inventory

The proposed Fee would apply to six sectors of sources that account for approximately 85 percent of California's total greenhouse gas emissions, or 412 MMTCO₂³.

Figure 2 below illustrates the sectors covered under the Fee regulation and their respective proportions of emissions compared to each sector to which a fee will be applied. The majority of greenhouse gas emissions under the Fee regulation are from the combustion of gasoline and diesel (45 percent) and natural gas (31 percent, including associated gas). Approximately 12 percent of the emissions covered under the Fee are associated with imported electricity. Emissions from coal combusted in the state account for approximately two percent of the emissions covered under the fee. Finally, industrial process emissions due to processes other than combustion of natural gas or coal at refineries and cement manufacturers account for approximately eight percent and 1.5 percent, respectively, of emissions covered under the Fee regulation.

³The proposed Fee regulation focuses on CO₂ instead on CO₂E.

Figure 2. GREENHOUSE GAS EMISSIONS COVERED BY FEE



Source: 2006 Greenhouse Gas Inventory

A discussion of how the proposed Fee would be assessed for each emission category follows⁴:

Combustion of Natural Gas

Combustion of natural gas accounts for approximately 26 percent of the overall greenhouse gas emissions in California, and 30 percent of the emissions covered in the Fee regulation. Affected entities in the natural gas sector subject to this regulation include the following:

- Public utility gas corporations that deliver natural gas to end users;
- Interstate and intrastate pipelines delivering natural gas directly to end users;
- Natural gas producers consuming gas produced onsite, and are subject to ARB Mandatory Reporting Regulation; and
- Producers of "associated gas" that consume associated gas produced onsite and are subject to ARB's mandatory reporting regulations.

Although natural gas is widely consumed in the California economy, supply is physically constrained by pipelines, making identifying upstream operators relatively straightforward. This is why the fee is applied at the pipeline for all natural gas consumers on that pipeline.

⁴The proposed points of regulation for this Fee and the assumptions and methods used in calculating the fee for fuels, process emissions and imported electricity, would be applicable only to this regulation and are not intended establish a precedent for how sources of emissions would be treated under any future regulation, including a cap and trade regulation.

ARB's research indicates that approximately 80 percent of the natural gas used in the State is eventually transmitted over public utility gas corporation pipelines owned by Pacific Gas and Electric, Southern California (SoCal) Gas, and San Diego Gas and Electric. A portion of the natural gas transmitted by these public utility corporations in their pipelines is not owned by the utilities, but is simply transmitted for a fee to end users. Since a transmission fee is applied by those entities, the companies transmitting natural gas, the utilities, would be the most appropriate upstream source to which the Fee should be attached. Public utility gas corporations would annually report the terms of natural gas delivered to end users in California via their pipelines.

About 10 percent of the natural gas used in the state is purchased directly from interstate pipelines, never touching the in-state public utility corporation pipelines. There are eight interstate pipelines that deliver natural gas into the state, and distribute natural gas directly to end users. The interstate pipeline owners or operators would annually report the terms of natural gas as measured at the meter directly delivered to end users in California.

The final 10 percent of the natural gas produced and consumed in California is never transported via public utility corporation pipelines or interstate pipelines. Two distinct processes need to be addressed to incorporate this remaining natural gas: direct deliveries from intrastate pipelines and natural gas and associated gas produced and used at the production site.

Direct Delivery:

A small number of large customers receive natural gas directly from intrastate companies that include Pacific Gas and Electric, SoCal Gas, and San Diego Gas and Electric. Gas transported directly to end users over intrastate pipelines would be subject to the Fee. The pipeline operator is the most appropriate upstream source to which to apply the Fee. Owners or operators of intrastate pipelines that deliver natural gas directly to end users would annually report the terms delivered at the end users' meter, similar to the public utility gas corporations.

Producers consuming a portion of the natural gas they produce directly onsite would also be subject to the Fee. ARB's research indicates that fewer than 20 facilities emit the majority of the CO₂ emissions in this category and that these facilities are already subject to ARB's Mandatory Reporting Regulation. These sources would report the terms of natural gas produced and subsequently consumed on-site.

Associated Gas:

Finally, a by-product of the oil production process is associated gas, which consists mostly of natural gas. This by-product is used for some combustion equipment. Oil production facilities that use associated gas produced on-site and that are subject to the Mandatory Reporting

Regulation would be subject to the Fee. Unlike other entities that would be charged a fee per therm of natural gas reported, the Fee for associated gas would be based on the reported greenhouse gas emissions resulting from consumption of associated gas and would be assessed on oil production facilities.

Producers and Importers of Gasoline and Diesel Fuels

Emissions from combustion of gasoline and diesel fuel accounts for 39 percent of the state's total greenhouse gas emissions. These emissions occur when on-road vehicles (passenger cars, light duty trucks, heavy-duty vehicles, and motorcycles), off-road vehicles (bulldozers, lawn mowers, marine craft) and other sources combust gasoline and diesel fuel.

Staff is proposing to apply the fee to producers and importers of:

- California gasoline;
- California Reformulated Gasoline Blendstock (CARBOB), which is blended with an oxygenate to create California gasoline; and
- California diesel.

California has 21 refineries located in the San Francisco Bay area, the Los Angeles area, and the Bakersfield area. California used about 4 billion gallons of diesel and 15.7 billion gallons of gasoline in 2007.⁵

Producers and importers of gasoline and diesel would report the quantity of fuels supplied for use in the State. To ensure that ARB only compares quantities of finished gasoline, ARB will adjust for the total quantity of finished fuel made from CARBOB. The reported quantity of CARBOB would be multiplied by a factor that adjusts for the gallons of final product (gasoline). For example, one gallon of CARBOB formulated for blending with five percent ethanol would be adjusted as follows:

$1.0 \times (\text{CARBOB}) + ((0.05 / (1.0 - 0.05)) \times (\text{ethanol})) = \text{approximately } 1.0526$
gallons finished gasoline, with the Fee assessed on the gallons of finished California gasoline.

Under the proposed regulation, the fee would apply to the intrinsic greenhouse gas emissions from ethanol that is blended with CARBOB to produce gasoline. As ARB implements the recently approved Low Carbon Fuel Standard to reduce the carbon content of transportation fuel, ARB will revisit how the emissions from transportation fuels are calculated.

⁵ Air Resources Board, 2006 Greenhouse Gas Emissions Inventory

Industrial Emissions from Refineries and Cement Manufacturers

Emissions from these sources account for over eight percent of California's greenhouse gas emissions – over seven percent from the refinery process, and approximately 1.5 percent from the cement manufacturing process.

Refineries:

The Fee on emissions associated with the refinery processes would be determined in two parts: first, the emissions from the combustion of products of the refinery process other than gasoline and diesel (petroleum coke, catalyst coke and refinery gas), and second, the direct emissions from the refinery process itself.

Emissions from combustion of petroleum coke, catalyst coke and refinery gas produced by each refinery would be reported to ARB consistent with information reported to the California Energy Commission under the Petroleum Industry Information Reporting Act (PIIRA). PIIRA requires that refineries report data on the production of these products, as well as the amount exported out of the state. Since the Fee will not be applied to emissions from the combustion of these products outside of California, each refinery will report the individual quantities of catalyst coke, petroleum coke, and refinery gas produced annually, less the quantities exported out of the state.

The Fee would be applied to the refinery responsible for the creation of the refining process by-product, which is the furthest upstream point in this process. Staff expects that the Fee would be passed through if the by-product is sold and ultimately combusted by another party. Additionally, emissions from the consumption of feedstock other than natural gas used in the steam methane reforming process (hydrogen production), as reported under ARB's Mandatory Reporting Regulation, would be subject to this fee. Any use of natural gas is accounted for in the natural gas sector as described above.

Cement Manufacturing:

Emissions from the cement manufacturing process originate from two sources: fuel combustion and by-products from the clinker production process.

Approximately half of the emissions come from fuel combustion, and the Fee would be applied to the applicable fuel (e.g. coal, natural gas) combusted. The remaining half of the emissions are a by-product of the clinker production process. Limestone (CaCO_3) and other chemicals are heated and undergo a chemical reaction that directly emits CO_2 . Cement manufacturers are subject to mandatory reporting, with emissions from the clinker production process reported as a separate line item. Staff proposes to assess a fee to the manufacturer based on the emissions of CO_2 from this process.

Imported Electricity

To provide context for the discussion of the application of the Fee to imported electricity, this section begins with a brief, general discussion of California electricity.

The electricity generation sector, including both in-state generation and electricity imported into the State, accounts for 23 percent of California's total greenhouse gas emissions. Sources of California's electricity include non-emitting generation such as hydropower, nuclear, and renewable energy (including solar, wind, geothermal, small hydropower, and biomass) as well as fossil fuel generation (primarily natural gas and coal). Non-emitting sources typically supply about 40 percent of California's electricity annually.

Natural gas supplies over 40 percent of total electricity consumed in California, and comprises the majority of in-state fossil fuel generation⁶. In-state generation from fossil fuels includes both power plants that deliver electricity to the grid, and cogeneration facilities that may use power onsite and/or sell power to the grid. Hydropower, nuclear power and renewables are also important in-state electricity sources. Very little of the electricity generated in-state is from coal.

AB 32 includes in its definition of "statewide greenhouse gas emissions" all emissions of greenhouse gases from the generation of electricity "delivered to and consumed in California, accounting for transmission and distribution losses, whether the electricity is generated in the state or imported" (HSC section 39505). Thus, AB 32 specifically requires ARB to consider imported electricity in the implementation of the statute.

California imports electricity from other western states, British Columbia and Northern Mexico. Most imported electricity is generated at facilities that burn coal or natural gas or at hydroelectric or nuclear facilities. The amount of electricity consumed, as well as the amount available from each source type, varies year to year, depending on the amount of water available and on variation in weather conditions.

Imported electricity typically supplies between 20 and 30 percent of the electricity consumed in California. However, because it includes a sizable percentage of high emission coal generation, it is responsible for about 50 percent of the greenhouse gas emissions associated with electricity generation, or 10 to 13 percent of total California greenhouse gas emissions. This proposed Fee would be imposed on imported electricity in order to reflect this significant source of California's greenhouse gas emissions.

To assess the Fee in an equivalent manner on both imported electricity and electricity generated in California, staff propose to apply, in both cases, the same

⁶ Source: CEC, 2007 Net System Power Report. See also System Power tables for 2002-2007 available at: http://energy.almanac.ca.gov/electricity/total_system_power.html

cost per metric ton of CO₂ emitted due to electricity generation. However, because California cannot apply the Fee to upstream suppliers of fuel to out of state generation facilities (as ARB proposes to do with in-state facilities), two different, but equivalent approaches are needed.

The discussion of Fee calculations below shows how the fee is applied to fuels used to generate electricity in-state, and to imported electricity. Although the units (therms of natural gas, short tons of coal, MWh of electricity) to which the Fee is applied may vary, the impact of the fee is equivalent for electricity generated in-state or out-of-state, because it is based on CO₂ emitted in the generation of electricity.

For electricity generated in-state, fees would be paid by entities that deliver natural gas for electricity generation, and facilities that consume coal for electricity generation. For imported electricity, it is not feasible for fees to be applied to suppliers of fuels, or to use the generation facility located out of state as the point of regulation, because California does not have jurisdiction over these entities. Instead, the fee would be applied to imported electricity when it is first delivered into California. The basis for calculating the Fee, the CO₂ emissions, is the same. However, the mechanism for collection and the entities subject to the Fee would be distinct.

Fees would be paid by entities that import electricity into California. These are retail providers of electricity and marketers, as defined in the regulation. There are approximately 70 retail providers and 60 marketers that could be subject to this regulation.

Electricity imported into California falls into two classes: electricity generated from specified sources (either a generation facility or an asset-owning or asset-controlling supplier for which emissions and electrical generation can be tracked), and electricity from unspecified sources (the facility where the electricity is generated is unknown). Quantities of imported electricity of both types are required to be reported under ARB's Mandatory Reporting Regulation.

The fee rate per MWh of electricity imported from specified sources would be calculated as the source's emission factor multiplied by the cost per MTCO₂ emitted (defined below as the Common Carbon Cost.) The next section on calculation methodologies shows, in detail, how emission factors are calculated for various kinds of specified sources. The calculations would use data that has been reported by the source either to ARB under the Mandatory Reporting Regulation, or to Federal agencies.⁷

⁷ Data reported to Federal agencies includes that reported to the U.S. Environmental Protection Agency pursuant to 40 CFR Part 75, downloadable at: <http://www.epa.gov/epa3/access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=56534622613+1+2+0&WALSaction=retrieve>; and monthly and annual data on generation and fuel consumption at power plant and prime mover level reported to

For imported electricity from unspecified sources, staff would use a default emission factor of 0.499 MTCO₂ (1,100 pounds) per MWh of CO₂ per MWh. This default value was recommended by the CPUC and the CEC in CPUC Decision 07-09-017 as an interim regional default emission factor for electricity imported from unspecified sources for use in tracking and verification of greenhouse gas emissions⁸. As discussed in the decision, this value is close to the regional average for the western states, and also approximates an emission factor for marginal electricity generation available in the market (generated at a natural gas facility). Appendix D provides further detail on the default emissions factor for unspecified imports.

Coal

Coal combustion is responsible for approximately two percent of California's total greenhouse gas inventory. Owners and operators of power plants, cogeneration facilities and other facilities that use coal as a fuel and that are subject to ARB Mandatory Reporting Regulation are subject to the fee. The affected entities would report tons of coal and the associated grade of coal combusted.

D. Fee Calculation Methodology

ARB will annually calculate a cost per unit CO₂ under this regulation, based on the Total Revenue Requirement, the quantities of reported fuels, imported electricity, and process emissions and the fuel and imported electricity emissions factors.

Each year ARB would determine the annual revenue requirement. The Total Revenue Required would be the sum of legislatively approved AB 32 program expenditures and, in the first four years, an additional amount needed to repay the start up loans for ARB and Cal/EPA. The Total Required Revenue will also be adjusted for any excess or shortfall in collections from the previous year. The intended use of the Fee is to fund the administrative costs of activities to carry out AB 32, and not those related to adaptation or other climate activities. Additional detail is included in Appendix C.

the Energy Information Administration, and available online at:
http://www.eia.doe.gov/cneaf/electricity/page/ela906_920.html

⁸ CPUC (California Public Utilities Commission), 2007. Decision 07-09-017: Interim Opinion on Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector.
http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/72513.pdf

Assigning a common cost to the emissions of greenhouse gases is a critical component to this regulation. This is known in the regulation as the Common Carbon Cost, or CCC and is defined as follows:

$$CCC = \frac{TRR}{(Q_c \times EF_c) + (Q_{ng} \times EF_{ng}) + (Q_g \times EF_g) + (Q_d \times EF_d) + (Q_{ls} \times EF_{ls}) + TE_i}$$

Where

TRR = Total Required Revenues in accordance with proposed section 95203(a)

$(Q_c \times EF_c)$ = Statewide total quantity of emissions from coal calculated as the sum of:

$(Q_b \times EF_b)$ = Quantity of bituminous coal x emission factor for bituminous coal;

$(Q_l \times EF_l)$ = Quantity of lignite coal x the emission factor for lignite coal;

$(Q_a \times EF_a)$ = Quantity of anthracite coal x the emission factor for anthracite coal;

$(Q_{sb} \times EF_{sb})$ = Quantity of subbituminous coal x the emission factor for subbituminous coal;

Q_{ng} = Statewide quantity in therms of natural gas supplied during the reporting period

EF_{ng} = Emission Factor of $MTCO_2$ for each supplied therm of natural gas

Q_g = Statewide quantity of California gasoline supplied during the reporting period. This is the volumetric sum of California gasoline produced or imported into California and the amount of finished CARBOB product produced or imported into California. The finished gasoline product is calculated as the volume of CARBOB multiplied by one plus the maximum amount of oxygenate designated for each volume of CARBOB.

EF_g = Emission Factor of $MTCO_2$ for each supplied gallon of California gasoline

| | |
|-----------------------------|--|
| $Q_d =$ | Quantity of California diesel fuel supplied during the reporting period |
| $EF_d =$ | Emission Factor of $MTCO_2$ for each supplied gallon of diesel fuel |
| $(Q_{ie} \times EF_{ie}) =$ | Total CO_2 emissions from total imported electricity as the sum of: |
| | $(Q_{sp} \times EF_{sp}) =$ Quantity of MWh of electricity imported from each specified source "sp" x emission factor for that specified source |
| | $(Q_{usp} \times EF_{usp}) =$ Statewide quantity of MWh of electricity imported from unspecified sources x emission factor for unspecified source. |
| $TE_i =$ | Total state process emissions for cement manufacturers and refineries, and emissions from the combustion of associated gas. |

Once ARB calculates the CCC, the basic calculation methodology for the Fee applied to each sector is similar. Generally, the Fee is determined by multiplying the CCC by the total emissions for each entity. For entities reporting quantities of fuels or imported electricity, an intermediate step is necessary to calculate fee rates based on emissions per unit of fuel or electricity. For each fuel, Fuel Fee Rates are calculated based on the emissions associated with fuel combustion. Electricity fee rates are calculated for imported electricity based on the emissions from the generation of the electricity.

Calculation of Fuel Fee Rates for entities reporting quantity of fuel: For natural gas (not including associated gas), gasoline and diesel, and coal, the Fuel Fee Rate for each unit of fuel reported is the product of the CCC multiplied by the appropriate emission factor, as follows:

$$FR_i = CCC \times EF_i$$

Where:

FR_i = The Fuel Fee Rate for the fuel

CCC = Common Carbon Cost

EF_i = Emission Factor of $MTCO_2$ for each unit of fuel supplied or consumed.

Fuel units are therms, gallons and short tons for natural gas, gasoline and diesel, and coal, respectively. Emissions factors for each fuel are shown in Table 1 below.

Table 1: Emission Factors by Fuel Type

| Fuel Type | CO ₂ Emission Factor | Emission Factor Units |
|----------------|---------------------------------|--------------------------------|
| Coal | | |
| Anthracite | 2,597.94 | kg CO ₂ / short ton |
| Bituminous | 2,328.35 | kg CO ₂ / short ton |
| Sub-bituminous | 1,673.64 | kg CO ₂ / short ton |
| Lignite | 1,369.32 | kg CO ₂ / short ton |
| Natural Gas | 5.302 | kg CO ₂ / therm |
| Diesel | 9.96 | kg CO ₂ / gallon |
| Gasoline | 8.55 | kg CO ₂ / gallon |

The fuel emission factors are those specified in Appendix A of the "Regulation for the Mandatory Reporting of Greenhouse Gas Emissions", *ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions*.

Fee for entities reporting quantities of fuel: For California diesel, California gasoline and the adjusted quantity of CARBOB, each gallon reported would be multiplied by the Fuel Fee Rate for each fuel to determine the annual fee. The Fee for each entity reporting fuel delivery or use is calculated as follows:

$$\text{Fee} = \text{FR}_i \times \text{QF}_i$$

Where:

QF_i = Quantity of fuel

FR_i = The Fuel Fee Rate for the fuel

Calculation of Imported Electricity Fee Rates: An Imported Electricity Fee Rate (EFR) will be calculated for each specified source, including asset-owning and asset-controlling suppliers, and the default emission factor previously discussed will be used to calculate an Imported Electricity Fee Rate for imported electricity from unspecified sources. Greenhouse gas emissions from the facilities that generate electricity depend on the quantities and types of fuels used, facility emissions, and on the efficiency with which the facility converts the energy in fuels to electrical energy. For any generating source or group of sources, a CO₂ emissions factor (MTCO₂ per MWh) can be calculated by dividing the total facility emissions by the total electricity output of the facility or group of facilities. Imported Electric Fee Rates will be calculated as follows:

$$\begin{aligned} \text{EFR}_{\text{sp}} &= \text{CCC} \times \text{EF}_{\text{sp}} \\ \text{EFR}_{\text{asp}} &= \text{CCC} \times \text{EF}_{\text{asp}} \\ \text{EFR}_{\text{usp}} &= \text{CCC} \times \text{EF}_{\text{usp}} \end{aligned}$$

Where:

"sp" denotes a specified source that is a generating facility or unit

"asp" denotes an asset-owning or asset-controlling supplier

"usp" denotes an unspecified source

CCC = Common Carbon Cost

EFR_{sp} = The Imported Electricity Fee Rate for the specified source

EFR_{asp} = The Imported Electricity Fee Rate for the asset-owning and asset-controlling suppliers

EF_{sp} = Emission Factor for specified source in MTCO_2 per MWh

EF_{asp} = Emission Factor for asset-owning and asset-controlling suppliers in MTCO_2 per MWh

EFR_{usp} = The Imported Electricity Fee Rate for unspecified sources

EF_{usp} = 0.499 MTCO_2 per MWh, the default Emission Factor for unspecified sources

Emission Factors for Imported Electricity

ARB will calculate emission factors for imported electricity from specified sources (including generation facilities, asset-owning and asset-controlling suppliers) by dividing the source's CO_2 emissions by electric generation output as detailed in the equations below. The resulting emission factor for each specified source, in MTCO_2 per MWh, is applicable to any quantity of electricity imported from the source. Calculations are as follows:

For specified sources that are generating units or facilities:

$$\text{EF}_{\text{sp}} = \frac{\text{E}_{\text{sp}}}{\text{EG}}$$

Where:

EF_{sp} = Emission Factor for specified source in MTCO_2 per MWh

E_{sp} = CO₂ emissions from electricity generation for a specified electric generating facility/unit for the report year (MTCO₂)

EG = Net generation from a specified electric generating facility/unit for the report year (MWh)

(1) For specified electric generating facilities/units whose operators are subject to reporting or who voluntarily report under the Mandatory Reporting Regulation, E_{sp} shall be equal to the sum of CO₂ emissions directly associated with electricity generation as reported to ARB. Similarly, EG shall be the net generation reported to ARB.

(2) For specified electric generating facilities/units whose operators are not subject to Mandatory Reporting Regulation but who are subject to the Acid Rain Program (40 CFR Part 75), E_{sp} shall be equal to the amount of CO₂ emissions reported to U.S. EPA pursuant to 40 CFR Part 75 for the facility in metric tons for the report year. EG shall be data reported to EIA and published in the EIA 923 Excel file for the reporting year available at http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html (the EIA data).

(3) For specified electric generating facilities/units whose operators do not report to ARB under the Mandatory Reporting Regulation and do not report to U.S. EPA under the Acid Rain Program, EG shall be taken from the EIA data for the reporting year. E_{sp} shall be calculated using EIA data as shown below.

$$E_{sp} = 1000 \times \sum (Q_{fuel} \times EF_{fuel})$$

Where:

Q_{fuel} = Heat of combustion for each specified fuel type from the specified electric generating facility for the report year (MMBtu)

EF_{fuel} = CO₂ emission factor for the specified fuel type as described in the Mandatory Reporting Regulation, Appendix A (kgCO₂/MMBtu).

For asset-owning and asset-controlling suppliers:

$$EF_{asp} = \frac{\sum E_{asp} + \sum (PE_{sp} * EF_{sp}) + (PE_{usp} * EF_{usp}) - \sum (SE_{sp} * EF_{sp})}{\sum EG_{asp} + \sum PE_{sp} + PE_{usp} - \sum SE_{sp}}$$

EF_{asp} = Emission Factor for asset-owning and asset-controlling suppliers "asp," in MTCO₂ per MWh

ΣE_{asp} = the sum of CO₂ emissions from electricity generation for each specified electric generating facility/unit in the asset owning/controlling supplier's fleet, as reported to ARB under the Mandatory Reporting Regulation (MTCO₂)

ΣEG_{asp} = the sum of net generation for each specified electric generating facility in the asset owning/controlling supplier's fleet for the report year as reported to ARB under the Mandatory Reporting Regulation (MWh)

ΣPE_{sp} = Sum of electricity purchased from specified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

PE_{usp} = Amount of electricity purchased from unspecified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

ΣSE_{sp} = Amount of wholesale electricity sold from a specified source by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

EF_{sp} = CO₂ emission factor as defined for generating units and facilities.

EF_{usp} = CO₂ default emission factor for unspecified sources (0.499 MTCO₂ per MWh).

For unspecified sources:

The default emission factor for unspecified sources shall be the default emission factor of 0.499 MTCO₂ per MWh.

ARB will use the default emissions factor of 0.499 MTCO₂ per MWh to calculate emissions for electricity imported from all unspecified sources. Further detail on ARB's choice of this default emissions factor is provided in Appendix D. Sources of data used for calculating emissions from imported electricity include:

- data provided by marketers and retail providers (including asset owning and asset controlling suppliers) under ARB's mandatory reporting regulation
- data reported to the U.S. Environmental Protection Agency pursuant to 40 CFR Part 75
- data on generation facilities reported to the Energy Information Administration, including fuel use, fuel heat content, and net electricity generation

Fee for Entities Reporting Imported Electricity

For each retail provider or marketer the Fee is based on the quantity of electricity imported from each specified source and from unspecified sources as reported:

$$\text{Fee} = \text{EFR}_i \times \text{QM}_{ei}$$

Where:

EFR_i = The Electricity Fee Rate for the specified source or unspecified source.

QM_{ei} = Quantity of electricity imported

E. Administration and Enforcement

The first year of implementation differs with respect to the submittal of reports to ARB. All affected entities would be required to report their 2008 emissions, or quantities of therms or fuels by January 2010 utilizing the Mandatory Greenhouse Gas Emissions Reporting Tool (Tool), in accordance with section 95104(e) of the Mandatory Reporting of Greenhouse Gas Emissions Regulation. ARB would send out Fee Notices to the affected entities by February 1, 2010, and payment would be due in April, 2010.

In subsequent years, affected entities would report their prior calendar year's emissions in June using the Tool. For those entities subject to ARB's Mandatory Reporting Regulation, changes made to the reported data as a result of the verification process must be concluded by December 1 of each year. Fee Notices would be sent out in January, the following year, and Fee payment would be in March, the same year the Fee Notice is sent.

ARB will modify the Reporting Tool so the affected entities not subject to the Mandatory Reporting Regulation can also report their information using the Tool.

The proposed Fee regulation includes enforcement provisions. Any violation of the proposed regulation is subject to the penalty provisions set forth in Health and Safety Code section 38580. Failure to submit any required report, submittal of incorrect statements, or to pay the Fee would constitute a violation. The proposed regulation also includes audit provisions, whereby ARB may contract with outside entities to obtain data or services needed to audit the returns provided by Fee payers. ARB may use Fee revenues collected to fund auditing and collection procedures.

F. Expenditures to be Supported by AB 32 Cost of Implementation Fee

The purpose of this proposed regulation is to repay loans that were used to fund ARB and the California Environmental Protection Agency's (Cal/EPA) implementation of AB 32 in fiscal years 2007/2008 and 2008/2009 and to create

a stable and steady funding source for state agencies to carry out AB 32 in future years. This section describes the loans, as well as how ARB proposes to determine the Required Revenue to carry out AB 32 in fiscal year 2009/2010 and future budget years.

This fee would cover expenditures for implementing AB 32, including:

1. 2007/2008 fiscal year loan repayment for ARB and Cal/EPA
2. 2008/2009 fiscal year loan repayment for ARB and Cal/EPA
3. 2009/2010 fiscal year and future year costs for ARB, Cal/EPA and other California state agencies.

The amount of revenue collected through the fees is the Required Revenue, which is the total amount of funds necessary to recover the costs of implementing the AB 32 program, plus loan repayment. The Required Revenue is based on the number of personnel positions, including salaries and benefits, and other expenses (contracts, equipment, etc.), approved in the California Budget Act for that fiscal year. The Total Required Revenue is the Required Revenue adjusted for excess or under collection from the previous fiscal year.

Repayment of Loans

For the 2007/2008 fiscal year, a portion of the expenditures by ARB and Cal/EPA to implement AB 32 were supported by loans. ARB is proposing that only loan-related budgeted costs be recouped. ARB received a loan of approximately \$15.2 million from the Motor Vehicle Account (MVA) and was budgeted for approximately \$8.5 million from the Air Pollution Control Fund (APCF).⁹ Cal/EPA also received a loan of approximately \$300,000 from the MVA.

For the 2008/2009 fiscal year, most of the budgeted resources needed to implement the AB 32 program for ARB and Cal/EPA were provided through a \$32 million loan from the Beverage Container Recycling Fund (BCRF). The loan was approved, with loan repayments spelled out in the Budget Act (AB 1781, Chapter 268, statutes of 2008). Table 2 illustrates the loan breakdown by fiscal year for ARB and Cal/EPA.

⁹ The funding from the Air Pollution Control Fund came from ARB and will not be repaid.

Table 2: ARB and Cal/EPA Loans to Carry Out AB 32

| Fiscal Year | Loans (Approximate, in Millions \$) |
|--------------|---|
| FY 2007/2008 | (MVA loan, ARB) \$15.2 (MVA loan, Cal/EPA) \$0.3 |
| FY 2008/2009 | (BCRF loan) \$32.0 |
| Total | \$47.5 |

ARB proposes to repay these loans over four years, beginning in the 2009/2010 fiscal year. Repayment of the three loans will include accrued interest. This proposed repayment schedule meets the statutory obligation for repayment, and is described in greater detail in Appendix C. Table 3 shows the proposed loan repayment schedule. If ARB expends funds from the loan approved by the legislature for fiscal year 2009/2010A, this repayment schedule will be modified to incorporate repayment of that loan.

Table 3: Proposed Loan Repayment Schedule

| Payment Date | Approximate Repayment Amount ¹ Including Interest (Million \$) |
|---------------|---|
| June 30, 2010 | \$13.7 |
| June 30, 2011 | \$14.0 |
| June 30, 2012 | \$13.8 |
| June 30, 2013 | \$13.2 |
| Total | \$54.6 |

¹ Does not add due to rounding.

ARB Expenses for Fiscal Years 2007/2008 and 2008/2009

In order to confirm that the funds loaned to ARB were expended on AB 32 related activities for fiscal years 2007/2008 and 2008/2009, staff reviewed the person years and other expenditures related to AB 32 in each fiscal year. This included the program staff workload associated with AB 32 work products, such as the Scoping Plan, various Early Action Measures, and additional regulatory measures. ARB utilized existing program staff, management oversight and program support staff, as needed, in order to complete the considerable workload within the statutory timeline.

Based on our initial evaluation of fiscal year 2007/2008 expenses, ARB expended resources in excess of the loan amount. Fiscal year 2008/2009 is still in progress, so the expenditures are preliminary, but similarly they show that ARB has expended resources in excess of the loan amount. With the proposed Fee regulation, ARB is proposing that only loan-related budgeted costs shown in Table 2 be recouped for prior fiscal years.

A summary of ARB's AB 32 expenditures for fiscal years 2007/2008 and 2008/2009 is provided in Tables 4 and 5 below. Additional detail is provided in Appendix C.

**Table 4: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year 2007/2008**

| | Costs (Million \$)* |
|--------------------------------|--------------------------------|
| Staff Related Costs | |
| • Salary | \$10.75 |
| • Benefits | \$3.77 |
| • Operating Costs | \$4.21 |
| Program Oversight ¹ | \$2.00 |
| Contracts ² | \$4.65 |
| Equipment | \$0.05 |
| Total | \$25.43 |

¹ Program Oversight includes Chairman's Office, Executive Office, administrative services and computer support expenses in proportion to the staffing for the AB 32 program.

² Estimated expenditures in the 2007/2008 fiscal year.

*Numbers do not add due to rounding

**Table 5: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year 2008/2009 - Preliminary**

| | Costs (Million \$) |
|--------------------------------|-------------------------------|
| Staff Related Costs | |
| • Salary | \$16.10 |
| • Benefits | \$5.64 |
| • Operating Cost | \$7.54 |
| Program Oversight ¹ | \$1.96 |
| Contracts ² | \$5.92 |
| Equipment | \$1.83 |
| Total | \$38.99 |

¹Program Oversight includes Chairman's Office, Executive Office, administrative services and computer support expenses in proportion to the staffing for the AB 32 program.

²Preliminary estimate of expenditures in the 2008/2009 fiscal year.

Cal/EPA Expenses for Fiscal Years 2007/2008 and 2008/2009

Cal/EPA and ARB undertook a similar process to confirm that the Cal/EPA loans were expended on AB 32 related activities for fiscal years 2007/2008 and 2008/2009, reviewing the person years and other expenditures related to AB 32. Based on an initial evaluation of fiscal year 2007/2008 expenses, Cal/EPA expended resources in excess of the loan amount. Fiscal year 2008/2009 is still in progress, so the expenditures are preliminary estimates. However, combined with ARB's preliminary 2008/2009 expenditures, they show that the two agencies have expended resources in excess of the loan amount.

Like ARB, only funds loaned to Cal/EPA will be recouped by the fee for fiscal years 2007/2008 and 2008/2009. A summary of the expenditures is provided in Tables 7 and 8 below.

**Table 7: Estimated Cal/EPA Expenditures for the AB 32 Program
Fiscal Year 2007/2008**

| | Costs¹ (Million \$) |
|---------------------|---|
| Staff Related Costs | |
| • Salary | \$0.15 |
| • Benefits | \$0.08 |
| • Operating Cost | \$0.12 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.34 |

¹Does not add due to rounding.

**Table 8: Estimated Cal/EPA Expenditures for the AB 32 Program
Fiscal Year 2008/2009 - Preliminary**

| | Costs (Million \$) |
|---------------------|-------------------------------|
| Staff Related Costs | |
| • Salary | \$0.34 |
| • Benefits | \$0.15 |
| • Operating Cost | \$0.30 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.79 |

Fiscal Year 2009/2010 Budget

In February 2009, the Legislature passed and the Governor signed the fiscal year 2009/2010 budget. This budget included a continuation of funding for ARB and Cal/EPA to carry out AB 32. For the 2009/2010 fiscal year, the Budget Act (SBX3 1, Chapter 1, Statutes of 2009) includes a \$35 million loan from the BCRF for ARB and Cal/EPA expenditures related to AB 32. ARB will consider this fee regulation in June 2009, and if approved, fee collection for the 2009/2010 fiscal year will begin in spring 2010. Timely implementation of this fee regulation could eliminate the need for some or all of the loan for the 2009/2010 fiscal year. If ARB and Cal/EPA do rely on the loan for some or all of their 2009/2010 expenditures, the fee will be used to repay the loan with interest. These loan repayments would be added to the repayment schedule shown in Table 3, and extend final payment by one year.

Funding Criteria

AB 32 provides ARB with the authority to adopt fees for the broad purpose of "carrying out this division." For the 2009/2010 fiscal year and future fiscal years, ARB proposes to use the following criteria to determine which expenses would be funded from this fee.

- Staff related expenditures for the start-up and ongoing implementation of the AB 32 program that have been approved through budget change proposals (BCPs) after AB 32 was signed into law (September 2006).
- Other post AB 32 BCPs approved costs directly related to the administration of AB 32 programs to reduce greenhouse gas emissions, such as contracts, administrative overhead, and research directly related to the implementation of the AB 32 program.

For the 2009/2010 fiscal year and future fiscal years, ARB proposes that the following types of activities *not* be funded through AB 32 fees:

- Redirected staff positions working on AB 32 that were not approved in the formal budget process with an approved BCP;
- Costs incurred by non-state agencies such as air quality/pollution districts, other special districts, etc;
- Activities which are currently funding a part of an agency's principal responsibilities (water conservation, waste reduction, traffic planning, etc.) that achieve greenhouse gas emission reductions as a co-benefit;
- Specific greenhouse gas emission mitigation activities that started prior to the passage of AB 32 or were covered by earlier budget requests;
- Activities related to adaptation to climate change, including adaptation-related research;

- Activities related to compliance with the California Environmental Quality Act (CEQA) requirements for state agencies related to climate change/greenhouse gas emissions; and,
- Compliance with existing and future programs, regulations or other initiatives for state agencies which reduce their own greenhouse gas emissions.

Funding for AB 32 Implementation in Fiscal Year 2009/2010 Budget

Several other state agencies have been working with Cal/EPA and ARB on AB 32 implementation, including work on the Climate Change Scoping Plan that ARB adopted in December 2008. The Scoping Plan describes a broad range of measures, including many measures that are the primary responsibility of other state agencies. These agencies, which all meet the funding criteria described above, include: the Department of Food and Agriculture, Energy Commission, Department of General Services, and Integrated Waste Management Board.

Table 8 below provides a preliminary summary of anticipated state agency expenses, including staffing levels, for the AB 32 program for the 2009/2010 fiscal year. Note that the numbers contained in the table are preliminary and subject to change due to potential changes to the adopted 2009/2010 budget during the May revise. A final determination of the required revenue for fiscal year 2009/2010 will be made once final budget information becomes available. Additional detail is provided in Appendix C.

**Table 8: Preliminary Summary of
AB 32 Program Funding for FY 2009/2010**

| State Agency | PYs | Total Costs (in Million \$) |
|---|------------|--|
| Air Resources Board | 155 | \$ 33.1 |
| Integrated Waste Management Board | 6 | \$ 1.3 |
| Energy Commission | 5 | \$ 0.6 |
| Environmental Protection Agency | 4 | \$ 0.7 |
| Department of General Services | 2 | \$0.2 |
| California Department of Food and Agriculture | 2 | \$ 0.3 |
| TOTAL | 174 | \$ 36.2 |

G. Ensuring Consistency with AB 32 Fee Authority

California law requires that a "nexus" must exist between a fee and the program funded by the Fee. If an adequate nexus does not exist, this Fee could be determined to be a tax. Health and Safety Code section 38597 specifically states that fees may be assessed on sources of greenhouse gas emissions regulated

pursuant to the division and consistent with Health and Safety Code section 57001.

Health and Safety Code section 38597 provides that ARB may adopt a regulation imposing fees on "sources of greenhouse gas emissions" regulated pursuant to AB 32. The proposed regulation imposes fees on upstream suppliers of natural gas and transportation fuels. Some stakeholders have argued that these upstream suppliers are not "sources" of greenhouse gas emissions within the meaning of section 38597, but that "sources" are the end users who actually burn the natural gas and transportation fuel (e.g., individual business, households, motorists, etc), and thereby directly emit greenhouse gases into the atmosphere.

ARB staff does not agree with this argument. Staff believes that the proposed regulation is consistent with section 38597 for the following reasons. First, some of the entities on which fees are imposed are clearly "sources" of greenhouse gas that are directly emitted into the atmosphere. These entities include refineries and cement producers (who generate process emissions from their operations) and facilities that burn coal. Stakeholders have not suggested otherwise.

Second, to address emissions from natural gas and transportation fuels, the proposed regulation is simply an administrative mechanism for efficiently collecting fees on downstream "sources" of greenhouse gas emissions based on the assumption that the costs of the fees will be passed on to downstream end users who actually combust the natural gas and transportation fuel.¹⁰

Gasoline and diesel fuels are burned by millions of individual motorists, as well as millions of individuals who operate small combustion sources such as construction and farm equipment, water pumps, lawn mowers, chainsaws, stoves and water heaters in homes, boats, off-highway all-terrain vehicles, snowmobiles and many others. Equipment that burns natural gas, gasoline, or diesel fuel is owned and operated by virtually every household and business in California. It would be inefficient, impractical and overly burdensome to impose fees on all of the individuals who own or operate such equipment. To do this, a fee would need to be imposed on essentially every person who resides in California.

H. Amendment to Mandatory Reporting Regulations

Additionally, this regulatory package proposes to amend the Mandatory Reporting Regulation. The Mandatory Reporting Regulation provides for reporting of GHG emissions electronically. The proposed amendment requires entities subject to the Mandatory Reporting Regulation to submit data via ARB's GHG Reporting Tool for ease of use and consistency in reporting.

¹⁰ Upstream suppliers of transportation fuels and natural gas are also "sources" of greenhouse gas emissions in the sense that they are in the business of placing a commodity into the stream of commerce that will ultimately result in greenhouse gas emissions.

III. Recommended Action and Alternatives to the Proposed Regulations

Recommended Action

To provide the funding authorized by Health and Safety Code section 38597, the staff recommends that the Board adopt the proposed AB 32 Cost of Implementation Fee Regulation. This would be put into effect by adopting new sections 95200 through 95207, title 17, CCR, as contained in Appendix A.

Evaluation of Regulatory Alternatives

California Government Code section 11346.2 requires ARB to consider and evaluate reasonable alternatives to the proposed regulation and provide reasons for rejecting those alternatives. This section discusses alternatives evaluated and provides the reasons why they were not included in the proposed rulemaking. No alternative considered by the agency would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective or less burdensome to affected private parties than the proposed regulation.

A. No Action on AB 32 Cost of Implementation Fee

A "no action" alternative means that no fee would be assessed on sources of greenhouse gas emissions to cover the costs of carrying out the requirements of AB 32. Taking the "no action" approach would require that alternative funding sources be secured. It is unclear what these funding sources would be at this time. It is possible that in obtaining another source of funding, other projects would not be able to obtain funding, and/or the AB 32 climate change program would have to be diminished. This alternative was rejected as it is inconsistent with AB 32 and recent legislative intent.

B. No Action on Amendment to Mandatory Reporting of Greenhouse Gas Emissions Regulation

A "no action" alternative for amending the Mandatory Reporting of Greenhouse Gas Emissions Regulation means that the Mandatory Reporting Regulation would not be amended to require the use of the California Greenhouse Gas Reporting Tool (Tool) for data collection for the AB 32 Cost of Implementation Fee. Without the use of the Tool, the level of quality control and quality assurance that are possible with the Tool would be difficult to match. The Tool provides for automatic data check, and data security. Additionally, due to the ease of administration, the Tool reduces costs. Use of this "no action" alternative would result in a loss of these benefits.

C. Alternatives to this Broad-Based Fee Regulation

Staff considered analyzing each greenhouse gas-related regulation as it is developed, with the intent of adding a fee component to each regulation to cover costs required to carry out the goals of AB 32. However, this alternative would mean that ARB would not have the funds to start up each program and would need to borrow money to develop the regulation. Once the regulations were adopted, the Fee could cover the costs of carrying out the implementation of the regulation, but the borrowed money, including interest, would need to be repaid. This would increase costs, considering that each regulation would require borrowing money and repaying those loans with interest.

In addition, the complexity required for implementation of a regulation may not be proportional to the amount of emissions reductions achieved by that regulation. This could create an equity issue, in that some regulations may only decrease a small amount of greenhouse gas emissions but require a large number of resources to develop and carry out the reduction of those emissions, while other regulations may achieve a relatively large amount of emissions reductions, but have lower costs due to a lower level of complexity. In addition, every regulation would have an increased level of complexity due to the need to include the analysis to determine the appropriate fee levels required from each entity to cover the costs of carrying out the regulation. This would increase the cost of carrying out each regulation, thereby compounding total costs to affected entities, compared to the costs associated with the staff's proposed approach.

Furthermore, because California's greenhouse gas emission reduction program, as described in the Scoping Plan, includes regulatory measures that are not intended to be adopted by ARB, as well as non-regulatory measures, pursuing a regulation-by-regulation approach would mean that some sectors or source categories may not be subject to Fees while ARB-regulated sectors would have associated fees which would create inequity among the sectors.

D. Downstream Alternative

ARB staff considered assessing the Fee on the ultimate consumer of products that emit greenhouse gases. Under this alternative, ARB would assess fees on residential, commercial, and industrial users of natural gas; the owners or operators of cars, trucks and other equipment that combust gasoline and diesel fuel; and the end-users of electricity. This general approach was rejected as being administratively infeasible.

For natural gas, the Fee would be assessed on residential, commercial and industrial users. Although the largest industrial users of natural gas are already reporting their greenhouse gas emissions under the Mandatory Reporting Regulation, this alternative would dramatically increase the number of points of assessment by including residential and commercial customers, increasing

record-keeping and collection costs. In addition, because the largest industrial users of natural gas would already be billed for their greenhouse gas emissions through the Mandatory Reporting Regulation, this downstream alternative adds a layer of complexity in that a method would need to be developed to extract their natural gas combustion quantities from the aggregate amount of natural gas reported by the public utility gas corporations. Without this extraction of data, the largest industrial users of natural gas would be billed twice for the same natural gas.

For gasoline, the Fee could be assessed at the pump but because the amount of the fee that is required to implement AB 32 is less than one-tenth of a cent per gallon, the purchase of ten gallons would generate a fee of only a penny, excessively increasing administrative costs. ARB also considered assessing the Fee at the "rack," formally known as the terminal rack. The rack is the location in the fuel distribution system where fuel is blended with oxygenates and other additives and then distributed to gas stations. Fuels that are imported into the state can be transported directly to racks and are therefore not accounted for at the refinery level. A fee at the rack would increase administrative burden by doubling the number of collection points – increasing the administrative burden while still being upstream of the end user.

For electricity, the Fee would be assessed at the consumer-level and would necessarily apply to all electricity consumed, whether generated in-state or out-of-state. This approach would apply the Fee to consumers of electricity without regard to whether that electricity was a source of greenhouse gas emissions or not, thereby adding an undue burden on some consumers. In addition, this option would tremendously increase the number of regulated entities, increasing administrative burden, and therefore administrative costs.

ARB chose not to pursue the downstream alternative due to the increase in administrative burden, increased record-keeping and fee collection costs, which would increase the overall cost of carrying out AB 32 mandates.

E. Alternatives Considered for Imported Electricity

ARB staff considered three alternatives to assessing a fee on imported electricity: no fee on imported electricity, assessing the fee on the suppliers of the electricity-generation fuels for out-of-state generation facilities, and assessing the fee on in-state electric retail providers.

No Fee on Imported Electricity – Staff considered the option of not applying the fee to imported electricity. However, this option was rejected because this would mean that sources of approximately 10 to 13 percent of California's greenhouse gas emissions would not be covered by the Fee, which would make the Fee regulation less equitable, increasing costs on remaining fee payers. Additionally,

at workshops held by ARB several stakeholders asked ARB to include imported electricity if at all possible.

Assessing the Fees on the Suppliers of the Electricity Generation Fuels for Out-of-State Generation Facilities – ARB considered applying the Fee to fuel suppliers for out-of-state generation facilities, as is proposed for in-state generation facilities. However, it is not possible for fees to be applied to out-of-state suppliers of electricity generation fuels, or to use the generation facility located out of state as the point of regulation, because California does not have jurisdiction over these entities.

Assessing a Fee Solely on In-State Electric Retail Providers – Assessing a fee solely on in-state electric retail providers, based on the imported electricity they use, would require that the retail provider identify the generating facilities that are the sources of the electricity. Each generation source has a distinct emissions factor. When the source is identified, ARB can then calculate a source emissions factor and accurately determine a fee rate. However, retail providers may not be able to identify the sources of electricity purchased from marketers, even though the marketers may have that information. In such cases, the emissions factor would be unknown, and a fee could not be accurately calculated. Therefore, by solely assessing fees on retail providers, some information would be lost, reducing the accuracy of the application of the Fee. Assessing the Fee on both the retail providers and the marketers results in fewer unspecified sources of electrical generation. The recommendation by the CEC and CPUC is to obtain such information from the first deliverer, which includes the marketers.

F. Expanding Coverage of Fee to Additional Sources

ARB staff considered expanding the Fee to cover the remaining 15 percent of greenhouse gas emissions. Staff rejected this alternative for three primary reasons. First, some of the greenhouse gas emissions that are not proposed to be covered under the Fee are fugitive emissions (such as methane emissions from dairy operations and landfills) that are difficult to accurately measure in order to assess an equitable fee. Second, some types of emission sources (such as jet fuel and kerosene) contribute a small proportion of greenhouse gas emissions, so the administrative burden of including those emissions outweighs the potential increase in revenue. Third, staff opted not to pursue a fee on high GWP gases because there is already a regulation planned to assess mitigation fees on high GWP gases, which is expected to be considered by the Board within the next year. Some portion of the high GWP fee will be dedicated to program implementation costs, and the high GWP mitigation program will be administratively self-supporting.

IV. Impacts Analysis

The California Environmental Act (CEQA) and ARB policy require an analysis of the potential adverse environmental impacts of proposed regulations. The Secretary of Resources has certified ARB's program for the adoption of regulations. Public Resources Code, Section 21080.5, allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report, once the Secretary for Resources has determined that ARB meets the criteria for a Certified State Regulatory Program (Title 14, California Code of Regulations (CCR) section 15251 (d)). This certification allows ARB to include an environmental analysis in the Initial Statement of Reasons for the adoption of regulations, instead of preparing Negative Declarations or Environmental Impact Reports (EIRs). In addition, ARB will respond in writing to all significant comments that pertain to potential environmental impacts raised by the public during the public review period or at the Board hearing. These responses will be contained in the Final Statement of Reasons for the regulation.

ARB's basis for analysis originates from the CEQA Guidelines' Initial Study Checklist. The following environmental impact areas were considered in making the determination of whether the adoption and implementation of the proposed regulation would result in a potential adverse impact:

A. Impacts to Air Quality and Other Environmental Impact Areas

Staff evaluated the potential environmental impacts from the proposed Fee regulation and the proposed amendment to the Mandatory Reporting Regulation and determined that no potential significant adverse environmental impacts to air quality or any other environmental impact area would result from the proposed regulations. The proposed Fee regulation simply assesses fees on various entities. The proposed amendment to the Mandatory Reporting Regulation would require the use of ARB's reporting tool. Neither would cause a physical change to the environment, directly or indirectly. It would not result in the disturbance or conversion of land, cultural, biological or water resources, increase energy demand, affect populations or increase the need for housing. It will not result in a change in existing transportation or in traffic, solid waste or affect the aesthetics of the State.

B. Environmental Justice

State law defines 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 (Senate Bill 115, Solis; Statutes of 1999, CH. 690; Government Code section 65040.12 (c)). On December 13, 2001, the Board approved

Environmental Justice Policies and Actions that establish a framework for incorporating environmental justice into ARB's programs, and that would be consistent with the directives of State law. The policies subsequently developed apply to all communities in California. Staff has determined that the proposed regulation and the proposed amendment would not result in an adverse impact to air quality, thus would not result in an increase in exposure to pollutants.

Adoption and implementation of this regulation will have no adverse environmental impacts on environmental justice communities. Staff believe the economic impacts will be extremely minor. The cost per person would be approximately \$1.00 to \$1.50 per year, or \$4.00 per household per year, assuming that the fee payers pass all their costs through to their customers.

V. Economic Impact Analysis

A. AB 32 Cost of Implementation Fee Regulation

In this section, ARB provides estimates of the costs to businesses of compliance with the staff's proposed fee regulation. ARB expects the regulation to directly affect approximately 230 businesses in the state. While staff has quantified economic impacts to the extent feasible, the cost estimates are based on historical data of industry-level emissions, fuel use, and commodity prices that are all highly variable. In addition, all calculations are based on current budget levels that may be changed by the Legislature. Consequently, the staff acknowledges that individual companies may experience different impacts than those depicted for each industry in this analysis.

The analysis begins with an explanation of how fee rates are based on reported emissions and annual budget levels. ARB will use its annual budgeted revenue requirement and emissions reported by fee payers to calculate a Common Carbon Cost per ton of emissions on a CO₂ equivalent basis (MTCO₂E). Each company's fee obligation is based on the Common Carbon Cost and the company's reported emissions and fuel distributions.

The analysis then examines the estimated distribution of the fee payments by industry. These payments represent the direct impacts on businesses. The analysis then assesses how the directly impacted businesses may try to recover the costs through output price increases.

B. Annual Cost of the AB 32 Cost of Implementation Fee Regulation

Assuming the Legislature continues to authorize AB 32 activities at fiscal year 2009/2010 budget levels, the regulation is expected to raise approximately \$51.2 million annually over the first three years of its operation, and about \$50.2 million in its fourth year. This level would cover \$36.2 million in annual program costs at fiscal year 2009/2010 budgeted levels and repayment of loans from special funds to support implementation of climate change programs by ARB and Cal/EPA in previous years. After the loans are repaid, the regulation would raise approximately \$36.2 million annually unless modified by the Legislature.

The Common Carbon Cost is determined by dividing the Total Revenue Requirement by total covered emissions, which includes the carbon content of covered fuels. The fees charged to each source will equal the Common Carbon Cost multiplied by the amount of the business' emissions. Table 9 demonstrates the calculation using emissions inventory data for 2006. Had the fee regulation been in effect in 2006, the emissions covered by the fee would have been about 412 million metric tons, in CO₂ equivalent. In this case, the Common Carbon

Cost per ton of emissions to cover only the \$36.2 million annual ongoing cost would be about \$0.09 per MTCO₂. The Common Carbon Cost per ton of emissions to cover the annual ongoing cost plus loan repayment would be about \$0.12 per MTCO₂E. The Common Carbon Cost would be recalculated each year based on budgeted revenue requirements and the amount of covered emissions.

| Table 9: Sample Calculation of Common Carbon Cost Based on Fiscal Year 2009/2010 Estimated Expenditures | | | |
|---|----------------------|----------------------------------|--|
| Units | | Annual Ongoing Costs Only | Annual Ongoing Costs Plus Loan Repayments |
| Revenue Requirement | Million \$ | \$36.2 | \$51.2 |
| Covered Emissions (2006) | MMT | 412 | 412 |
| Common Carbon Cost | \$/MTCO ₂ | \$0.0880 | \$0.1244 |
| Source: ARB calculations. | | | |

C. Affected Industries by Sector

Table 10 presents estimates of the fee payments by sector. The first two columns contain the entities directly paying the Fee and their respective emission quantities in 2006. The fourth column presents the costs over the first four years of the program based on the assumption that all ARB and Cal/EPA loans are paid over that period. After the loans are repaid, the payments are based on the annual ongoing budgeted cost of \$36.2 million per year, as presented in column three. The estimated fee payment by source sector is calculated by multiplying the quantity of emissions subject to the fee by the Common Carbon Cost given in the last row of Table 10. The fifth column contains the estimated share of total revenue for each source sector.

Table 10: Affected Industries By Sector
 Example using 2006 Emissions Data and
 Fiscal Year 2009/2010 Estimated Expenditures

| Sector | 2006 Emissions Million MTCO ₂ | Estimated Fee Payments | | Share of Costs by Emissions Source % |
|----------------------------|---|---|---|--|
| | | Annual Ongoing Costs Only Million \$ | Annual Ongoing Costs Plus Loan Repayments Million \$ | |
| | | | | |
| Refinery Process Emissions | 33.92 | \$2.98 | \$4.22 | 8.2 |
| Gasoline | 143.38 | \$12.61 | \$17.84 | 34.8 |
| Diesel | 42.84 | \$3.77 | \$5.33 | 10.4 |
| Natural Gas | 124.53 | \$10.95 | \$15.49 | 30.2 |
| Associated Gas | 3.24 | \$0.28 | \$0.40 | 0.8 |
| Cement | 8.39 | \$0.74 | \$1.04 | 2.0 |
| Non-Cement Coal Use | 5.74 | \$0.50 | \$0.71 | 1.4 |
| Electricity Imports | 49.64 | \$4.37 | \$6.17 | 12.1 |
| Total | 411.67 | \$36.21 | \$51.21 | 100.0 |
| Common Carbon Cost | \$/MTCO ₂ | \$0.0880 | \$0.1244 | |

Note: Emissions data from 2006 ARB Emissions Inventory, all other entries based on ARB calculations.

Table 11 presents estimates of the number of businesses in each of the sectors expected to pay the proposed Fee. Businesses may operate more than one facility. Column three contains the average Fee payment for businesses by source for the first four years of the Fee, when the payment rates cover loan repayments. Column four contains the average payment for subsequent years after the loan repayment is complete. All annual cost figures assume a constant ongoing budget requirement of \$36.2 million per year.

Table 11: Estimated First Year and Ongoing Costs Per Business

| Source | Estimated Number of Businesses | Estimated Average Annual Cost for First Four Years | Estimated Average Annual Ongoing Costs |
|--|---|---|---|
| | Number | Million \$ | Million \$ |
| Cement | 5 | \$0.21 | \$0.15 |
| Refineries | 21 | \$1.32 | \$0.94 |
| Associated Gas | 11 | \$0.04 | \$0.03 |
| Electricity Imports | 130 | \$0.05 | \$0.03 |
| Non-Cement Coal | 14 | \$0.05 | \$0.04 |
| Natural Gas Direct Use and Distribution | 50 | \$0.31 | \$0.22 |
| Total | 231 | | |
| Source: ARB estimates Assumes Fiscal Year 2009/2010 Expenditures are constant | | | |

The estimate in Table 11 of the number of businesses in the electricity imports category is based on the number of businesses defined as retail providers and marketers of imported electricity that are active in California. This number could change from year to year.

The estimates in Table 11 are based on emissions inventory data for 2006. Since the regulation is designed to raise a fixed amount of budgeted revenue, a decrease in industry output and consequent emissions due to the current recession would have the effect of raising the Common Carbon Cost. This, in turn, would raise the cost of the Fee per unit of output. Similarly, prices in most of the sectors paying the Fee are highly variable, and ARB recognizes the fee impacts are sensitive to changes in those prices.

D. Mandatory Use of Greenhouse Gas Reporting Tool

The proposed regulation would also require entities subject to the Fee to use ARB's Greenhouse Gas Reporting Tool when reporting emissions or other information used for calculating the Fees. The Reporting Tool is a web-based platform designed to facilitate reporting and ease the administrative burden on respondents and ARB. A comprehensive users' guide, sector-specific reporting guidance, and other training aids will be provided. The use of the tool reduces the need for entities to develop their own reporting methods for this regulation, and lessening the possibility of reporting errors.

Entities already subject to the Mandatory Reporting of Greenhouse gas Emissions Regulation would not incur significant costs to use the Reporting Tool for compliance with this fee regulation. These entities include cement producers,

facilities combusting coal, oil producers combusting associated gas, refineries, electric utilities and marketers importing electricity, and natural gas producers and pipeline owners and operators. Some entities complying with the Reporting regulation for their direct emissions would have to augment their reports for the fee regulation with data on fuel distribution, but this should not represent a significant additional cost. These entities include refineries and natural gas pipeline owners and operators.

There would be some entities not currently required to comply with the Reporting Regulation that would be required to pay fees and use the Reporting Tool for reporting their data for fee calculation purposes. These would include interstate pipeline owners and operators, non-public utility gas corporation intrastate pipeline owners and operators, and transportation fuel importers without direct emissions above the Reporting threshold. These entities would only need to report their fuel throughput and any direct emissions, which should only involve insignificant costs

E. Economic Impact of AB 32 Fees

ARB expects that most businesses paying the Fee have the ability to pass the Fee costs through to consumers. The demand for gasoline and diesel is inelastic and the carbon-content portion of the Fee is also assessed on imported fuel, so the refiners should have the ability to pass on Fee costs. Although imported transportation fuels do not bear the cost of process emission fees, these are a small percent of the total. Because the Fee will affect providers of gasoline and diesel fuel in substantially the same way, ARB believes that the Fee will likely be passed on to customers.

Electricity importers, cogeneration facilities, and natural gas-fired power plants should be able to pass the Fee cost on to the load-serving entities. The load-serving entities can then recover the passed-through Fee costs as a price increase over all of their deliveries. ARB believes that imposition of the Fee is too small to affect wholesale market dispatch.

Charging the Fee on the burning of associated gas in petroleum production would raise the cost of producing petroleum in California. In 2006, California produced about 249 million barrels of oil. If the 2006 emissions and oil production rates prevail when the Fee is applied the fee would amount to about \$0.002 per barrel, equal to less than 0.1% of recent prices. ARB does not know if all petroleum producers burn associated gas or whether each company's combustion is proportional to its oil output. If companies do not combust associated gas in the same relation to output then the Fee cost per barrel for some of those paying the Fee would be higher than ARB's estimate.

California both produces and imports oil. The presence of imports may limit the ability of the oil producers to pass the full Fee costs on to the refineries. In

addition, ARB cannot determine the covered emissions for entities combusting associated gas, so ARB is unable to determine the financial impact of the regulation on individual companies expected to pay the Fee. However, the average Fee cost per barrel produced appears to be very low at the industry level, and ARB does not consider it likely to have a significant adverse economic impact on oil producers.

The amount by which cement producers would need to raise their prices is very small, estimated to be about \$0.10 per ton, or less than 0.2% of recent prices. The ability of cement manufacturers to pass on the Fee costs may also be limited by the availability of imports. Unlike transportation fuels, natural gas, and electricity, the Fee would not be assessed on imported cement and cement products. The presence of significant import supply on which the Fee is not assessed could limit the ability of California cement manufacturers to pass on the entire Fee cost to consumers of cement.

ARB has evaluated the impact of the Fee on cement manufacturing companies' profitability assuming that the cement companies are not able to pass on any of the Fee costs. Generally, ARB uses the return on equity (ROE) as a measure of a company's profitability. ARB has determined that even if cement manufacturers are unable to pass on any of the Fee cost, the reduction in their profitability would be less than a 1 percent decrease in ROE. ARB believes the parent companies of California plants are sufficiently large so that the costs will not significantly affect profitability, even in the unlikely case that cement plants cannot pass on any of their Fee costs.

Businesses not directly paying the Fee would face higher costs as producers directly paying the Fee pass on the fee costs. However, as shown in Table 12, these price increases to be very small. ARB has determined that these indirect cost increases will not have a significant adverse economic impact on businesses and individuals.

F. Potential Impact on Consumers

ARB expects that businesses paying the Fee will recover most of the cost of the fee by raising output prices. Table 12 presents estimates of the increase in output prices needed for businesses to completely recover the fee over the first four years of the regulation, when previous loans are repaid. Column five presents the Fee cost per unit of output. In some cases, the businesses producing products listed in Table 12 pay fees on more than one of the sources listed in Table 10. For example, the combined fees assessed on electrical generation and delivery, including coal for cogeneration, natural gas, and imported electricity totals about \$0.05 for each MWh consumed in California. Electricity load-serving entities would need to raise their average retail price by that amount to recover the combined fee, equal to about 0.04% of the 2006 retail price of \$120 per MWh.

**Table 12: Estimated Change in Output Prices
Needed to Recover Fee Payments**

| Product | Units | Product Price \$/Unit | Number of Units (2006) Units | Fee Cost per Unit of Output \$/Unit | Percent Change in Product Price % | Revenue Million \$ |
|--------------------------------|---------|--------------------------|------------------------------------|--|--------------------------------------|-----------------------|
| Electricity | MWh | \$120.00 | 269,271,000 | \$0.0495 | 0.04 | \$13.32 |
| Gasoline | Gallons | \$2.20 | 15,974 Billion | \$0.0013 | 0.06 | \$21.50 |
| Diesel | Gallons | \$2.20 | 4,182 Billion | \$0.0015 | 0.07 | \$6.29 |
| Non-Electricity Natural Gas | Therms | \$1.24 | 130,600,000 | \$0.0007 | 0.05 | \$9.06 |
| Cement | MT | \$75.00 | 11,500,000 | \$0.0907 | 0.12 | \$1.04 |
| Total | | | | | | \$51.21 |

NOTES

1. Electricity and natural gas data from California Energy Commission.
2. Cement data based on industry estimates.
3. Gasoline and diesel quantities based on data reported to ARB.
4. Coal is incorporated in electricity and cement products.

In the same manner, the cost estimates for gasoline and diesel include the fees assessed on their carbon content as well as fees assessed in their production, such as associated gas and process emissions. Note that the associated gas fee is levied at the point of production, but for the purposes of estimating the potential impact on consumers the calculations in Table 12 the assumption is made that the Fee is passed on to the refinery as part of the cost of petroleum production. The Fee costs on associated gas are then reflected in the price of gasoline or diesel. The cost estimates for cement include both coal combustion and process (clinker) emissions. The cost estimate for natural gas combustion in Table 12 covers only non-electricity uses.

VI. Summary and Rationale for Proposed Regulations

The proposed AB 32 Cost of Implementation Fee Regulation would assess fees on approximately 85 percent of the sources of greenhouse gas to support implementation of the Global Warming Solutions Act of 2006, Assembly Bill 32, Chapter 488, Statutes of 2006 (AB 32). The fees would be assessed on sources of greenhouse gas, with each fee being calculated separately for each source. This section discusses the requirements and rationale for each provision of the proposed regulations.

The proposed amendment to the Mandatory Reporting of Greenhouse Gas Emissions regulation requires operators and verifiers subject to the Mandatory Reporting regulation to use ARB's reporting tool.

A. Proposed AB 32 Cost of Implementation Fee Regulation

Section 95200. Purpose.

Summary of Proposed Regulation.

This section states the purpose of the regulations. Specifically, pursuant to Health & Safety Code section 38597, the Board is adopting this Fee schedule to collect fees to carry out AB 32.

Rationale for Proposed Regulation.

This section is needed to ensure the regulated public understands that fees generated from these regulations will be used for implementation of programs pertinent to AB 32.

Section 95201. Applicability.

Summary of Section 95201(a).

Subsection (a) of the proposed regulation outlines that the fees will be imposed on the category of sources stated in subsections (a)(1) through (a)(6).

Rationale for Section 95201(a).

This section is required in order to identify the entities to which this regulation would apply.

Summary of Section 95201(a)(1), Natural Gas Utilities and Users.

Subsection (a)(1) addresses natural gas utilities and users. A fee is assessed on each therm of natural gas: (1) delivered to any end user in California by a public utility gas corporation (defined in section 95202subsection (a)(70)), (2) owners and operators of interstate and intrastate pipelines that distribute natural gas directly to end users in California, (3) all owners or operators consuming natural gas or associated gas produced on-site that are subject to the Mandatory Reporting Requirements of Title 17, California Code of Regulations sections 95100 et seq. ("Mandatory Reporting Requirements."), and (4) owners and operators that consume associated gas that is produced on-site and are subject to the Mandatory Reporting Regulation.

Rationale for Section 95201(a)(1).

This section is necessary for two reasons: the first is to include natural gas utilities, users and pipeline owners and operators that distribute natural gas for use in California because combustion of natural gas is responsible for 26 percent of greenhouse emissions in California. The second reason is that it is necessary to define where in the chain of commerce the Fee will be assessed and address each and every natural gas producer or consumer at the most upstream point possible for natural gas utilities, users and pipeline owners and operators that distribute natural gas for use in California. As explained elsewhere in this report, ARB considered several alternative methods of assessing the Fee. Assessing the Fee at the most upstream point possible was determined to be the most economically feasible, while the costs of the Fee could be passed through to the ultimate consumer of natural gas.

Summary of Section 95201(a)(2), Producers and Importers of Gasoline and Diesel Fuels.

Subsection (a)(2) outlines that the Fee would be assessed on: (1) all producers and importers of California gasoline or California diesel, based on the number of gallons of gasoline or diesel fuel, and (2) all producers and importers of CARBOB, based on each gallon of CARBOB plus the designated oxygenate amount.

Rationale for Section 95201(a)(2).

It is necessary to include transportation fuels such as gasoline and diesel fuel because emissions from combustion of transportation fuels contribute 38 percent of the greenhouse gas emissions in California. This section is necessary to define the scope of the Fees assessed on producers and importers of gasoline and diesel. Each subsection is necessary to address a separate sector of transportation fuel producers and importers

Summary of Section 95201(a)(3). Refineries.

Subsection (a)(3) proposes to impose a fee on all owners or operators of refineries that emit process emissions, including refineries that produce or consume catalyst coke, petroleum coke, refinery gas or produce emissions that result from the steam methane reforming process. The Fee will be based on reported emissions.

Rationale for Section 95201(a)(3).

It is necessary to include these refineries because the process emissions produced are sources of greenhouse gases and must be included in the Fee base to ensure the widest possible base of Fee payers.

Summary of Section 95201(a)(4). Cement Manufacturers.

Subsection (a)(4) proposes to impose a Fee on cement manufacturing facilities that emit greenhouse gases. The Fee will be based on reported emissions.

Rationale for Section 95201(a)(4).

It is necessary to include these refineries because the process emissions produced are sources of greenhouse gases and must be included in the Fee base to ensure the widest possible base of fee payers.

Summary of Section 95201(a)(5). Retail Providers and Marketers of Imported Electricity.

Subsection (a) (3) proposes to impose a Fee on retail providers or marketers of imported electricity. The Fee will be paid based on the greenhouse gas emissions associated with each Megawatt-hour of imported electricity.

Rationale of Section 95201(a)(5)

It is necessary to include importers of electricity because the out-of-state generation of electricity to supply California consumers results in greenhouse gas emissions. These emissions must be included in the Fee base to ensure the widest possible base of fee payers. This method will result in a fee that is equitable to that proposed to be assessed on in-state electricity, however the method is different because ARB does not have the authority to regulate providers of fuel to electricity generators located out-of-state

Summary of Section 95201(a)(6). Facilities that Combust Coal.

Subsection (a)(5) proposes to impose a Fee on the combustion of coal in California if the owner or operator of the combusting facility is subject to the Mandatory Reporting Requirements. The Fee will be based on reported emissions.

Rationale for Section 95201(a)(6).

It is necessary to include these facilities that combust coal because the emissions produced are sources of greenhouse gases and must be included in the fee base to ensure the widest possible base of fee payers.

Summary of Section 95201(b)(1) through (9).

Subsection (b) proposes to exclude greenhouse gas emissions caused by combustion of certain fuels (aviation gasoline, jet fuel, kerosene, liquefied petroleum gas, biodiesel, renewable diesel, residual fuel oil, propane and fuel exported for use outside California) from the Fee.

Rationale for Section 95201(b)(1) through (9).

These fuels are excluded because the total greenhouse gases emitted by these sources is too small a portion of the greenhouse gas inventory to capture and the points of regulation are too numerous (potentially in the tens of thousands) to administer in a cost effective manner.

Section 95202. Definitions.

Summary of Section 95202

This section proposes definitions to the terms used in this regulation.

Rationale for Section 95202.

It is necessary that ARB defines its terms as they apply to the AB 32 Cost of Implementation Fee Regulation. Most of these terms are used in other Articles and Titles in the California Code of Regulations, Government Code sections or statutes, and it is necessary that ARB be consistent with existing definitions to the extent that they apply to this regulation.

Section 95203. Calculation of Fees.

Summary of Section 95203(a), Total Required Revenue (TRR).

This subsection proposes to define the elements that will compose the annual Total Required Revenue. The Total Required Revenue (TRR) shall include Required Revenue plus any shortfalls or excesses from the previous fiscal year. The Required Revenue will be based on the number of personnel positions and contracts approved in the California budget for each fiscal year for all agencies implementing AB 32. The TRR must also include payments required to be made by ARB for loans obtained in implementing AB 32 within ARB for the 2007/2008 and 2008/2009 fiscal years. Repayment of the loan for 2008/2009 is required by Assembly Bill 1781, Chapter 268, Stats. 2008, page 309.

Rationale for Section 95203(a).

This section is needed to define the total amount of money that ARB will collect on an annual basis, and so the regulated public will be able to accurately compute the cost of the efforts of state agencies implementing AB 32. Inclusion of the debt is necessary because it is required by AB 1781 as a debt to be repaid. ARB has no other means of raising funds to pay down the debt, as required by law.

Summary of Section 95203(b), Common Carbon Cost (CCC).

This section proposes a formula to calculate the fees that will be paid by the entities defined in Section 95201. First, a "common carbon cost" or "CCC" will be calculated, which will be a unit cost of each metric ton of carbon dioxide (MTCO₂). This cost will be determined dividing the TRR by the proportion of greenhouse gas emissions

Rationale for Section 95203(b).

This section is necessary to calculate the cost of each MTCO₂. The CCC is the basis for the calculation of Fee rates which allow the Fee to be applied equitably to all sources of emissions subject to this regulation.

Summary of Section 95203(c), Fuel Fee Rate.

This section proposes to calculate a Fuel Fee Rate for emissions from combustion of natural gas, motor vehicle fuels and coal. The Fuel Fee Rate is multiplied by the CCC calculated in section 95203(b) and the emission factor of each fuel.

Rationale for Section 95203(c).

This section is necessary to describe how to calculate a fee for each fuel instead of using the same fee for each fuel. Each fuel has a different emission factor because each fuel has different carbon dioxide emissions, and so the Fuel Fee Rate must be calculated separately.

Summary of Section 95203(d), Fuel Emission Factors.

This section describes the source of the emission factors to be used for calculating the CCC as required in section 95203 (b), and the Fuel Fee Rate as required in section 95203 (c).

Rationale for Section 95203(d).

This section is necessary to describe the specific emission factors to be used for purpose of the fee calculation described in this regulation

Summary of Section 95203(e), Imported Electricity Fee Rate.

This section proposes to calculate an Imported Electricity Fee Rate for specified and unspecified sources of electricity imported into California. The Electricity Fee Rate for each specified source is calculated by multiplying the CCC by the emission factor of the specified source. For unspecified sources, the Electricity Fee Rate is calculated by multiplying the CCC by the default emission factor for unspecified sources.

Rationale for Section 95203(e).

This section is necessary to calculate the Electricity Fee Rate per MWh of imported electricity based on the emissions associated with combustion of fuels to generate the imported electricity. This "two pronged" approach is necessary to ensure that each source of imported electricity pays its portion of the Fee, while also accounting for the different types of electricity imported into California. Additionally, ARB needs to assess the Fee on as many contributors of greenhouse gas emissions as possible. Through this methodology, the impact of the Fee on imported electricity is equivalent to the impact of the Fee on in-state electricity generation, because in both cases, the Fee is based on the quantity of emissions from combustion of fuels used for generation. For in-state generation, the Fee is assessed upstream directly on the fuel used to generate the electricity, and the cost of the Fee is expected to be passed on to the generator, and ultimately to the consumers of electricity.

Summary of Section 95203(f), Emissions Factors for Generating Units or Facilities of Imported Electricity

This section proposes to calculate emission factors for specified sources of imported electricity that are generating units or facilities. Emission factors are calculated by dividing the source's CO₂ emissions by the source's electricity generation output.

Rationale for Section 95203(f).

This section is necessary to calculate the emission factors that are used to calculate Electricity Fee Rates for imported electricity from specified sources that are generating units or facilities. Specified sources have emissions factors that can be easily calculated by using data that they report either to ARB, under the Mandatory Reporting Regulation, to the U.S. Environmental Protection Agency, or to the federal Energy Information Administration.

Summary of Section 95203(g), Emissions Factors for Asset Owning/Controlling Suppliers

This section proposes to calculate emission factors for specified sources that are asset-owning or asset-controlling suppliers, and to assign an emission factor for

unspecified sources of imported electricity. Emission factors for asset-owning and asset-controlling suppliers are calculated as total emissions from generation of electricity that makes up the supplier's portfolio of electricity supply, divided by the total quantity of electricity in MWh. This section assigns the default emission factor of 0.499 MTCO₂ per MWh to electricity imported from unspecified sources.

Rationale for Section 95203(g).

This section is necessary to calculate the emission factors that are used to calculate Electricity Fee Rates for imported electricity from asset-owning and asset-controlling suppliers, and to assign a default emission factor for imported electricity from unspecified sources. The suppliers emission factors can be calculated by using data that they report either to ARB, under the Mandatory Reporting Regulation, to the U.S. EPA, or to the federal EIA. However, unspecified sources, which cannot be matched to a particular generating facility or group of facilities, also contribute a portion of California's electricity whose generation results in greenhouse gas emissions. These sources can only be captured by assigning an emission factor. The assigned emission factor is that recommended by the CPUC and the CEC for use in the reporting and verification of greenhouse gas emissions.

Summary of Section 95203(h), Fee for Fuels.

This section proposes to calculate the Fee for fuels supplied, consumed or produced based on the quantity of fuel supplied, consumed or produced. The Fee charged will be the fuel rate, (calculated in section 95203(c)) multiplied by the quantity of fuel supplied, consumed or produced based on the reporting requirements of section 95204.

Rationale for Section 95203(h).

This section is necessary to calculate an individual entity's Fee for the fuels supplied, consumed or produced. To this point, ARB has calculated the cost of each MTCO₂, then the cost per MTCO₂ for each fuel source of greenhouse gas emissions. This final calculation for fuels will be the basis of ARB's recovery of funds allowed by HSC 38597.

Summary of Section 95203(i), Fee for Imported Electricity.

This section proposes to calculate the Fee for retail providers and marketers that import electricity based on the amount of electricity imported from each specified or unspecified source. The Fee charged will be the Electricity Fee Rate (calculated in section 95203(e)) multiplied the quantity of electricity imported, for electricity that a retail provider or marketer imports from each specified or unspecified source.

Rationale for Section 95203(i).

This section is necessary to calculate the Fee for each retail provider and marketer that imports electricity. To this point, ARB has calculated the cost of each MTCO₂, and the Electricity Fee Rate per MWh of imported electricity. This final calculation will be the basis of ARB's recovery of funds.

Summary of Section 95203(j). Fee for Entities.

This section proposes to calculate the Fee for stationary sources based on the total number of MTCO₂ emitted and reported on an annual basis. Specifically, the CCC is multiplied by the total amount of process emissions associated with the stationary source.

Rationale for Section 95203(j).

This section is necessary to calculate the Fee for the stationary sources that emit process emissions that are greenhouse gases. The process emissions of each source are already reported pursuant to the Mandatory Reporting Requirements. The process emissions of each source are already reported pursuant to the Mandatory Reporting regulation or other requirements. It cannot be calculated in the same manner as the fuel calculation because process emissions are an additional source of greenhouse gases but are emitted in a different manner. Additionally, process emissions may be sold elsewhere as a fuel, which would result in overcharging an entity.

Section 95204. Reporting and Recordkeeping Requirements.

Summary of Section 95204(a) and (b). Reporting Format.

This section requires all reports to be submitted to ARB by using ARB's Greenhouse Gas Reporting Tool. It also specifies the information each entity is required to report.

Rationale for Section 95204(a) and (b).

The information must be submitted to ARB so that ARB may calculate the appropriate fees, as required by Health and Safety Code section 38597 and other provisions of these regulations.

Summary of Section 95204(c). Timeline for Reporting.

This section stipulates the date entities must annually report to ARB.

Rationale for Section 95204(c)

This information must be submitted to ARB by the reporting date so that ARB is able to calculate the appropriate fees by January 30th of the following calendar

year and so it is consistent the with the reporting date in the Mandatory Reporting Regulation.

Summary of Section 95204(d) through (i)

These subsections require the various entities included in these regulations to report information to ARB. Specifically, the regulated natural gas entities report the quantity of therms of natural gas transported, purchased or consumed, as applicable. These reporting requirements are consistent with requirements in Article 2, title 17 of the California Code of Regulations. Producers and importers of motor vehicle fuels must report the total amount of each variety of fuel sold for use in California, entities subject to the Mandatory Reporting Requirements which combust coal must report the total number of tons and the grade of coal combusted, marketers and retail providers that import electricity must report MWh of imported electricity, refineries must report the quantities of process emissions produced, oil field operators that produce associated gas must report quantities of emissions from onsite combustion of the associated gas, and cement manufacturers must report the total process emissions resulting from their operations. Wherever possible, entities that already report information to another agency or pursuant to the Mandatory Reporting Requirements only need to submit the same information to ARB.

Rationale for Sections 95204(d) through (i).

This information is necessary for ARB to accurately calculate the Common Carbon Cost and subsequently collect the Fee required by Health and Safety Code section 38597.

Summary of Section 95204(j). Records Retention.

This section requires entities to maintain copies of the information provided pursuant to this article, and to make this information available to representatives of ARB within 5 business days upon request.

Rationale for Section 95204(j)

This requirement is necessary in case any discrepancies or questions arise following report submittal.

Section 95205. Payment and Collection.

This section proposes the payment schedule of fees assessed by these regulations. Fees will be assessed annually, based on the calendar year. Within 30 days of the end of the calendar year, ARB's Executive Officer will calculate the fee owed by each affected entity and provide the fee calculation in writing to the affected entity. This Fee will be based on reports submitted pursuant to section 95204. Each entity will have 60 days from the receipt of the Fee Determination Notice to remit the fees to ARB. If an entity fails to send the payment to ARB within the required 60 days, late fees will be assessed. Fees

recovered shall only be used for recovering costs of implementing the provisions of AB 32 and repaying the debt incurred for previous fiscal years.

Rationale for Section 95205.

This section is necessary to describe how payments will be made. Specifically, it has been ARB's experience that ARB needs 30 days from the end of the calendar year to calculate the fee to be assessed. Additionally, absent the 60 day remittance time, ARB would possibly run out of money to implement AB 32 programs.

Section 95206. Enforcement.

This section proposes the penalties and consequences of not complying with these regulations. These provisions include penalties pursuant to Health and Safety Code section 98580. The failure to submit a required report or pay the fee assessed constitutes a single and separate violation for each day the report is not submitted or the fee is not filed. This section also gives ARB authority to contract with other state agencies or third parties to obtain data or audit information submitted by regulated entities. This section allows ARB to designate other parties to enforce the regulation.

Rationale for Section 95206.

Section 95206 (a) and (b) merely restate existing law. This is necessary to inform the public what the penalties will be for noncompliance with the regulation and to direct the public to the appropriate statutes to determine the penalties. Subsections (c) and (d) are authorized pursuant to Health and Safety Code section 38580(b)(3) and necessary in this instance to ensure compliance with the regulation, as well as to deter misrepresentation of data submitted. Additionally, subsections (c) and (d) encourage the correction of mistakes as soon as possible. Subsections (e) and (f) are necessary because ARB needs to be allowed to contract with third parties in certain circumstances due to ARB's limited resources for auditing and enforcement purposes.

Section 95207. Severability.

This section ensures that if one provision of the regulations is declared invalid by a court or other authority, the remaining provisions will remain in full force and effect.

Rationale for Section 95207.

This section is necessary to ensure that if ARB has enacted a provision in the proposed regulatory article that is illegal or unconstitutional the remaining regulatory provisions remain intact.

B. Proposed Amendment to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

Section 95104(e). Greenhouse Gas Emissions Data Report.

This section requires that all operators and verifiers, subject to the Mandatory Reporting Regulation, use ARB's Greenhouse Gas Reporting Tool to report the data specified in sections 95103 through 95133 to ARB.

Rationale for Section 94104(e).

This section is needed to ensure that all operators and verifiers use the Greenhouse Gas Reporting Tool to report emissions data to ARB which will help lessen the possibility of reporting errors.

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Appendix A

Proposed Regulation for the AB 32 Cost of Implementation Fee and Proposed Amendments to the Mandatory Reporting of Greenhouse Gas Emissions Regulations

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AB 32 COST OF IMPLEMENTATION FEE

Adopt new article 3, sections 95200 to 95207, title 17, California Code of Regulations, to read as follows:

(Note: All of the following is new language to be added to the California Code of Regulations.)

Article 3: Fees for Sources of Greenhouse Gas Emissions

95200. Purpose.

The purpose of this article is to collect fees to be used to carry out the California Global Warming Solutions Act of 2006 (Stats. 2006; Ch. 488; Health and Safety Code sections 38500 *et seq.*), as provided in Health and Safety Code section 38597.

NOTE: Authority cited: Sections 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: Sections 38530 and 39600, Health and Safety Code.

95201. Applicability.

- (a) This article applies to the following entities. The terms used below are defined in section 95202.
 - (1) *Natural Gas Utilities, Users, and Pipeline Owners and Operators that distribute or use natural gas in California.*
 - (A) All public utility gas corporations operating in California. Fees shall be paid for each therm of natural gas delivered to any end user in California.
 - (B) All owners or operators of interstate and intrastate pipelines, not included in subsection (a)(1)(A), that distribute natural gas directly to end users in California. Fees shall be paid for each therm of natural gas directly distributed by interstate or intrastate pipelines.
 - (C) All California owners or operators that consume natural gas produced on-site and that are subject to Mandatory Reporting Regulation. Fees shall be paid for each therm of natural gas consumed of the natural gas produced on-site.
 - (D) All California owners or operators that consume associated gas that is produced on-site and that are subject to the

Mandatory Reporting Regulation. Fees shall be paid on the amount of emissions resulting from the combustion of these fuels.

(2) *Producers and Importers of Gasoline and Diesel Fuels.*

(A) All producers and importers of California gasoline or California diesel for use in California. Fees shall be paid for each gallon of gasoline or diesel fuel distributed.

(B) All producers or importers of CARBOB. Fees shall be paid for each gallon of CARBOB plus the designated amount of oxygenate.

(3) *Refineries.*

Fees shall be paid on the amount of emissions by the owner or operator of any refinery that emits process emissions resulting from the steam methane reforming process, or the production or consumption of:

- (A) Catalyst coke;
- (B) Petroleum coke; or
- (C) Refinery gas.

(4) *Cement Manufacturers.*

All entities or operators of cement manufacturing facilities that emit greenhouse gases through the clinker manufacturing process. Fees shall be paid on reported quantities of emissions.

(5) *Retail Providers and Marketers of Imported Electricity.*

Any retail provider or marketer that is the purchasing/selling entity at the first point of delivery in California of imported electricity. Fees shall be paid for each megawatt-hour of imported electricity.

(6) *Facilities that Combust Coal.*

Any owner or operator of a facility that combusts coal in California and is subject to the Mandatory Reporting Regulation. Fees shall be paid on the reported emissions.

- (b) This article does not apply to any of the following fuels, or to emissions resulting from combustion of any of the following fuels:
- (1) aviation gasoline;
 - (2) jet fuel;
 - (3) kerosene;
 - (4) liquefied petroleum gas;
 - (5) biodiesel;
 - (6) renewable diesel;
 - (7) residual fuel oil;
 - (8) propane; or
 - (9) any fuel exported for use outside of California.

NOTE: Authority: Sections 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: Sections 38501, 38505 and 39300, Health and Safety Code.

95202. Definitions.

- (a) For the purposes of this article, the following definitions shall apply:
- (1) "AB 32" means the California Global Warming Solutions Act of 2006, Assembly Bill 32, Chapter 488, Statutes of 2006, as codified at Health and Safety Code section 38500 *et seq.*
 - (2) "Annual" means with a frequency of once a year; unless otherwise noted, annual events such as the fee payment and liability will be based on the calendar year.
 - (3) "ARB" or "Board" means the California Air Resources Board.
 - (4) "Asset-controlling supplier" means any entity that operates electricity generating facilities or serves as an exclusive marketer for certain generating facilities even though it does not own them, and assigned a supplier-specific identification number for its fleet of generating facilities under the provisions of article 2, title 17 of the California Code of Regulations.
 - (5) "Asset-owning supplier" means any entity that owns electricity generating facilities that deliver electricity to a transmission or

distribution line, and is assigned a supplier-specific identification number for its fleet of generating facilities under the provisions of article 2, title 17 of the California Code of Regulations.

- (6) "Associated gas" means hydrocarbon-based gaseous fuel produced in association with crude oil from any oil well and subsequently burned in the field as a fuel.
- (7) "Biodiesel" means a diesel fuel substitute produced from nonpetroleum renewable resources that meet the registration requirements for fuels and fuel additives established by the Environmental Protection Agency under section 211 of the Clean Air Act. It includes biodiesel meeting all of the following:
 - (A) Registered as a motor vehicle fuel or fuel additive under title 40, Code of Federal Regulations, part 70;
 - (B) A mono-alkyl ester;
 - (C) Meets American Society for Testing and Material designation ASTM D 6751-08 (*Standard Specification for Biodiesel Fuel Blendstock (B100) for Middle Distillate Fuels*);
 - (D) Intended for use in engines that are designated to run on conventional diesel fuel; and
 - (E) Derived from nonpetroleum renewable resources.
- (8) "Calendar year" means the time period from January 1 through December 31.
- (9) "California gasoline" has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

For California gasoline,

- (A) "Produce" for California gasoline has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).
- (B) "Producer" for California gasoline has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).
- (C) "Supply" for California gasoline has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

- (D) "Importer" for California gasoline means the majority owner of the California gasoline when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.
 - (E) "Import" for California gasoline means movement of California gasoline into the state of California. For rail cars, cargo tanks, and pipelines it is when the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.
- (10) "California reformulated gasoline blendstock for oxygenate blending, or "CARBOB," has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

For CARBOB,

- (A) "Produce" for CARBOB has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).
- (B) "Producer" for CARBOB has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).
- (C) "Supply" for CARBOB has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).
- (D) "Importer" for CARBOB means the majority owner of the CARBOB when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.
- (E) "Import" for CARBOB means movement of CARBOB into the state of California. For rail cars, cargo tanks, and pipelines it is when the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

- (11) "California diesel fuel" has the same meaning as "Vehicular Diesel Fuel" as defined in title 13 California Code of Regulations, section 2282(b).

For California diesel fuel,

- (A) "Produce" for California diesel fuel has the same meaning as "Vehicular Diesel Fuel" as defined in title 13 of the California Code of Regulations, section 2282(b).
 - (B) "Producer" for California diesel fuel has the same meaning as "Vehicular Diesel Fuel" as defined in title 13 of the California Code of Regulations, section 2282(b).
 - (C) "Supply" for California diesel fuel has the same meaning as defined in title 13 of the California Code of Regulations, section 2282(b).
 - (D) "Importer" for California diesel fuel means the majority owner of the California diesel fuel when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.
 - (E) "Import" for California diesel fuel means movement of product into the state of California. For rail cars, cargo tanks, and pipelines it is when the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.
- (12) "Carbon dioxide" or "CO₂" means the most common of the six primary greenhouse gases, consisting on a molecular level of a single carbon atom and two oxygen atoms.
- (13) "Carbon dioxide equivalent" or "CO₂E" or "CO₂ equivalent" means a measure for comparing carbon dioxide with other greenhouse gases, based on the quantity of those gases multiplied by the appropriate global warming potential factor and commonly expressed as metric tons of carbon dioxide equivalents (MTCO₂E).
- (14) "Catalyst" means a substance added to a chemical reaction, which facilitates or causes the reaction, and is not consumed by the reaction.
- (15) "Catalyst coke" means carbon that is deposited on a catalyst, thus deactivating the catalyst.

- (16) "Cement" means a building material that is produced by heating mixtures of limestone and other minerals or additives at high temperatures in a rotary kiln to form clinker, followed by cooling and grinding with blended additives. Finished cement is a powder used with water, sand and gravel to make concrete and mortar.
- (17) "Cement manufacturer" means an owner or operator of a cement plant.
- (18) "Cement plant" means an industrial structure, installation, plant or building primarily engaged in manufacturing Portland, natural, masonry, pozzolanic, and other hydraulic cements, and typically identified by North American Industry Classification System Code 327310.
- (19) "Clinker" means the mass of fused material produced in a cement kiln from which finished cement is manufactured by milling and grinding.
- (20) "Coal" means all solid fuels classified as anthracite, bituminous, sub-bituminous, or lignite by the American Society for Testing and Material Designation ASTM D388-05 "Standard Classification of Coals by Rank."
- (21) "Combust" means the process of burning or setting fire to a fuel.
- (22) "Combustion emissions" means greenhouse gas emissions occurring during the exothermic reaction of a fuel with oxygen.
- (23) "Cracking" means the process of breaking down larger molecules into smaller molecules, utilizing catalysts and/or elevated temperatures and pressures.
- (24) "Debt" means those loans obtained by the Board and required by the Legislature to be repaid to carry out AB 32 for fiscal years 2007/08, 2008/09, and any loans necessary for the 2009/10 fiscal year.
- (25) "Electricity Fee Rate" means the rate charged per MWh of imported electricity generated at a specified source or an unspecified source based on source-specific emissions factors, or a default emissions factor for unspecified sources.
- (26) "Emissions" means the release of greenhouse gases into the atmosphere from sources and processes in a facility.

- (27) "Emissions data report" or "greenhouse gas emissions data report" or "report" means the report prepared by an operator each year and submitted by electronic means to ARB to comply with this article.
- (28) "Emissions factor" means a unique value for determining an amount of a greenhouse gas emitted for a given quantity of activity (e.g., metric tons of carbon dioxide emitted per gallon of gasoline burned).
- (29) "End user" means either:
 - (A) the point to which natural gas is delivered for consumption, or
 - (B) a publicly-owned natural gas utility that further distributes natural gas for consumption.
- (30) "Entity" means a person, firm, association, organization, partnership, business trust, corporation, limited liability company, company, government agency, or public district.
- (31) "Exclusive marketer" means a marketer that has exclusive rights to market electricity for a generating facility or group of generating facilities.
- (32) "Executive Officer" means the Executive Officer of ARB or his or her delegate.
- (33) "Facility" means any property, plant, building, structure, stationary source, stationary equipment or grouping of stationary equipment or stationary sources located on one or more contiguous or adjacent properties, in actual physical contact or separated solely by a public roadway or other public right-of-way, and under common operational control, that emits or may emit any greenhouse gas. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.
- (34) "Fee determination notice" means the notice provided by ARB to entities regulated by this article stating the dollar amount due for the current calendar year.
- (35) "Feedstock" means the raw material supplied to a process.
- (36) "Fiscal year" means the time period from July 1 to June 30.

- (37) "Fuel" means solid, liquid or gaseous combustible material.
- (38) "Fuel fee rate" means the rate charged per MTCO₂ produced by greenhouse gas sources specific to the fuel combusted and calculated by ARB.
- (39) "Gallon" means the United States gallon of 231 cubic inches or the volumetric gallon adjusted to 60 degrees Fahrenheit when the invoice and settlement is made on the temperature corrected gallonage.
- (40) "Generating facility" means an existing or planned location or site at which electricity is or will be produced.
- (41) "Generating unit" means any combination of physically connected generator(s), reactor(s), boiler(s), combustion turbine(s), or other prime mover(s) operated together to produce electric power.
- (42) "Global warming potential" or "GWP factor" means the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time.
- (43) "Government agency" means any agency as defined in Government Code section 11000.
- (44) "Greenhouse gas source" means any physical unit, process, or other use or activity that releases a greenhouse gas into the atmosphere.
- (45) "Imported electricity" means electricity that is generated outside of California and delivered into California. Imported electricity does not include power wheeled through California, which is power that is imported into California that terminates in a location outside of California.
- (46) "Importer" means the majority owner of the California gasoline, CARBOB, or California diesel fuel when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

- (47) "Interstate Pipeline" means any entity engaged in natural gas transportation subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC) under the Natural Gas Act.
- (48) "Kerosene" means a light distillate fuel that includes No. 1-K and No. 2-K as well as other grades of range or stove oil that have properties similar to those of No. 1 fuel oil.
- (49) "Mandatory Reporting Regulation" means ARB's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, as set forth in title 17, California Code of Regulations, Chapter 1, Subchapter 10, article 2 (commencing with section 95100).
- (50) "Marketer" means a purchasing/selling entity that is not a retail provider, and that is the purchaser/seller at the first point of delivery in California for electric power imported into California, or the last point of receipt in California for power exported from California.
- (51) "Megawatt-hour" or "MWh" means the electrical energy unit of measure equal to one million watts of power supplied to, or taken from, an electric circuit steadily for one hour.
- (52) "Meter" means a device designed to measure, record or regulate the amount or volume of the flow of a gas.
- (53) "Metric ton" or "MT" or "tonne" means a common international measurement for the quantity of greenhouse gas emissions, equivalent to about 2204.6 pounds, or 1.1 short tons.
- (54) "Motor vehicle" has the same meaning as defined in section 415 of the Vehicle Code.
- (55) "Natural gas" means a naturally occurring mixture of hydrocarbons (e.g., methane, ethane, or propane) produced in geological formations beneath the Earth's surface that maintains a gaseous state at standard atmospheric temperature and pressure under ordinary conditions.
- (56) "Natural gas importer" means any entity that receives natural gas from a party that is not a public gas corporation, as defined in this article that consumes and/or distributes natural gas to consumers of natural gas.
- (57) "Operational control" for a facility subject to this article means the entity that has authority to introduce and implement operating, environmental, health and safety policies.

- (58) "Operator" means the entity having operational control of a facility.
- (59) "Owner" means the entity having title of the property or assets which are subject to the fee.
- (60) "Payment period" means 60 days from the receipt of the billing, as stated in section 95205 each calendar year.
- (61) "Petroleum coke" means a solid residue high in carbon content and low in hydrogen that is the final product of thermal decomposition in the condensation process in cracking.
- (62) "Petroleum refinery" or "refinery" means any facility engaged in producing gasoline, aromatics, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt, or other products through distillation of petroleum or through redistillation, cracking, rearrangement or reforming of unfinished petroleum derivatives.
- (63) "Power" means electricity, except where the context makes clear that another meaning is intended.
- (64) "Process" means the intentional or unintentional reactions between substances or their transformation, including, but not limited to, the chemical or electrolytic reduction of metal ores, the thermal decomposition of substances, and the formation of substances for use as product or feedstock.
- (65) "Process emissions" means:
 - (A) For cement manufacturing: The greenhouse gas process emissions produced through the chemical reactions of feedstock during pyroprocessing to produce cement clinker (which does not include greenhouse gas emissions which are the result of fuel combustion emissions).
 - (B) For refineries:
 - 1. the greenhouse gas emissions resulting from the on-site consumption of catalyst coke, and
 - 2. all greenhouse gas emissions both on- and off-site, resulting from the combustion of petroleum coke and refinery gas in California, and
 - 3. the greenhouse gas emissions resulting from the steam methane reforming process excluding those that occur as a result of the use of natural gas as a feedstock.

- (66) "Producer" means any person who owns, leases, operates, controls or supervises a California production facility.
- (67) "Production facility" means a facility in California at which gasoline or CARBOB is produced. Upon request of a producer, the Executive Officer may designate, as part of the producer's production facility, a physically separate bulk storage facility which (A) is owned or leased by the producer, and (B) is operated by or at the direction of the producer, and (C) is not used to store or distribute gasoline or CARBOB that is not supplied from the production facility.
- (68) "Propane" means a normally straight chain hydrocarbon that boils at -3.67 degrees Fahrenheit and is represented by the chemical formula C_3H_8 .
- (69) "Publicly-owned utility" means a municipality or municipal corporation, a municipal utility district, a public utility district, or a joint powers authority that includes one or more of these agencies that furnishes natural gas services to end users.
- (70) "Public utility gas corporation" is a gas corporation defined in California Public Utilities Code section 222 that is also a public utility as defined in California Public Utilities Code section 216.
- (71) "Purchasing/selling entity" means an entity that is eligible to purchase or sell energy or capacity and reserve transmission services.
- (72) "Renewable diesel" means a motor vehicle or fuel additive which is all of the following:
- (A) Registered as a motor vehicle fuel or fuel additive under 40 CFR part 79;
 - (B) Not a mono-alkyl ester;
 - (C) Intended for use in engines that are designated to run on conventional diesel fuel; and
 - (D) Derived from nonpetroleum renewable resources.
- (73) "Report Year" means the calendar year for which emissions are being reported in the emissions data report.

- (74) "Retail provider" means an entity that provides electricity to retail end users in California and is an electric corporation as defined in Public Utilities Code section 218, electric service provider as defined in Public Utilities Code section 218.3, local publicly owned electric utility as defined in Public Utilities Code section 9604, community choice aggregator as defined in Public Utilities Code section 331.1, or the Western Area Power Administration.
- (75) "Source" means greenhouse gas source.
- (76) "Specified source" or "specified source of power" means a particular generating unit or facility for which electrical generation can be confidently tracked due to full or partial ownership or due to its identification in a power contract including any California eligible renewable resource, or an asset-owning or asset-controlling supplier.
- (77) "Stationary" means neither portable nor self propelled, and operated at a single facility.
- (78) "Steam methane reforming process" means a method in which high temperature steam is used to produce hydrogen from a methane source.
- (79) "Therm" means a unit of heat equal to 100,000 British thermal units (1.054×10^8 joules).
- (80) "Ton" means a short ton equal to 2000 pounds.
- (81) "Unspecified source of power" or "unspecified source" means electricity generation that cannot be matched to a particular generating facility.

NOTE: Authority cited: Section 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: Sections 38530, 39600 and 39601, Health and Safety Code.

95203. Calculation of Fees.

(a) Total Required Revenue (TRR).

- (1) The Required Revenue (RR) shall be the total amount of funds necessary to recover the costs of implementation of AB 32 program expenditures for each Fiscal Year, based on the number of personnel positions, including salaries and benefits and all other costs, as approved in the California Budget Act for that fiscal year.

- (2) For Fiscal Years 2009/2010, 2010/2011, 2011/2012, 2012/2013, and 2013/2014, the RR shall also include the payments required to be made by ARB on the Debt.
- (3) The RR shall also include any amounts required to be expended by ARB in defense of this article in court.
- (4) If there is any excess or shortfall in the actual revenue collected for any fiscal year, or if any collections are less than the Revenue Requirement, such shortfall or excess shall be carried over to the next year's calculation of the Total Revenue Requirement. The annual Total Revenue Requirement is equal to the annual RR adjusted for the previous fiscal year's excess or shortfall amount.

(b) *Common Carbon Cost (CCC).*

The Executive Officer shall calculate a Common Carbon Cost (CCC), which represents the cost per MTCO₂ emitted. The CCC shall be calculated in accordance with the following formula:

$$CCC = \frac{TRR}{(Q_c \times EF_c) + (Q_{ng} \times EF_{ng}) + (Q_g \times EF_g) + (Q_d \times EF_d) + (Q_{lb} \times EF_{lb}) + TE_1}$$

Where

TRR = Total Required Revenue, as specified in subsection 95203(a).

$(Q_c \times EF_c)$ = Statewide total quantity of emissions from coal calculated as the sum of:

$(Q_b \times EF_b)$ = Quantity of bituminous coal (Q_b) x emission factor for bituminous coal (EF_b);

$(Q_l \times EF_l)$ = Quantity of lignite coal (Q_l) x the emission factor (EF_l) for lignite coal;

$(Q_a \times EF_a)$ = Quantity of anthracite coal (Q_a) x the emission factor (EF_a) for anthracite coal;

$(Q_{sb} \times EF_{sb})$ = Quantity of subbituminous coal (Q_{sb}) x the emission factor (EF_{sb}) for subbituminous coal;

Q_{ng} = Statewide quantity in therms of natural gas supplied during the reporting period

EF_{ng} = Emission Factor of $MTCO_2$ for each supplied therm of natural gas

Q_g = Statewide quantity of gasoline supplied during the reporting period. This is the volumetric sum of California gasoline produced or imported into California and the amount of finished CARBOB product produced or imported into California. The finished CARBOB product is calculated as the volume sum of the CARBOB plus the maximum amount of oxygenate designated for each volume of CARBOB.

EF_g = Emission Factor of $MTCO_2$ for each supplied gallon of California gasoline.

Q_d = Quantity of California diesel fuel supplied during the reporting period

EF_d = Emission Factor of $MTCO_2$ for each supplied gallon of diesel fuel

$(Q_{ie} \times EF_{ie})$ = Total CO_2 emissions from total imported electricity as the sum of:

$(Q_{sp} \times EF_{sp})$ = Quantity of MWh of electricity imported from each specified source x emission factor for that specified source

$(Q_{usp} \times EF_{usp})$ = Statewide quantity of MWh of electricity imported from unspecified sources x emission factor for unspecified source.

TE_i = Total state process emissions inventory for cement manufacturers and refineries, and emissions from the combustion of associated gas.

(c) *Fuel Fee Rate.*

For entities reporting pursuant to section 95204(d)(1-3), (e) and (f) the Executive Officer shall calculate a Fuel Fee Rate for each fuel included in subsection 95203(b) using the following formula:

$$FR_i = CCC \times EF_i$$

Where:

FR_i = The Fuel Fee Rate for the fuel

CCC = Common Carbon Cost

EF_i = Emission Factor of $MTCO_2$ for each unit of fuel supplied.

(d) *Fuel Emission Factors.*

For entities reporting pursuant to section 95204(d)(1-3), (e) and (f) the Executive Officer shall calculate the Common Carbon Cost and the Fuel Fee Rates using the following emissions factors:

| Fuel Type | CO ₂ Emission Factor | Emission Factor Units |
|----------------|---------------------------------|--------------------------------|
| Coal | | |
| Anthracite | 2,597.94 | kg CO ₂ / short ton |
| Bituminous | 2,328.35 | kg CO ₂ / short ton |
| Sub-bituminous | 1,673.64 | kg CO ₂ / short ton |
| Lignite | 1,369.32 | kg CO ₂ / short ton |
| Natural Gas | 5.302 | kg CO ₂ / therm |
| Diesel | 9.96 | kg CO ₂ / gallon |
| Gasoline | 8.65 | kg CO ₂ / gallon |

(e) *Imported Electricity Fee Rate.*

The Executive Officer shall calculate an Imported Electricity Fee Rate for each affected entity pursuant to section 95204(f) using the following formulas:

$$EFR_{sp} = CCC \times EF_{sp}$$

$$EFR_{asp} = CCC \times EF_{asp}$$

$$EFR_{usp} = CCC \times EF_{usp}$$

Where:

"sp" denotes a specified source that is a generating facility or unit

"asp" denotes an asset-owning or asset-controlling supplier

"usp" denotes an unspecified source

CCC = Common Carbon Cost

EFR_{sp} = The Electricity Fee Rate for the specified source

EF_{asp} = The Electricity Fee Rate for the asset-owning and asset-controlling suppliers

EF_{usp} = The Electricity Fee Rate for unspecified sources

EF_{sp} = Emission Factor for specified source in $MTCO_2$ per MWh

EF_{asp} = Emission Factor for asset-owning and asset-controlling suppliers in $MTCO_2$ per MWh

EF_{usp} = 0.499 $MTCO_2$ per MWh, the default Emission Factor for unspecified sources.

(f) *Emissions Factors for Generating Units or Facilities of Imported Electricity.*

The Executive Officer shall calculate emissions factors for specified sources of imported electricity that are generating units or facilities using the following methodology:

$$EF_{sp} = \frac{E_{sp}}{EG}$$

Where:

EF_{sp} = Emission Factor for specified source "sp", in $MTCO_2$ per MWh

E_{sp} = CO_2 emissions from electricity generation for a specified electric generating facility/unit for the report year ($MTCO_2$)

EG = Net generation from a specified electric generating facility for the report year (MWh)

(1) For specified electric generating facilities/units whose operators are subject to reporting or who voluntarily report under the Mandatory Reporting Regulation, E_{sp} shall be equal to the sum of CO_2 emissions directly associated with electricity generation as reported to ARB. Similarly, EG shall be the net generation reported to ARB.

(2) For specified electric generating facilities/units whose operators are not subject to Mandatory Reporting Regulation but who are subject to the Acid Rain Program (40 CFR Part 75), E_{sp} shall be equal to the amount of CO_2 emissions reported to U.S. EPA pursuant to 40 CFR Part 75 for the facility in metric tons for the report year. EG shall be data reported to EIA and published in the

EIA 923 Excel file for the reporting year available at http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html (the EIA data).

(3) For specified electric generating facilities whose operators do not report to ARB under the Mandatory Reporting Regulation and do not report to U.S. EPA under the Acid Rain Program, EG shall be taken from the EIA data for the reporting year. E_{sp} shall be calculated using EIA data as shown below.

$$E_{sp} = 1000 \times \sum (Q_{fuel} \times EF_{fuel})$$

Where:

Q_{fuel} = Heat of combustion for each specified fuel type from the specified electric generating facility for the report year (MMBtu)

EF_{fuel} = CO₂ emission factor for the specified fuel type as taken from the title 17, California Code of Regulations, Chapter 1 Subchapter 9, Article 2, Appendix A (kgCO₂/MMBtu)

(g) *Emission Factors for Asset Owning/Controlling Suppliers.*

The Executive Officer shall calculate emissions factors for asset-owning or asset-controlling suppliers using the following methodology:

$$EF_{asp} = \frac{\sum E_{asp} + \sum (PE_{sp} \times EF_{sp}) + (PE_{usp} \times EF_{usp}) - \sum (SE_{sp} \times EF_{sp})}{\sum EG_{asp} + \sum PE_{sp} + PE_{usp} - \sum SE_{sp}}$$

EF_{asp} = Emission Factor for asset-owning and asset-controlling suppliers in MTCO₂ per MWh

$\sum E_{asp}$ = the sum of CO₂ emissions from electricity generation for each specified electric generating facility/unit in the asset-owning/controlling supplier's fleet, as reported to ARB under the Mandatory Reporting Regulation (MTCO₂)

$\sum EG_{asp}$ = the sum of net generation for each specified electric generating facility/unit in the asset-owning/controlling supplier's fleet for the report year as reported to ARB under the Mandatory Reporting Regulation (MWh)

$\sum PE_{sp}$ = Sum of electricity purchased from specified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

PE_{usp} = Amount of electricity purchased from unspecified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

$\sum SE_{sp}$ = Amount of wholesale electricity sold from a specified source by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

EF_{sp} = CO₂ emission factor as defined for generating units and facilities.

EF_{usp} = CO₂ default emission factor for unspecified sources.

(h) *Fee Liability for Fuels.*

The Executive Officer shall calculate the Fee Liability for each entity reporting pursuant to section 95204(d)(1-3), (e) and (f) based on the quantity of each fuel supplied, consumed or produced, as follows:

$$FS_i = (FR_i \times QF_i)$$

Where:

FS_i = The Fee Liability for each entity

QF_i = Quantity of fuel

(Note: The Fee Liability calculation formula for associated gas is addressed under section 95203(j))

(i) *Fee Liability for Imported Electricity.*

The Executive Officer shall calculate the fee liability for each entity reporting pursuant to section 95204(g) based on the quantity of electricity imported, as follows:

$$FS_i = (EFR_i \times QM_i)$$

Where:

FS_i = The Fee Liability for each entity

QM_i = Quantity of MWh of imported electricity from each specified source, asset-owning or asset-controlling supplier, or unspecified source, as appropriate

EFRI = Electricity fee rate for each specified source, asset-owning or asset-controlling supplier, or unspecified source, as appropriate

(j) *Fee Liability for Entities.*

For entities reporting pursuant to section 95204(d)(4), (h) and (i), each entity shall be charged a Fee based on the total number of MTCO₂ emitted and reported annually. The fee shall be calculated as follows:

$$FS_i = CCC \times QE_i$$

Where:

FS_i = The Fee for the Entity

CCC = Common Carbon Cost

QE_i = the total amount of process emissions associated with the entity.

NOTE: Authority cited: Sections 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: 38501, 38510, 38597, 39600 and 39601, Health and Safety Code.

95204. Reporting and Recordkeeping Requirements.

(a) *Reporting Format.*

All reports required by this article must be submitted to ARB by using the California Air Resources Board's Greenhouse Gas Reporting Tool, as specified in title 17, California Code of Regulations section 95104(e), and is available on ARB's internet website at www.arb.ca.gov.

(b) All entities subject to this article must report the following:

(1) Report Information:

- (A) Report Year
- (B) Facility Information
 - (i) Facility name
 - (ii) Physical address
 - (iii) Mailing address
 - (iv) Description of facility geographic location

(2) Operator Information:

- (A) Operator name
- (B) Email address

(C) Telephone number

- (3) Operator Statement of Truth, Accuracy and Completeness.
Operator signature and date stating: *This report has been prepared in accordance with subchapter 105, article 1, sections 95100 to 95133, title 17, California Code of Regulations. The statements and information contained in this emissions data report are true, accurate and complete.*

(c) *Timeline for Reporting.*

- (1) Reports for the 2008 calendar year must be submitted to ARB by January 2, 2010, or by the operative date of this article, whichever is later.
- (2) Reports for the 2009 and subsequent calendar years must be submitted to ARB by June 30 of each year. For those entities subject to ARB's Mandatory Reporting Regulation, changes made to reported data as a result of the verification process must be concluded by December 1 of each year.

(d) *Natural Gas Utilities, Users and Pipeline Owners and Operators.*

- (1) All public utility gas corporations operating in California must annually report the aggregate quantity of therms of natural gas delivered at the meter to end users.
- (2) All owners or operators of interstate and intrastate pipelines that distribute natural gas directly to end users must annually report the aggregate quantity of therms of natural gas directly distributed, at the metered to the end users.
- (3) All California owners or operators that consume natural gas produced on-site and are subject to the Mandatory Reporting Regulation must report the quantity of therms of natural gas consumed annually of natural gas produced on-site in addition to all information required under the Mandatory Reporting Regulation.
- (4) All California owners or operators that consume associated gas produced on-site and that are subject to the Mandatory Reporting Regulation must report all information required by the Mandatory Reporting Regulation, including the quantities of emissions resulting from the combustion of these fuels.

(e) *Producers and Importers of Gasoline and Diesel Fuels.*

All producers and importers of California gasoline, CARBOB or California diesel fuel must report the total amount of each variety of fuel sold or supplied for use in California. Producers and importers of CARBOB must report each volume of CARBOB and the associated designated volume/volumes of oxygenate.

(f) *Coal Combustion.*

All entities that are subject to the Mandatory Reporting Regulation and combust coal must report the number of tons and the grade of coal combusted for each calendar year.

(g) *Retail Providers and Marketers of Imported Electricity.*

(1) *Retail Providers of Electricity.* This information shall be the same information that is required to be submitted under the Mandatory Reporting Regulation, and include the total quantity of MWh of electricity imported from specified sources and unspecified sources with final point of delivery in California, and shall be reported on the schedule specified in the Mandatory Reporting Regulation.

(2) *Marketers.* All marketers of imported electricity must report all information required under the Mandatory Reporting Regulation, be consistent with section 95111 of the Mandatory Reporting Regulation, and include the total quantity of MWh of electricity imported from specified sources and unspecified sources with final point of delivery in California.

(h) *Refinery Process Emissions.*

Each refinery that produces process emissions must report all information required under the Mandatory Reporting Regulation, including individual quantities of those emissions. Each refinery must report the individual quantities of catalyst coke, petroleum coke, and refinery gas produced annually less the quantities exported out of the state. This information shall be derived from the information reported pursuant to the California Energy Commission's Petroleum Industry Information Reporting Act (PIIRA) codified in Public Resources Code sections 25350 *et seq.*, and the Mandatory Reporting Regulation.

(i) *Cement Manufacturers.*

All cement manufacturers must report all information required under the Mandatory Reporting Regulation, including the total amount of process emissions resulting from their operations, as defined in this article. This information shall be the same information as that required to be submitted under the Mandatory Reporting Regulation.

(j) *Records Retention.*

Entities subject to this article must maintain copies of the information reported pursuant to this article and provide them to an authorized representative of ARB within five business days upon request. Records must be kept at a location within the State of California for five years.

NOTE: Authority cited: Sections 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: 38501, 38510, 38597, 39600 and 39601, Health and Safety Code.

95205. Payment and Collection.

- (a) For 2010, the Executive Officer shall provide a written fee determination notice to each affected entity of the amount due by February 1, or 30 days after the operative date of this article, whichever is later.
- (b) Beginning in 2011, no later than 30 days after the end of each calendar year, the Executive Officer shall provide a written fee determination notice to each affected entity of the amount due for the current calendar year. The amount of the fee shall be based on the reports submitted pursuant to section 95204 and the fee calculation formulas set forth in section 95203.
- (c) *Payment Period.* Each entity that is notified by the Executive Officer that it must remit a specified dollar amount to ARB for the current fiscal year shall transmit that dollar amount to ARB for deposit into the Air Pollution Control Fund within 60 days of receipt of the fee determination notice.
- (d) *Late Fees.* The Executive Officer shall assess an additional fee on entities failing to pay the fee within 60 days of receipt of the fee determination notice. The Executive Officer shall set the late fee in an amount sufficient to pay ARB's additional expenses incurred by the entity's untimely payment. The late fee is in addition to any penalty that may be assessed as provided in section 95206.

- (e) *Expenditure of Fees.* The fees collected from the entities are to be expended by ARB only for the purposes of recovering the costs of carrying out the provisions of AB 32 and repaying the Debt.

NOTE: Authority: Sections 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: Sections 38501, 38505 and 39300, Health and Safety Code.

95206. Enforcement.

- (a) *Penalties.* Penalties may be assessed for any violation of this article pursuant to Health and Safety Code section 38580. Each day during any portion of which a violation occurs is a separate offense.
- (b) *Injunctions.* Any violation of this article may be enjoined pursuant to Health and Safety Code section 41513.
- (c) *Violations.* Each day or portion thereof that any report required by this article remains unsubmitted, is submitted late, or contains incomplete or inaccurate information, shall constitute a single, separate violation of this article. For the purposes of this section, "report" means any information required to be submitted by section 95204.
- (d) *Payment Violations.* The failure to pay the full amount of any fee required by this article shall constitute a single, separate violation of this article for each day or portion thereof that the fee has not been paid after the date the fee is due.
- (e) *Auditing.* The Executive Officer may contract with outside entities, including, but not limited to, the Board of Equalization, to obtain data or services needed to audit the returns provided by fee payers. The Executive Officer may use fee revenues collected under this article to fund auditing and collection procedures.
- (f) *Authorization to Enforce.* Enforcement of this article may be carried out by authorized representatives of ARB, including authorized representatives of air pollution control or air quality management districts.

NOTE: Authority: Sections 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: Sections 38501, 38505, 39300 and 41513, Health and Safety Code.

95207. Severability.

- (a) Each part of this article is deemed severable, and, in the event that any part of this article is held to be invalid, the remainder of this article shall continue in full force and effect.

NOTE: Authority: Sections 38510, 38597, 39600 and 39601, Health and Safety Code.
Reference: Sections 38501, 38505 and 39300, Health and Safety Code.

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Proposed Regulation Order

PROPOSED AMENDMENTS TO THE REGULATION FOR THE MANDATORY REPORTING OF GREENHOUSE GAS EMISSIONS

Amend section 95104, title 17, California Code of Regulations to read as follows:

(Note: The proposed amendments to the existing regulation are shown in underline to indicate proposed additions)

95104. Greenhouse Gas Emissions Data Report.

(No modifications are proposed to subsections (a) through (d) of section 95104.)

(e) The operator shall submit emissions data reports, and any revisions to the reports, through the California Air Resources Board's Greenhouse Gas Reporting Tool.

NOTE: Authority cited: Sections 38510, 38530, 39600, 39601, and 41511, Health and Safety Code. Reference: Sections 38530, 39600, and 41511, Health and Safety Code.

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Appendix B

Workshop Notices

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Workshop Notices



Linda S. Adams
Secretary for
Environmental Protection

Air Resources Board

Mary D. Nichols, Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov



Arnold Schwarzenegger
Governor

January 9, 2009

TO: All Interested Parties

SUBJECT: Public Workshop on AB 32 Administrative Fee Regulation

The Air Resources Board (ARB) invites you to participate in a public workshop concerning the AB 32 Administrative Fee Regulation.

Health and Safety Code Section 38597 (AB 32, Nunez, Chapter 488, Statutes of 2006), added by the Global Warming Solutions Act of 2006, authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions (GHG) to support the administrative costs of implementing AB 32. ARB recently adopted the Climate Change Scoping Plan which outlines California's framework for reducing GHGs. ARB is initiating a rulemaking for this fee, with the intent of bringing a proposed regulation to the Board for consideration in May 2009.

The public workshop will be held at the following location:

DATE: Tuesday, January 27, 2009
TIME: 1:00 p.m. to 4:00 pm
PLACE: Cal/EPA Headquarters Building
Coastal Hearing Room, 2nd Floor
1001 I Street
Sacramento, CA 95814

The workshop is intended to provide for stakeholders input into development of a fee structure that will support the administration of programs to implement in AB 32.

For those unable to attend in person, the workshop will be webcast. On the day of the workshop, the broadcast can be accessed at:
<http://www.calepa.ca.gov/broadcast/?BDO=1>

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>

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All Interested Parties
January 9, 2009
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You can also submit your questions and comments during the workshop to cworkshops@arb.ca.gov. ARB recommends that you do not run other programs while viewing the webcast, as it may interrupt or lower the quality of the signal. The agenda and staff presentation for the workshop will be posted at least five days prior to the workshop on ARB's website at: <http://www.arb.ca.gov/cc/adminfee/adminfee.htm>

If you require special accommodations or language needs, please contact Mary Farn at (916) 445-8280 or mfarn@arb.ca.gov, as soon as possible, but no later than 7-10 business days before the scheduled event/meeting. TTY/TDD/Speech to Speech users may dial 7-1-1 for the California Relay Service.

If you have questions regarding the workshop or the Administrative Fee Regulation Development, please contact Jeannie Blakeslee at (916) 445-8286 or jblakesl@arb.ca.gov.

Sincerely,

/s/

Jon Costantino, Manager
Climate Change Planning Section
Office of Climate Change

S:\SHARED\Admin Fee\2009 Regulation Development\Workshops\January 27\January 09 draft workshop notice_1.doc



Air Resources Board

Mary D. Nichols, Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov



AB 32 Administrative Fee Regulation Workshop Draft Regulatory Language

The Air Resources Board (ARB) invites you to participate in a public workshop to discuss the draft AB 32 Administrative Fee Regulation language.

Health and Safety Code Section 38597 (AB 32, Nunez, Chapter 488, Statutes of 2006), added by the Global Warming Solutions Act of 2006, authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions (GHG) to support the administrative costs of implementing AB 32. ARB is in the process of developing a rulemaking for this fee, with the intent of bringing a proposed regulation to the Board for consideration in May 2009.

This workshop is intended to provide an opportunity for stakeholders' input on the draft regulatory language. The workshop will contain time for questions and detailed discussion after staff presentation.

Where and When is the Meeting?

This meeting will be held at CalEPA Headquarters in Sacramento and will also be webcast.

DATE: Wednesday, February 25, 2009
TIME: 1:00 p.m. to 5:00 pm
PLACE: CalEPA Headquarters Building
Coastal Hearing Room, 2nd Floor
1001 I Street
Sacramento, CA 95814

Meeting Topic Details

The purpose of the workshop is to introduce the draft regulatory language for the Administrative Fee Regulation.

Meeting Materials

Meeting materials and an agenda will be posted on February 19, 2009 at <http://www.arb.ca.gov/cc/adminfee/adminfee.htm>. At this website you may also join our electronic mailing list to receive further notices of ARB activities and public meetings related to the implementation of AB 32.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>

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Can't Make it to the Meeting?

This meeting will be webcast, and viewers can email written comments or questions during the session to ccworkshops@arb.ca.gov. Webcast links are posted at <http://www.calreg.ca.gov/mpadcast/7BDO-1>. ARB recommends that you do not run other programs while viewing the webcast, as it may interrupt or lower the quality of the signal.

Directions to CalEPA

There are many ways to arrive at the CalEPA Headquarters Building but we encourage you to take public transportation or drive low emission/high efficiency vehicles whenever possible. Use the following link for directions and information on public transit: <http://www.calreg.ca.gov/EPA/ldg/location.htm>.

Special Accommodations or Language Assistance

If you require special accommodations or language needs, please contact Mary Farr at (916) 445-8290 or mfarr@arb.ca.gov as soon as possible, but no later than 7 business days before the scheduled event/meeting. TTY/TDD/Speech to Speech users may dial 7-1-1 for the California Relay Service.

We Value Your Input

We welcome and encourage your participation in this important effort. If you have questions regarding the workshop or the Administrative Fee Regulation development, please contact Jeannie Blakeslee at (916) 445-8286 or jblakesl@arb.ca.gov.

Sincerely,

Charles M. Shulock
Assistant Executive Officer



Air Resources Board

Mary D. Nichols, Chairman
1001 I Street - P.O. Box 2816
Sacramento, California 95812 - www.arb.ca.gov



Draft AB 32 Cost of Implementation Fee Regulation

The Air Resources Board (ARB) invites you to participate in the 3rd public workshop to discuss the revised draft of the AB 32 Cost of Implementation Fee Regulation. In addition, ARB staff will discuss the newly proposed amendments to the mandatory reporting regulation in Title 17, California Code of Regulation, Section 95104.

Health and Safety Code Section 38597 (AB 32) authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions (GHG) to support the administration costs of implementing AB 32.

Where and When is the Meeting?

The workshop will be held at the following location:

DATE: Monday, April 20, 2009
TIME: 1:00 p.m. to 5:00 pm
PLACE: CalEPA Headquarters Building
Sierra Hearing Room, 2nd Floor
1001 I Street
Sacramento, CA 95814

Meeting Topic Details

The purpose of this workshop is to discuss with stakeholders the current status of the development of the fee regulation; the required revenue for AB 32 implementation; and the newly proposed amendments to the mandatory reporting regulation.

Meeting Materials

The materials for this workshop will be posted prior to the workshop at ARB's website <http://www.arb.ca.gov/ccadmin/fee/meetings/meetings.htm>. The materials will include an updated draft of the proposed regulation, information about the required revenue, and amendments to the mandatory reporting regulation.

At this website you may also join our electronic mailing list to receive further notices of ARB activities and public meetings related to the implementation of AB 32.

Can't Make It to the Meeting?

This meeting will be webcast, and viewers can email written comments or questions during the session to ccworkshops@arb.ca.gov. Webcast links are posted at <http://www.calepa.ca.gov/broadcast?BDC=1>. ARB recommends that you do not run other programs while viewing the webcast, as it may interrupt or lower the quality of the signal.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.energy.ca.gov>.

California Environmental Protection Agency

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Directions to CalEPA

There are many ways to arrive at the CalEPA Headquarters Building but we encourage you to take public transportation or drive low emission/high efficiency vehicles whenever possible. Use the following link for directions and information on public transit: <http://www.calepa.ca.gov/EPAInfo/location.htm>.

Special Accommodations or Language Assistance

If you require special accommodations or language needs, please contact Mary Farr at (916) 445-8290 or mfarr@arb.ca.gov as soon as possible, but no later than 7 business days before the scheduled event/meeting. TTY/TDD/Speech to Speech users may dial 7-1-1 for the California Relay Service.

We Value Your Input

We welcome and encourage your participation in this important effort. If you have questions regarding the workshop or the Administrative Fee Regulation development, please contact Jeanne Blakeslee at (916) 445-8286 or jblakesl@arb.ca.gov.

Sincerely,

Jon Costantino, Manager
Office of Climate Change

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Appendix C

Program Costs

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Program Costs

The purpose of this proposed regulation is to repay loans that were used to fund ARB and the California Environmental Protection Agency's (Cal/EPA) implementation of AB 32 in fiscal years 2007/2008 and 2008/2009 and to create a stable and steady funding source for state agencies to carry out AB 32 in future years. This section describes the loans, as well as how ARB proposes to determine the Required Revenue to carry out AB 32 in fiscal year 2009/2010 and future budget years.

This fee would cover expenditures for implementing AB 32, including:

1. 2007/2008 fiscal year loans for ARB and Cal/EPA
2. 2008/2009 fiscal year loan for ARB and Cal/EPA
3. 2009/2010 fiscal year and future year costs for ARB, Cal/EPA and other California state agencies.

The amount of revenue collected through the fees is the Required Revenue, which is the total amount of funds necessary to recover the costs of implementing the AB 32 program, plus loan repayment. The Required Revenue is based on the number of personnel positions, including salaries and benefits, and other expenses (contracts, equipment, etc.), approved in the California Budget Act for that fiscal year. The Total Required Revenue is the Required Revenue adjusted for excess or under collection from the previous fiscal year.

Loan Repayment for ARB and CalEPA

For the 2007/2008 fiscal year, expenditures for ARB and Cal/EPA to carry out AB 32 were supported by loans. ARB received a loan of approximately \$15.2 million from the Motor Vehicle Account (MVA) through legislation. The 2007/2008 Budget provided Cal/EPA a loan of approximately \$300,000 from MVA (SB 77, Chapter 171, Statutes of 2007, and SB 78, Chapter 172, Statutes of 2007). ARB also was budgeted approximately \$8.5 million from the Air Pollution Control Fund (APCF).

For the 2008/2009 fiscal year, the expenditures for ARB and Cal/EPA were covered through a \$32 million loan from the Beverage Container Recycling Fund (BCRF). The loan was approved with repayments spelled out within the Budget Act (AB 1781, Chapter 268, statutes of 2008) with budget bill language as follows:

"The transfer made by this item is a loan to the Air Pollution Control Fund and shall be fully repaid from revenues established by the State Air Resources Board pursuant to the California Global Warming Solutions Act of 2006. The loan shall be repaid by the earliest feasible date. At least one-third of the loan shall be repaid on or before June 30, 2011, and the

full amount shall be repaid on or before June 30, 2013. The loan shall be repaid with interest at the rate earned by the Pooled Money Investment Account at the time of the transfer."

For the 2009/2010 fiscal year, the Budget Act (SBX3 1, Chapter 1, Statutes of 2009) approved a \$35 million loan (BCRF) for ARB and Cal/EPA expenditures. Timely implementation of this Fee regulation could eliminate the need for some or all of the loan for the 2009/2010 fiscal year. The budget provisions for this loan are as follows:

The transfer made by this item is a loan to the Air Pollution Control Fund and shall be fully repaid from revenues established by the State Air Resources Board pursuant to the California Global Warming Solutions Act of 2006 (Division 25.5 (commencing with Section 38500) of the Health and Safety Code). The loan shall be repaid by the earliest feasible date. At least one-third of the loan shall be repaid on or before June 30, 2012, and the full amount shall be repaid on or before June 30, 2014. The loan shall be repaid with interest at the rate earned by the Pooled Money Investment Account at the time of the transfer.

Table 1 shows the loans used to carry out AB 32 for the first two fiscal years.

**Table 1: Fiscal Year 2007/2008 and 2008/2009 Loans
To Carry Out AB 32**

| Fiscal Year | Approximate Program Costs (\$ Millions) |
|--------------------|---|
| FY 2007/2008 | (MVA loan, ARB) \$15.2 (MVA loan, Cal/EPA) \$0.3 |
| FY 2008/2009 | (BCRF loan) \$32.0 |
| Total | \$47.5 |

Loan Repayment Plan

Pursuant to Budget Acts SBX3 1 (Chapter 1, Statutes of 2009) and AB 1781 (Chapter 268, Statutes of 2008), the BCRF loans must be fully repaid with interest with at least one-third paid back by the second year. ARB used the same methodology to determine the repayment schedule for the MVA loan, which did not come with legislative directives. Based on the interest rate for each loan, ARB calculated the amount due, including the accrued interest. The interest rate is determined by the rate of the Pooled Money Investment Account at the time the loans are transferred. Table 2 shows the repayment schedule for the two loans. As shown in the table, ARB will repay the loans over four years. If ARB requires funds from the 2009/2010 loan, this repayment schedule will be modified to incorporate repayment of that loan.

**Table 2: Repayment Schedule for
Fiscal Year 2007/2008 and 2008/2009 Loans**

| Payment Due Date | Approximate Amount Due Including Interest (\$ million)* |
|-------------------------|--|
| June 30, 2010 | \$13.7 |
| June 30, 2011 | \$14.0 |
| June 30, 2012 | \$13.8 |
| June 30, 2013 | \$13.2 |
| Total | \$54.6 |

*Numbers do not add due to rounding

ARB Expenses for Fiscal Years 2007/2008 and 2008/2009

In order to confirm that the funds loaned to ARB were expended on AB 32 related activities for fiscal years 2007/2008 and 2008/2009, staff reviewed the person years and other expenditures related to AB 32 in each fiscal year. This included the program staff workload associated with AB 32 work products, such as the Scoping Plan, various Early Action Measures, and additional regulatory measures. ARB utilized existing program staff, management oversight and program support staff, as needed, in order to complete the considerable workload within the statutory timeline.

Staff related costs include salary, benefits and operating expenses such as facility costs, training and travel. Program support costs account for executive oversight as well as administrative and computer support. To calculate this cost, ARB determined that approximately 13 percent of our program-related positions are budgeted as climate change positions. Staff then attributed 13 percent of the total cost of the Chairman's Office, the Executive Office, administrative services and computer services to the climate change program.

Based on our initial evaluation of fiscal year 2007/2008 expenses, ARB expended resources in excess of the loan amount. Fiscal year 2008/2009 is still in progress, so the expenditures are preliminary, but similarly they show that ARB has expended resources in excess of the loan amount. With the proposed Fee regulation, ARB is proposing that only loan-related budgeted costs shown in Table 2 be recouped for prior fiscal years.

A summary of ARB's AB 32 expenditures for fiscal years 2007/2008 and 2008/2009 is provided in Tables 3 and 4 below. Tables 3a and 4a provide a more detailed breakdown of ARB's expenditures for the first two years of the AB 32 program.

**Table 3: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year 2007/2008**

| | Costs (Million \$)* |
|------------------------------|--------------------------------|
| Staff Related Costs | |
| • Salary | \$10.75 |
| • Benefits | \$3.77 |
| • Operating Costs | \$4.21 |
| Program Support ¹ | \$2.00 |
| Contracts ² | \$4.65 |
| Equipment | \$0.05 |
| Total | \$25.43 |

¹Program Oversight includes Chairman's Office, Executive Office, administrative services and computer support expenses in proportion to the staffing for the AB 32 program.

²Estimated expenditures in the 2007/2008 fiscal year.

*Numbers do not add due to rounding.

**Table 3a: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year 2007/2008 - Detail**

Personal Services and Operating Expenses:

| Classification | Number of PYs | Annual Salaries |
|---------------------------------|---------------|----------------------|
| Air Pollution Spec | 53.74 | 4,050,831.42 |
| Air Resources Engr | 19.70 | 1,577,282.27 |
| Air Resources Supvr I | 19.50 | 2,003,209.18 |
| Air Resources Supvr II | 7.47 | 857,309.28 |
| Assoc Govtl Prog Analyst | 1.60 | 91,066.20 |
| Assoc Info Systems Analyst-Spec | 0.03 | 1,945.08 |
| Asst Div Chief | 1.40 | 173,653.20 |
| Auto Emission Test Spec II | 0.30 | 13,062.60 |
| Auto Emission Test Spec III | 0.66 | 35,133.75 |
| C.E.A. I | 2.95 | 382,841.40 |
| Environmental Program Manager I | 0.25 | 22,725.00 |
| Exec Asst | 1.13 | 41,398.08 |
| Instrument Techn | 0.20 | 11,966.40 |
| Library Tech Asst I | 0.02 | 646.85 |
| Office Techn-Typing | 1.42 | 52,607.04 |
| Special Consultant | 0.16 | 8,100.48 |
| Staff Air Pollution Spec | 14.62 | 1,349,022.00 |
| Staff Services Analyst-Gen | 1.56 | 64,107.62 |
| Staff Services Mgr I | 0.20 | 13,159.20 |
| Supervising Librarian II | 0.05 | 3,839.40 |
| Sub-Total | 126.96 | 10,753,906.44 |

| Benefits | | |
|------------------|---------------|---------------------|
| FICA | 6.20% | 666,742.20 |
| Medicare | 1.45% | 155,931.64 |
| Retirement | 16.63% | 1,788,374.64 |
| Health | 10.82% | 1,163,572.68 |
| Sub-Total | 35.10% | 3,774,621.16 |

Total Personal Services: 14,528,527.61

| Operating Costs | Number of PYs | Estimated Annual Cost |
|------------------|---------------|-----------------------|
| General Expense | 14,378 | 1,825,430.88 |
| Printing | 766 | 97,251.36 |
| Communications | 2,533 | 321,589.68 |
| Postage | 600 | 76,176.00 |
| Training | 2,500 | 317,400.00 |
| Travel-In-State | 2,395 | 304,069.20 |
| Facilities | 10,000 | 1,289,600.00 |
| Sub-Total | 33,172 | 4,211,517.12 |

Total Program Staff
Related Costs: 18,740,044.73

| Other Costs | |
|---------------------|----------------------|
| Contracts | 4,662,429.00 |
| Equipment | 45,180.00 |
| Program Support | 1,998,871.68 |
| Sub-Total | 6,696,480.68 |
| Total Costs: | 25,436,525.41 |

**Table 4: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year 2008/2009 - Preliminary**

| | Costs (Million \$) |
|------------------------------|-----------------------|
| Staff Related Costs | |
| • Salary | \$16.10 |
| • Benefits | \$5.64 |
| • Operating Cost | \$7.54 |
| Program Support ¹ | \$1.96 |
| Contracts ² | \$5.92 |
| Equipment | \$1.83 |
| Total | \$38.99 |

¹Program Oversight includes Chairman's Office, Executive Office, administrative services and computer support expenses in proportion to the staffing for the AB 32 program.

²Preliminary estimate of expenditures in the 2008/2009 fiscal year.

**Table 4a: Detailed ARB Expenditures for the AB 32 Program
Fiscal Year 2008/2009 - Preliminary**

Personal Services and Operating Expenses:

| Classification | Number of PYs | Actual Annual Salaries |
|---------------------------------|---------------|------------------------|
| Air Pollution Spec | 85.05 | 6,959,829.89 |
| Air Resources Engr | 32.78 | 2,786,431.25 |
| Air Resources Field Rep II | 1.36 | 80,325.00 |
| Air Resources Field Rep III | 0.15 | 9,603.00 |
| Air Resources Supvr I | 26.00 | 2,686,079.95 |
| Air Resources Supvr II | 9.07 | 1,055,123.28 |
| Assoc Govtl Prog Analyst | 0.68 | 39,898.92 |
| Assoc Info Systems Analyst-Spec | 0.03 | 2,042.28 |
| Asst Div Chief | 1.35 | 160,402.19 |
| Auto Emission Test Spec II | 0.25 | 11,218.20 |
| Auto Emission Test Spec III | 0.00 | 0.00 |
| C.E.A. I | 1.97 | 255,819.84 |

| | | |
|---------------------------------|--------|---------------|
| Environmental Program Manager I | 0.00 | 0.00 |
| Exec Asst | 0.95 | 39,182.40 |
| Instrument Techn | 0.20 | 11,966.40 |
| Library Tech Asst I | 0.02 | 646.85 |
| Office Asst-Gen | 0.70 | 18,557.28 |
| Office Techn-Typing | 2.20 | 77,635.20 |
| Special Consultant | 0.20 | 10,125.60 |
| Staff Air Pollution Spec | 17.76 | 1,798,343.54 |
| Staff Services Analyst-Gen | 1.81 | 78,612.58 |
| Staff Services Mgr I | 0.20 | 13,816.80 |
| Supervising Librarian II | 0.05 | 3,839.40 |
| Sub-Total | 182.77 | 16,099,499.64 |

| | | |
|-----------------|--------|--------------|
| Benefits | | |
| FICA | 6.20% | 998,168.98 |
| Medicare | 1.45% | 233,442.74 |
| Retirement | 16.57% | 2,667,687.09 |
| Health | 10.82% | 1,741,965.86 |
| Sub-Total | 35.04% | 5,641,264.68 |

Total Personal Services: 21,740,764.32

| | | |
|--|--------|--------------|
| Operating Costs - Staff Related | | |
| General Expense | 20,454 | 3,738,377.58 |
| Printing | 958 | 175,093.66 |
| Communications | 1,958 | 357,863.66 |
| Postage | 1,000 | 182,770.00 |
| Training | 2,000 | 365,540.00 |
| Travel-In-State | 2,874 | 525,280.98 |
| Facilities | 12,000 | 2,193,240.00 |
| Sub-Total | 41,244 | 7,538,165.88 |

Total Program Staff Related Costs: 29,278,930.20

| | | |
|--------------------|--|--------------|
| Other Costs | | |
| Contract | | 5,917,120.00 |
| Equipment | | 1,830,564.00 |
| Program Support | | 1,961,068.98 |
| Sub-Total | | 9,691,632.98 |

Total Costs: 38,987,683.18

Cal/EPA Expenses for Fiscal Years 2007/2008 and 2008/2009

Cal/EPA and ARB undertook a similar process to confirm that the Cal/EPA loans were expended on AB 32 related activities for fiscal years 2007/2008 and 2008/2009, reviewing the person years and other expenditures related to AB 32. Based on an initial evaluation of fiscal year 2007/2008 expenses, Cal/EPA expended resources in excess of the loan amount. Fiscal year 2008/2009 is still in progress, so the expenditures are preliminary estimates. However, combined

with ARB's preliminary 2008/2009 expenditures, they show that the two agencies have expended resources in excess of the loan amount.

Like ARB, only funds loaned to Cal/EPA will be recouped by the fee for fiscal years 2007/2008 and 2008/2009. A summary of the expenditures is provided in Tables 5 and 6 below.

**Table 5: Estimated Cal/EPA Expenditures for the AB 32 Program
Fiscal Year 2007/2008**

| | Costs¹ (Million \$) |
|----------------------------|---|
| Staff Related Costs | |
| • Salary | \$0.15 |
| • Benefits | \$0.08 |
| • Operating Cost | \$0.12 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.34 |

¹ Does not add due to rounding.

**Table 6: Estimated Cal/EPA Expenditures for the AB 32 Program
Fiscal Year 2008/2009 - Preliminary**

| | Costs (Million \$) |
|----------------------------|-------------------------------|
| Staff Related Costs | |
| • Salary | \$0.34 |
| • Benefits | \$0.15 |
| • Operating Cost | \$0.30 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.79 |

ARB's AB 32 Activities

In fiscal years 2007/2008 and 2008/2009, ARB engaged in, and is continuing to engage in, numerous activities to implement AB 32. The statute describes an aggressive timeline for ARB to inventory greenhouse gas emissions in the state, to identify a 2020 emissions goal, to identify and adopt Discrete Early Action Measures to reduce greenhouse gas emissions, to adopt a comprehensive Scoping Plan that describes how the state will meet the goal, and to develop, adopt and implement additional greenhouse gas reduction measures to meet the

2020 goal. The major milestones of AB 32 and their due dates, most of which are during fiscal years 2007/2008 and 2008/2009, are shown in Table 7.

Table 7: Major Milestones in AB 32

| Status | Milestone |
|---------------|--|
| X | Publish a list of Discrete Early Actions (HSC §38550 (a)) |
| X | Determine 1990 greenhouse gas emission level and set 2020 emissions target at that level (HSC §38550) |
| X | Adopt regulations to require reporting and verification of statewide greenhouse gas emissions (HSC §38530) |
| X | Approve a Scoping Plan (HSC §38561) |
| In Process | Adopt regulations to implement Discrete Early Action Measures to be enforceable no later than January 1, 2010 (HSC §38550 (b) and (d)) |
| In Process | Adopt greenhouse gas emission limits and emission reduction measures to become operative January 1, 2012 (HSC §38562) |

In order to support these activities, to meet other requirements of AB 32, and to lay the groundwork for meeting the long-term goal described in AB 32, ARB deployed numerous resources. Many of the activities described below will continue in fiscal year 2009/2010, or will require resources to transition from regulatory development and adoption to regulatory implementation.

A more detailed discussion of ARB's climate change activities in fiscal years 2007/2008 and 2008/2009, as well as anticipated activities for fiscal year 2009/2010, follows.

1. Greenhouse Gas Emission Inventory And Reporting

AB 32 describes specific tasks and milestones for developing a statewide greenhouse gas inventory.

A. Create Comprehensive Greenhouse Gas Inventory and Establish 2020 Limit

Section 38550 of the Health and Safety Code requires ARB to determine what the statewide greenhouse gas emissions level was in 1990, and approve, in a public hearing, a statewide greenhouse gas emissions limit that is equivalent to that level and which must be achieved by 2020.

Prior to the 2006 statute, ARB did not systematically collect greenhouse gas emissions data or have explicit authority or staff dedicated to collecting and storing greenhouse gas data and forecasting future emissions. Developing a California greenhouse gas emission inventory required establishing an

organizational unit to identify major sources and sinks of greenhouse gas emissions, develop methodologies for estimating greenhouse gas emissions, and identify sources of emissions information necessary to regularly update the statewide greenhouse gas emissions level. Based on the emissions data sources, ARB created a baseline for evaluating the success of emission reduction measures.

In the 2007/2008 fiscal year, staff undertook a comprehensive review of 1990 greenhouse gas emissions estimates using the best available scientific, technical, and economic information. ARB staff gathered data from state and federal agencies, international organizations, and California industries to estimate the total statewide 1990 greenhouse gas emissions level. These emissions estimates were developed through an extensive public process, which included technical workshops. ARB staff estimated the statewide 1990 emissions level to be 427 million metric tons of carbon dioxide equivalent (MMTCO₂E). In December 2007, the Board determined the 1990 emissions level to be 427 MMTCO₂E and approved this level as the statewide 2020 greenhouse gas emissions limit.

Work in this area continued in fiscal year 2008/2009 and will continue in fiscal year 2009/2010. Staff continue to refine the greenhouse inventory, and have developed a web-based interactive tool to identify all methods and data sources used to determine the greenhouse gas emissions in the California's greenhouse gas inventory by economic sector or activity. Inventory staff are also working closely with rulemaking staff to support development and adoption of the Scoping Plan measures.

B. Develop, Implement and Enforce Mandatory Reporting Regulation

Section 38530 of the Health and Safety Code requires ARB to adopt regulations, by January 1, 2008, to require the reporting and verification of statewide greenhouse gas emissions and to monitor and enforce compliance with the reporting program. In order to identify ways to reduce emissions, it was necessary to establish an effective program to collect data from specific greenhouse gas emissions sources, verifying the emissions, monitoring and annual reporting emissions, accounting for emissions from all electricity consumed in the state, including transmission and distribution line losses from electricity generated within the state or imported from outside the state.

In 2007, staff developed a regulation for the mandatory reporting and verification of greenhouse gas emissions from specified sources. In developing the regulation, staff focused on facilities within economic sectors accounting for the largest sources of greenhouse gas emissions. The Board adopted the regulation in December 2007. The mandatory reporting regulation is codified in subchapter 10, article 2, sections 95100 to 95133, title 17, California Code of Regulations.

Greenhouse gas emissions reporting begins in 2009 (for 2008 calendar year emissions.) In fiscal year 2008/2009, staff provided outreach to assist in the implementation of greenhouse gas mandatory emissions reporting. Staff has developed a comprehensive web-based greenhouse gas reporting tool to simplify and guide the reporting process. Staff conducted a series of training sessions to familiarize users with the reporting regulation and the Reporting Tool. Staff also developed a series of Reporting Tool user guides for the six economic sectors required to report greenhouse gas emissions. Staff will continue to implement the Mandatory Reporting Regulation in fiscal year 2009/2010.

Verifier Accreditation Program: The reporting regulation requires facilities to verify their greenhouse gas emissions estimates through a review by ARB-accredited third-party verifiers, consistent with international standards. Verification of emissions reports is required for all facilities subject to mandatory reporting beginning in 2010 (for their 2009 reported emissions). Verification is optional in 2009. In order to ensure an adequate number of third-party verifiers, ARB developed a greenhouse gas verifier training program that will provide accreditation for individuals interested in providing services for verification of greenhouse gas emission data reports. ARB staff also developed an accreditation application process and is presently screening.

In addition to verifier training and accreditation, ARB staff is responsible for determining the potential conflict of interest for proposed verifiers and overseeing verifier performance during emissions report reviews. Verification is also required to validate the emission reduction credits used to meet the requirements of greenhouse gas reduction regulations. This work will also continue in fiscal year 2009/2010.

2. AB 32 Program Planning

AB 32 identifies ARB as the state agency charged with monitoring and regulating sources of greenhouse gases that cause global warming in order to reduce their emissions. The addition of this new responsibility required ARB to create a new unit charged with overseeing the implementation of AB 32, including development of the Scoping Plan, coordinating ARB's internal climate change efforts, serving as a liaison with other state, local, national, and international agencies, and developing strategies for meeting California's goal of reducing greenhouse gas emissions.

Under AB 32, ARB must prepare and approve a Scoping Plan on or before January 1, 2009, outlining the State's strategy to reduce greenhouse gas emissions to 1990 levels by 2020. In 2007 and 2008, ARB engaged in an intensive effort to develop the Scoping Plan, approved at the December 11, 2008 Board meeting, which identifies the actions that will be taken to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions. In developing the Scoping Plan, ARB staff had to develop expertise on emission reduction strategies for greenhouse gases and identify

direct emission reduction measures for potential implementation. Additionally, staff evaluated and recommended alternative compliance mechanisms, market-based compliance mechanisms, and potential monetary and non-monetary incentives.

As required by AB 32, staff also evaluated and considered all relevant information pertaining to the greenhouse gas emission reduction programs in other state, regions, and nations, and evaluated the total potential costs and economic and non-economic benefits of the Scoping Plan, including the impacts on small businesses. Staff additionally identified opportunities for emission reductions from voluntary actions, and conducted public workshops throughout the state with a portion being held in regions with the most significant exposure to air pollutants, including communities with minority and low income populations.

To ensure that the public and stakeholders were involved at every stage of the development and implementation of the Scoping Plan, including informal and formal rulemaking activities, staff worked with the Environmental Justice Advisory Committee, the Economic and Technology Advancement Advisory Committee, small businesses, labor unions, community and neighborhood organizations, local chambers of commerce, and faith-based communities.

The Scoping Plan lays out a number of measures that ARB has already adopted or is in the process of developing. Most of the Discrete Early Action Measures in the Scoping Plan have been adopted, and ARB is now working on additional emission reduction measures. Several of these measures are discussed below.

3. Greenhouse Gas Emission Reduction Measures

A. Develop and Implement Discrete Early Action Reduction Measures

Health and Safety Code section 38560.5(a) requires ARB to develop and publish a list of Discrete Early Action greenhouse gas emission reduction measures by June 30, 2007. Health and Safety Code section 38560.5(b) further requires ARB to adopt regulations to implement the measures identified on that list, and for those measures to be enforceable by January 1, 2010.

In June 2007, the Board approved an initial list of Discrete Early Action Measures, and in October 2007, the Board augmented that list. The nine Discrete Early Action measures and their status are described below:

Diesel Auxiliary Engines on Ocean-Going Vessels Regulation: This regulation will reduce emissions from diesel auxiliary engines on container ships, passenger ships, and refrigerated-cargo ships while berthing at a California port. The regulation provides vessel fleet operators visiting these ports to reduce at-berth emissions from auxiliary engines by connecting to another source of power, most likely grid-based shore power; or using alternative control technique(s) that

achieve equivalent emission reductions. The Board approved this regulation in December 2007.

Reduction Of High Global Warming Potential (GWP) Greenhouse Gases In Consumer Products: At the June 2008 Board hearing, ARB approved amendments to the California Consumer Products Regulation that included the first GWP standard for consumer products in California, the GWP limit for Pressurized Gas Duster products.

Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Measure: This regulation will reduce greenhouse gas emissions produced by heavy-duty tractors by making them more fuel efficient. Fuel efficiency will be improved by requiring the use of aerodynamic tractors and trailers that are also equipped with low rolling resistance tires. The tractors and trailers subject to this regulation must either use United States Environmental Protection Agency Smartway (SmartWay) certified tractors and trailers, or retrofit their existing fleet with Smartway verified technologies. This regulation was approved in December 2008.

Regulation to Reduce Refrigerant Losses from Servicing of Motor Vehicle Air Conditioning: This regulation will reduce refrigerant emissions from servicing of automotive refrigerants by the do-it-yourselfer. The current automotive refrigerant (R-134a) is a potent greenhouse gas. This regulation will help prevent unnecessary releases of the refrigerant to the atmosphere and applies to automotive refrigerants with a GWP value greater than 150. The Board approved this regulation in January 2009.

Regulation to Reduce Greenhouse Gas Emissions from Semiconductor Operations: This regulation will reduce fluorinated gas emissions from the semiconductor industry. The Board approved this regulation in February 2009.

SF₆ Reductions from Non-Electric and Non-Semiconductor Applications: This regulation will reduce SF₆ emissions from uses such as magnesium die-casting, fume vent hood testing, tracer gas use, and other niche uses. The Board approved this regulation in February 2009.

Regulation to Reduce Greenhouse Gas Emissions from Vehicles Operating with Underinflated Tires: This regulation will reduce greenhouse gas emissions from vehicles through properly inflated tires. The Board approved the regulation in March 2009.

The Low Carbon Fuel Standard (LCFS): The Low Carbon Fuel Standard (LCFS) reduces the carbon intensity of California's transportation fuels by at least 10 percent by 2020. The LCFS regulation is also designed to reduce California's dependence on petroleum, create a lasting market for clean transportation technology, and stimulate the production and use of alternative low-carbon and no-carbon fuels in California. The Board adopted the LCFS regulation in April 2009.

For the 2008/2009 fiscal year, ARB received additional resources to assist in the development and implementation of the LCFS. These resources are being used to establish and implement the LCFS program, to evaluate sustainability issues, to evaluate the impact of changes to California's fleet of vehicles, and to perform exhaust and evaporative tests of low carbon fuels.

Landfill Methane Capture: ARB staff, in collaboration with the California Integrated Waste Management Board staff, is developing a control measure to provide enhanced control of methane emissions from municipal solid waste (MSW) landfills. The control measure will reduce methane emissions from MSW landfills by requiring gas collection and control systems on landfills where these systems are not currently required and will establish statewide performance standards to maximize methane capture efficiencies. This regulation will be considered at the Board Meeting in June 2009.

B. Develop and Implement Additional Source-Specific Measures

AB 32 tasks ARB with developing and adopting, by January 1, 2011, all greenhouse gas emission limits and emission reduction measures necessary to achieve the maximum technologically feasible and cost-effective reductions. Staff have developed or are now developing a number of individual greenhouse gas emissions reduction measures affecting a wide range of sectors. For measures that have already been adopted, resources have transitioned to implementation of the programs. In addition, ARB is working with other members of the Western Climate Initiative to identify source-specific measures that would be appropriate to pursue regionally. Several source-specific measures are discussed below.

The Scoping Plan called on ARB to develop outreach, assistance and education programs that involve small businesses, local governments, communities, green technology, and economic and workforce development to help move California to a low carbon future. ARB has, and will continue to develop, programs to encourage the voluntary implementation of cost effective greenhouse gas emission reduction practices for individuals, small businesses, local and regional governments. ARB is also participating in the Green Collar Jobs Council which is coordinating California's economic development and job training efforts in the green jobs arena.

Reflective Glazing: The purpose of this strategy is to reduce the solar heat gain in a vehicle parked in the sun. A cooler interior would make drivers less likely to activate the air conditioner, which increases carbon dioxide emissions. At this time, ARB is focusing on solar reflective window glazing. The regulation will be considered at the Board Meeting in June 2009.

Medium and Heavy-Duty Hybridization: Hybrid-electric technology offers the potential to significantly reduce emissions and improve fuel efficiency, especially for medium- and heavy-duty trucks operating in urban environments. ARB will consider a regulation and/or incentive program that reduces greenhouse gas emissions of new medium- and heavy-duty trucks sold in California.

Low Friction Engine Oil: Engine oils can be formulated to reduce friction, thereby improving the overall efficiency of the vehicle.

Pavley II: In the Scoping Plan, ARB committed to strengthen vehicle greenhouse emission standards beginning with the 2017 model year. This measure is referred to as Pavley II. The new standards will build on the existing standards (Pavley I) that reach their maximum stringency in 2016.

Energy Efficiency and Co-Benefits Audits: This proposed regulation would require large facilities to conduct an energy efficiency audit of individual combustion and other direct sources of greenhouse gases to determine the potential for efficiency improvements that would result in greenhouse gas emission reductions, and possibly co-benefits from reduction of criteria pollutants and toxic air contaminant emissions. The regulation will be considered at the Board Meeting in October 2009.

Removal of Methane Exemption from Existing Refinery Regulations: Under this measure, existing fugitive methane exemptions would be removed from the regulations applicable to equipment and sources employed in California's refineries.

Refinery Flares: While flare systems protect the refinery and surrounding community from potential catastrophic overpressure in the process units, the combustion of gases in flares results in emissions of various greenhouse gases as well as other air pollutants. Staff will work with local air districts to develop a measure to improve the overall flare gas recovery in the flare systems of refineries.

Oil and Gas Extraction: This measure is intended to reduce fugitive emissions from oil and gas extraction processes. These emissions, mostly in the form of methane, are from well and process equipment venting and from separation and storage units. This measure is scheduled to be adopted in late 2009 or early 2010. Currently, staff is conducting studies to investigate greenhouse gas emissions from this sector to develop accurate greenhouse gas emission estimates.

Oil and Gas Transmission: This measure is intended to reduce greenhouse from the transmission and distribution of natural gas. Transmission-related emissions come primarily from fugitive sources and secondarily from combustion sources. This measure is scheduled to be adopted in 2010 or early 2010. Currently, staff

is conducting studies to investigate greenhouse gas emissions from this sector to develop accurate greenhouse gas emission estimates.

High GWP Gases: While CO₂ is the most widely recognized greenhouse gas of the Kyoto Protocol of gaseous contributors to the greenhouse effect, there are a number of other pollutants that also contribute to global warming. Kyoto gases, including SF₆, HFCs and PFCs, have global warming impact that is hundreds to thousands of times the climate impact of CO₂ and are therefore called High Global Warming Potential (GWP) gases. To mitigate the high-GWP gases from various sources, staff developed or are in the process of developing several measures, include:

- Regulation to Reduce High-Global Warming Potential Refrigerant Emissions from Stationary Refrigeration and Air Conditioning (R/AC) Equipment: This measure is scheduled to be considered by the Board in 2009.
- Specifications for Commercial and Industrial Refrigeration: This regulatory measure proposes new specifications for commercial and industrial refrigeration systems to both reduce emissions of high GWP refrigerant and to increase energy efficiency of the units.
- Foam Recovery and Destruction Program: This measure is scheduled to go to the Board in December 2010.
- Residential Refrigeration Program: This proposed program would address the over one million residential refrigerators, freezers, and air conditioners that are disposed of each year. This program could also include establishing a voluntary program to encourage the upgrade of pre-2000 residential refrigeration equipment.
- High GWP Reductions from Mobile Sources: The measure could take a variety of forms to reduce GWP emissions from mobile sources such as requiring low GWP refrigerants for new Motor Vehicle Air Conditioning (MVAC) systems, including A/C systems used for heavy-duty and off-road vehicle applications and in the refrigerated shipping container industry. Other strategies could include mitigation of refrigerant emissions at a vehicle's end of life.
- Reduction of High GWP Greenhouse Gases in Consumer Products: Staff is currently working on proposed amendments to the Consumer Product Regulation.
- Sulfur Hexafluoride (SF₆) Emission Reductions for the Electricity Sector and Particle Accelerators: SF₆ is a very potent greenhouse gas, with a

GWP approximately 23,000 times more powerful than CO₂. This measure is scheduled to be heard by the Board in December 2009.

- **High GWP Gases Fee:** ARB is proposing a regulation to reduce high GWP gases through a mitigation fee on the sale of the gases. This mitigation fee would serve to decrease greenhouse gas emissions by changing behavior by increasing price (e.g. improve leakage reduction efforts); inducing new lower GWP alternative products; or providing revenue that can be used to mitigate greenhouse gas emissions elsewhere within the sector.

Greenhouse Gas Emission Reductions from Land Use: In a collaborative effort with other state agencies, local and regional governments, and public stakeholders, ARB staff is developing approaches for addressing greenhouse gas emissions from the land use and transportation sectors. These approaches focus on strategies that incentivize changes in both land use allocations and the amount of passenger vehicle travel within the major metropolitan regions of the state. A key component of this effort is the development of regional greenhouse gas emission reduction targets that could be met using a wide variety of land use and transportation strategies, including but not limited to: higher density development, increased transit opportunities, and pricing mechanisms. Reducing greenhouse gas emission from land use and transportation is a long-term endeavor. ARB anticipates on-going involvement in the development, tracking, and updating of any targets set for these sectors.

Voluntary Emissions Reduction Protocols: Health and Safety Code Section 38571 requires ARB to adopt methodologies to quantify voluntary greenhouse gas emission reductions and to adopt regulations to verify and enforce any voluntary emission reductions. Staff are working in collaboration with other agencies and organizations, including the California Climate Action Registry, to develop and adopt greenhouse gas protocols to support AB 32 program. Protocols for Local Government Operations, Manure Management Digesters and Urban Forests were adopted by the Board in Fall 2008.

C. Evaluate and Develop Market-Based Compliance System

Health and Safety Code section 38570(a) authorizes ARB to include in its regulations the use of market-based compliance mechanisms. AB 32 requires that prior to the inclusion of any market-based compliance mechanism in the regulations, ARB must consider the potential for direct, indirect, and cumulative emission impacts from these mechanisms, including localized impacts in communities already adversely impacted by air pollution. In addition, ARB must design a market-based compliance mechanism that prevents any increase in the emissions of toxic air contaminants or criteria air pollutants; and maximize additional environmental and economic benefits for California.

ARB's Scoping Plan identifies a cap-and-trade regulation as one of the main strategies California will employ to reduce greenhouse gas emissions that contribute to climate change. This program will help put California on the path to meet its 2020 emission reduction goal, and ultimately achieving the more aggressive 2050 goal. Under a cap-and-trade regulation, an overall limit on greenhouse gas emissions from capped sectors will be established under the program, and facilities subject to the cap will be able to trade permits (allowances) to emit greenhouse gases.

To develop the cap-and-trade measure for the Scoping Plan that was adopted in December 2008 and to develop the cap-and-trade regulation for Board consideration in late 2010, staff have, and will continue to, engage in a number of activities including an extensive public outreach process. Staff have held numerous workshops to engage stakeholders in the development of a regulatory concept.

Staff are continuing to work with stakeholders to design a regional cap-and-trade program that is enforceable and meets the requirements of AB 32, including the need to consider any potential impacts on disproportionately impacted communities. Staff are also working closely with six other western states and four Canadian provinces through the Western Climate Initiative (WCI) to design a regional cap-and-trade program that can deliver greenhouse gas emission reductions within the region at costs lower than could be realized through a California-only program. To that end, ARB rule development schedule is being coordinated with the WCI timeline for development of a regional program.

4. Applied Studies and Scientific Analysis

AB 32 requires ARB to design cost-effective greenhouse gas emission reduction measures to meet a statewide limit. A diverse portfolio of applied studies is required to help ARB identify and implement the most cost-effective, technologically feasible mitigation strategies. Research to support the requirements of AB 32 also illuminates linkages between greenhouse gas emissions and air pollution, as well as the health and social impacts of global warming. This research adds to the considerable existing research on impacts to California, providing information to facilitate identification and prioritization of mitigation strategies that will not adversely impact regional or community exposures to air pollution.

The research also involves data gathering and ambient monitoring of greenhouse gases or other pollutants of relevance as well as the investigation of fundamental science on global warming, its impacts and associated atmospheric processes to facilitate the adoption of the most cost-effective mitigation strategies. ARB has engaged in intensive seasonal monitoring of ambient levels of greenhouse gases, and has incorporated greenhouse gas monitoring into the existing Toxics Network. ARB is working to coordinate a statewide methane monitoring network, and will begin mobile measurements of greenhouse gases in summer 2009.

ARB has also collaborated with NASA to collect aircraft measurements of greenhouse gas levels in urban, rural, and off-shore areas, and is collaborating with NOAA on a 2010 field study to examine the nexus between air quality and climate change.

Research studies have focused on the technical data needs to develop and adopt Discrete Early Action Measures and for regional resolution of global warming in California. To support greenhouse gas mitigation activities, applied studies are in place for collaborative research on N₂O emissions from nitrogen land application and technical assistance to a voluntary "cool communities" program for promoting near-term reduction of greenhouse gases. ARB has also initiated research to resolve the intensity, distribution, and atmospheric processes associated with particles' climate forcing in California, with an emphasis on vehicular sources and biomass combustion.

Meeting near-term (2020) and long-term (2050) climate goals will require extensive changes in home energy and water use, business operations, and transportation patterns. Studies already underway will help ARB gauge the effectiveness of strategies designed to encourage voluntary residential reductions in energy consumption. ARB-supported research will also delineate the demographic and behavioral determinants of household consumption of energy, water, natural gas, and transportation resources.

5. Support and Administration

The expansion of ARB's activities associated with AB32 also extends to enforcement, legislative activities, and legal support, as well as increased workload for processing personnel paperwork, contracts and other administrative functions and information technology support.

ARB expanded enforcement resources to address new greenhouse gas measures, and as measures are adopted, resources will continue to shift to ensure smooth implementation of the regulations. As the scope of issues to be addressed by ARB under AB 32 is expansive, ARB legislative scope has also expanded, encompassing issues that in the past have not required significant ARB involvement. ARB has expanded its legislative review and tracking efforts to include additional issues in new program areas including waste management, forestry, agriculture, and the utility sector. Because the implementation of AB 32 presents many novel and complex legal issues, ARB also expanded its legal resources so that legal staff can be in the conception, development, and implementation of programs, such as the mandatory reporting regulations, the Scoping Plan, fee regulations, market mechanisms, and direct reduction measures. In light of the precedent-setting nature of these programs, it is likely that opponents will raise myriad legal issues during program development and implementation.

In the 2007/2008 and 2008/2009 fiscal years, ARB expanded its staff by over 10 percent, increasing the workload of the administrative and information technology units. The administrative unit experienced an initial increase in workload associated with the hiring of new staff. This workload will continue as these staff will require routine administrative support including personnel transactions, travel reimbursement, processing of contracts, training, and other administrative functions. Similarly, the information technology unit experienced an increase in workload that will continue as these new staff require workstation support, as well as support for the increasingly computer-based outreach methods used by ARB such as webcasts.

California Environmental Protection Agency's AB 32 Program Activities

Existing law and Executive Orders direct the Secretary for Environmental Protection to coordinate all state activities related to climate change. To achieve the required emission reductions called for in AB 32, each of the state agencies that are on the Climate Action Team must develop and implement programs within their own jurisdiction and authority. Since 2006, the California Environmental Protection Agency (Cal/EPA) has coordinated all the CAT sub-groups and their AB 32 measures in the Scoping Plan. In addition, Cal/EPA also produces the Biennial CAT Report that contains the updated assessment of the impacts of climate change in California.

Cal/EPA must also prepare the overarching economic analyses, the multi-state registry framework and the public education program. Furthermore, the Secretary must manage the increased administrative workload associated with additional rulemakings, contracts and procurements, and other matters generated by the Cal/EPA organizations, particularly ARB.

Additionally, Cal/EPA is responsible for the Climate Change Report Card, as mandated in statute (SB 85, Chapter 178, statutes of 2007), and the AB 32 Five Year Plans (AB 1338, Chapter 760, statutes of 2008). The climate change unit is also involved in coordinating cross-cutting activities of the Western Climate Initiative as they relate to implementation of AB 32. These activities will continue in fiscal year 2009/2010.

Future AB 32 Expenditures

In February 2009, the Legislature passed and the Governor signed the fiscal year 2009/2010 budget. This budget included a continuation of funding for ARB and Cal/EPA to carry out AB 32. For the 2009/2010 fiscal year, the Budget Act (SBX3 1, Chapter 1, Statutes of 2009) includes a \$35 million loan from the BCRF for ARB and Cal/EPA expenditures related to AB 32. ARB will consider this fee regulation in June 2009, and, if approved, fee collection for the 2009/2010 fiscal year will begin in spring 2010. Timely implementation of this Fee regulation could eliminate the need for some or all of the loan for the 2009/2010 fiscal year.

If ARB and Cal/EPA do rely on the loan for some or all of their 2009/2010 expenditures, the fee will be used to repay the loan with interest. These loan repayments would be added to the repayment schedule, and extend final payment of the loans by one year.

Funding Criteria

AB 32 provides ARB with the authority to adopt fees for the broad purpose of "carrying out this division." For the 2009/2010 fiscal year and future fiscal years, ARB proposes to use the following criteria to determine which expenses would be funded from this fee.

- Staff related expenditures for the start-up and ongoing implementation of the AB 32 program that have been approved through budget change proposals (BCPs) after AB 32 was signed into law (September 2006).
- Other post AB 32 BCPs approved costs directly related to the administration of AB 32 programs to reduce greenhouse gas emissions, such as contracts, administrative overhead, and research directly related to the implementation of the AB 32 program.

For the 2009/2010 fiscal year and future fiscal years, ARB proposes that the following types of activities *not* be funded through AB 32 fees:

- Redirected staff positions working on AB 32 that were not approved in the formal budget process with an approved BCP;
- Costs incurred by non-state agencies such as air quality/pollution districts, other special districts, etc;
- Activities which are currently funding a part of an agency's principal responsibilities (water conservation, waste reduction, traffic planning, etc.) that achieve greenhouse gas emission reductions as a co-benefit;
- Specific greenhouse gas emission mitigation activities that started prior to the passage of AB 32 or were covered by earlier budget requests;
- Activities related to adaptation to climate change, including adaptation-related research;
- Activities related to compliance with the California Environmental Quality Act (CEQA) requirements for state agencies related to climate change/greenhouse gas emissions; and,
- Compliance with existing and future programs, regulations or other initiatives for state agencies which reduce their own greenhouse gas emissions.

Funding for AB 32 Implementation in Fiscal Year 2009/2010 Budget

Several other state agencies have been working with Cal/EPA and ARB on AB 32 implementation, including work on the Climate Change Scoping Plan that ARB adopted in December 2008. The Scoping Plan describes a broad range of measures, including many measures that are the primary responsibility of other state agencies. These agencies, which all meet the funding criteria described

above, include: the Department of Food and Agriculture, Energy Commission, Department of General Services, and Integrated Waste Management Board.

Table 8 below provides a preliminary summary of anticipated state agency expenses, including staffing levels, for the AB 32 program for the 2009/2010 fiscal year. Note that the numbers contained in the table are preliminary and subject to change due to potential changes to the adopted 2009/2010 budget during the May revise. A final determination of the required revenue for fiscal year 2009/2010 will be made once final budget information becomes available.

**Table 8: Preliminary Summary of
AB 32 Program Funding for FY 2009/2010**

| State Agency | PYs | Total Costs (in Million \$) |
|---|------------|--------------------------------|
| Air Resources Board | 155 | \$ 33.1 |
| Integrated Waste Management Board | 6 | \$ 1.3 |
| Energy Commission | 5 | \$ 0.6 |
| Environmental Protection Agency | 4 | \$ 0.7 |
| Department of General Services | 2 | \$0.2 |
| California Department of Food and Agriculture | 2 | \$ 0.3 |
| TOTAL | 174 | \$ 36.2 |

A. Air Resources Board

The Air Resources Board's 2009/2010 activities are described above. A summary of ARB's budgeted costs for fiscal year 2009/2010 is shown in Table 9.

**Table 9: Summary of ARB's AB 32 Implementation Costs
Fiscal Year 2009/2010 (Preliminary)**

| | Costs (Million \$) |
|------------------------------|-----------------------|
| Staff Related Costs (155 PY) | \$22.64 |
| Contracts | \$9.50 |
| Equipment | \$0.96 |
| Total | \$33.10 |

B. California Environmental Protection Agency

The California Environmental Protection Agency's 2009/2010 activities are described above. A summary of Cal/EPA's budgeted costs for fiscal year 2009/2010 is shown in Table 10.

**Table 10: Summary of Cal/EPA's AB 32 Implementation Costs
Fiscal Year 2009/2010 (Preliminary)**

| | Costs (Million \$) |
|----------------------------|-------------------------------|
| Staff Related Costs (4 PY) | \$0.75 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.75 |

C. California Energy Commission

Because energy use is so closely linked to greenhouse gas emissions, the electricity and natural gas sectors will play critical roles in reaching AB 32 goals. In 2008, the Energy Commission and California Public Utilities Commission (CPUC) adopted a comprehensive set of recommendations, which included both programmatic and market-based mechanisms covering a broad range of energy efficiency and renewable energy measures. The Energy Commission identified numerous measures in the Scoping Plan that will be implemented through voluntary programs, new regulations, and other efforts.

Implementing the energy measures and strategies outlined in the Scoping Plan will require developing new building and appliance energy efficiency standards, expanding the use of renewable energy, and tracking associated greenhouse gas emission reductions. The Energy Commission is also working on measures to increase tire efficiency, accelerate the use of alternative transportation fuels and technologies, and explore smarter land use strategies to reduce greenhouse gas emissions. Additionally, staff will analyze California's electricity supply and demand, as well as for the entire western region, as ARB explores a possible regional cap-and-trade program. The Energy Commission is expected to develop forecasts and conduct new analyses to determine potential consequences and greenhouse gas emission impacts from different resource mixes.

A summary of the Energy Commission's budgeted costs for fiscal year 2009/2010 is shown in Table 11.

**Table 11: Summary of Energy Commission's AB 32 Implementation Costs
Fiscal Year 2009/2010 (Preliminary)**

| | Costs (Million \$) |
|----------------------------|-------------------------------|
| Staff Related Costs (5 PY) | \$0.59 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.59 |

D. California Department of General Services

As the State's business manager, the Department of General Services (DGS) has a statewide policy role with respect to building design, construction, operation, and maintenance. Implementing the energy measures and strategies outlined in the Scoping Plan will require DGS to analyze the energy usage data of state facilities and develop new policies and initiatives in order to achieve the targeted greenhouse gas reductions.

DGS not only leads by example, it serves as a catalyst for the development of methods and strategies to lower greenhouse gas emissions associated with the operation of building occupancy. Energy efficiency initiatives led by DGS demonstrate to the utility companies and the private sector the technical feasibility of using advanced technologies in the design, construction, and management of buildings, as well as the commitment of state government to implement public policies in this area. This provides a clear market signal that stimulates private sector action and investment into new technologies.

A summary of DGS's budgeted costs for fiscal year 2009/2010 is shown in Table 12.

**Table 12: Summary of DGS's AB 32 Implementation Costs
Fiscal Year 2009/2010 (Preliminary)**

| | Costs (Million \$) |
|----------------------------|-------------------------------|
| Staff Related Costs (2 PY) | \$0.18 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.18 |

E. California Integrated Waste Management Board

In collaboration with ARB, the California Integrated Waste Management Board (CIWMB) developed several measures in the Scoping Plan that have potential greenhouse gas emission reductions. These measures address landfill methane emissions and moving towards zero waste processes.

The CIWMB assisted ARB in the June 2007 adoption of a Discrete Early Action Measure for increasing landfill methane capture, and is continuing such efforts in the development of the control measure rulemaking expected to be completed during the 2009/2010 fiscal year.

Furthermore, the CIWMB has identified several measures in the Scoping Plan that focus on moving towards zero waste and high recycling by reducing waste and materials at the source of generation, expanding use of compost to benefit soils, and increasing commercial recycling. The CIWMB will also work to ensure that additional emission reductions will be realized through the implementation of the Extended Producer Responsibility measure and the Environmentally Preferable Purchasing measures.

A summary of CIWMB's budgeted costs for fiscal year 2009/2010 is shown in Table 13.

**Table 13: Summary of CIWMB's AB 32 Implementation Costs
Fiscal Year 2009/2010 (Preliminary)**

| | Costs (Million \$) |
|----------------------------|-------------------------------|
| Staff Related Costs (6 PY) | \$0.50 |
| Contracts | \$0.80 |
| Equipment | 0 |
| Total | \$1.30 |

F. Department Of Food and Agriculture

The California Department of Food and Agriculture (CDFA) is involved with several activities in the agricultural arena to identify and reduce sources of greenhouse gas emissions. In collaboration with ARB, the CDFA is supporting efforts that encourage voluntary installation of anaerobic digesters at large dairies in order to capture methane from manure. The CDFA is also funding research activities to determine baseline nitrous oxide (N₂O) emission levels from cotton and corn crops with and without nitrogen fertilizer. The CDFA will be collaborating with other state agencies to identify data to estimate the energy use of agricultural water use to reduce energy and related greenhouse gas emissions. Along with ARB and the CEC, the CDFA staff is developing

strategies to remove barriers and promote the adoption of clean farm-based energy technologies, such as bio-gas, bio-fuels, and biomass technologies, and to implement motor fuel quality standards.

A summary of CDFA's budgeted costs for fiscal year 2009/2010 is shown in Table 14.

**Table 14: Summary of CDFA's AB 32 Implementation Costs
Fiscal Year 2009/2010 (Preliminary)**

| | Costs (Million \$) |
|----------------------------|-------------------------------|
| Staff Related Costs (2 PY) | \$0.30 |
| Contracts | 0 |
| Equipment | 0 |
| Total | \$0.30 |

Funding Process for AB 32 Implementation Fee

To receive funding under this Fee, state agencies would go through the standard Budget Change Proposal (BCP) process of requesting and gaining approval from both the Legislature and Governor.

The proposed process is detailed as follows:

1. Each state agency would prepare and submit a BCP to the Department of Finance (DOF) through their normal budget process.
2. To assist stakeholders, Cal/EPA would issue a "*Preliminary AB 32 Crosscut Budget Summary*" based on information from DOF and the contents of the Proposed Governor's Budget.
3. After the Legislature passes and the Governor signs the annual budget act, Cal/EPA would issue an "*Approved AB 32 Crosscut Budget Summary*." This document would be an update of the *Preliminary AB 32 Crosscut Budget Summary*. This final document would become the basis for the current fiscal year's Revenue Requirement under this regulation.

Appendix D

Default Emissions Factor for Unspecified Electricity Imports

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Default Emissions Factor for Unspecified Electricity Imports

In order to equitably include greenhouse gas emissions associated with the generation of electricity in the Cost of Implementation Fee (Fee), it is necessary to assign emissions to imported electricity, which accounts for approximately half of total emissions from electricity consumed in California. Sources of imported electricity can be classified as either specified sources or unspecified sources.

Specified sources are particular electricity generation facilities, for which emissions and electricity output is known. For this fee, asset-owning and asset-controlling suppliers that have been assigned a supplier-specific identification number by ARB are treated as specified sources. When electricity is purchased on the market from an unspecified source, actual emissions cannot be precisely known, but an estimated emissions factor can be used, based on the generation facilities and electricity market in the region from which the electricity originates.

Staff proposes to use an emissions factor of 0.499 MTCO₂/MWh for imported electricity from unspecified sources. This is equivalent to the 1,100 lbs CO₂/MWh interim emission factor recommended by the California Public Utilities Commission and the California Energy Commission in CPUC Decision 07-09-017 (Decision)¹¹. CPUC and CEC recommend using this emission factor until a regional tracking system for greenhouse gas emissions is in place¹².

The joint agency Decision was the result of a public process to provide recommendations to ARB regarding the reporting and verification of greenhouse gas emissions from the electricity sector. It builds on reporting protocols of the California Climate Action Registry. The Decision recommends that proposed regulations for emissions reporting focusing on entities that are "first-deliverers" of electricity into California's transmission grid. This fee would be applied to retail providers and marketers that are first deliverers of electricity from specified or unspecified sources.

An important issue considered by the energy agencies is how to address electricity transactions classified as "contract shuffling." According to the Decision, "contract shuffling refers to a situation in which a retail provider modifies its power contracts to make it appear that emissions have been reduced whereas in fact, emissions are unchanged." For example, contract shuffling would occur if a California retail provider enters into a contract for power from a specified low-emission facility, but the payments to the supplier are actually used to increase generation at a different plant. Because ARB does not have jurisdiction over the electricity market outside of California, it may not be possible

¹¹ CPUC (California Public Utilities Commission), 2007. Decision 07-09-017: Interim Opinion on Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector. http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/72513.pdf

¹² To date, there is no regional tracking system for greenhouse gas emissions.

to determine if contract shuffling is occurring. This may create a significant barrier to accurate accounting of emissions. It is important that the choice of a default emissions factor not be an incentive for contract shuffling.

Prior to the joint agency Decision, CPUC and CEC staff prepared a joint staff proposal for a reporting protocol for electricity retail providers to report greenhouse gas emissions, and parties provided comments on the proposal¹³. The joint staff proposal recommended separate default emission factors for purchases from separate California Independent System Operator (CAISO) markets, and for unspecified sources in the Pacific Northwest and the Southwest. The proposal recommended a lower emissions factor of 419 lbs CO₂/MWh for the Northwest based on a mix of generation with a high percentage of hydroelectric power, and a higher emission factor of 1,075 lbs CO₂/MWh for the Southwest based on marginal electricity generation available for sales from primarily natural gas facilities and a small fraction of coal.

Several parties opposed using different emission factors for different CAISO market pools because they believed this would give marketers incentives that would undermine the efficient operation of electricity markets. Parties also believed that having different emission factors for the Northwest and Southwest would provide an incentive for importers to enter into transactions to hide high-emission sources located in the Southwest by moving power through California to the Northwest and then back into California. State agencies from Oregon and Washington also asserted that hydropower in their states is used primarily for local or regional loads, and that power generated from natural gas or coal is exported to California. They recommended a default emission factor of 1,062 lbs CO₂/MWh for the Northwest.

The joint energy agencies decided to use the conservative default emission factor of 1,100 lbs CO₂/MWh. This relatively high factor would help discourage high-emitting resources from characterizing themselves unspecified resources. Such a factor also would encourage marketers and retail providers to specify their sources of power, improving accuracy in emissions reporting. Using a relatively high default emissions factor would also reduce contract shuffling opportunities. In contrast, a low default emission factor could increase purchases from high-emitting resources by encouraging such sources to market themselves as unspecified sources. The 1,100 lbs CO₂/MWh emission factor is close to the regional average for the western states and higher than emission factors for most modern natural gas combined cycle facilities. With a default emission factor of 1,100 lbs CO₂/MWh, marketers that can specify their lower-emission sources will be encouraged to do so, so that imports from those facilities will have a specific emission factor.

¹³ Murtishaw, Scott, and Karen Griffin, Joint California Public Utilities Commission and California Energy Commission Staff Proposal for an Electricity Retail Provider GHG Reporting Protocol, June 12, 2007, downloaded on March 30, 2009 from <http://ftp.cpuc.ca.gov/puc/energy/electric/climate+change/Joint+Staff+GHG+Reporting+Proposal.pdf>

Finally, asset-owning and asset-controlling suppliers that meet ARB's mandatory reporting requirements for a supplier-specific identification number will also be able to be treated as specified sources. The CPUC and CEC joint staff report recommends a methodology for ARB to use in calculating emission factors for these entities. This methodology is the same as that used by ARB for calculating regional emission factors, as described in the technical report for the mandatory reporting regulation¹⁴. In this methodology, an emission factor for an asset-owning or asset-controlling supplier is the weighted average of emission factors of the supplier's generating facilities and purchased electricity. When part or all of the supplier's purchased electricity is from unspecified sources, that portion is assigned the default emission factor. Staff propose that ARB use this methodology for calculating emission factors for asset-owning and asset-controlling suppliers. Using these supplier-specific emission factors will result in a smaller fraction of imported electricity being assigned the default emission factor.

For the reasons discussed above, staff propose that ARB adopt the stated default emission factor for use in determining the cost-of-implementation fee for unspecified imported electricity. ARB staff recognize that as the development of California's cap-and-trade regulation proceeds, and as experience is gained with the mandatory reporting of emissions, other methods for calculating default emission factors may be needed. Furthermore, better methods of tracking and specifying emissions associated electricity purchased across state lines are likely to be developed. By proposing the adoption of the CPUC and CEC recommended interim default emission factor, staff does not intend to set a precedent for future regulations. After the Cap and Trade regulatory process has determined appropriate emission factors to be used to determine compliance obligation, staff would expect to revisit emission factors used for this fee.

¹⁴ Appendix A of the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions.

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Appendix E
Total In-State Greenhouse Gas Emissions in 2006

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Total In-State Greenhouse Gas Emissions in 2006

| Sector | Emission Type | Details | Total MMTCO ₂ E | % Sector | % Total |
|---|---------------|---------------------|-------------------------------|-------------|---------|
| Transportation | Fuel | Gasoline | 142.2 | 76.5% | 29.6% |
| | | Distillate | 37.5 | 20.2% | 7.8% |
| | | Residual fuel oil | 2.4 | 1.3% | 0.5% |
| | | Jet fuel | 1.4 | 0.7% | 0.3% |
| | | Natural gas | 0.6 | 0.3% | 0.1% |
| | | LPG | 0.5 | 0.3% | 0.1% |
| | | Aviation gasoline | 0.2 | 0.1% | 0.0% |
| | Fugitive | Lubricant Losses | 1.0 | 0.5% | 0.2% |
| | Total | | 185.8 | | 38.7% |
| Electricity Generation (In State) | Fuel | Natural gas | 47.6 | 20.2% | 9.9% |
| | | Petroleum coke | 2.4 | 1.0% | 0.5% |
| | | Coal | 2.4 | 1.0% | 0.5% |
| | | Refinery gas | 1.1 | 0.5% | 0.2% |
| | | MSW | 0.3 | 0.1% | 0.1% |
| | | Blomass | 0.1 | 0.0% | 0.0% |
| | | Distillate | 0.1 | 0.0% | 0.0% |
| | | Waste oil | 0.1 | 0.0% | 0.0% |
| | | Jet fuel | 0.0 | 0.0% | 0.0% |
| | | Tires | 0.0 | 0.0% | 0.0% |
| | | Crude oil | 0.0 | 0.0% | 0.0% |
| | | Residual fuel oil | 0.0 | 0.0% | 0.0% |
| | | Landfill gas | 0.0 | 0.0% | 0.0% |
| | | Digester gas | 0.0 | 0.0% | 0.0% |
| | | Propane | 0.0 | 0.0% | 0.0% |
| | Fugitive | Geothermal | 2.0 | 0.9% | 0.4% |
| | | SF ₆ | 0.7 | 0.3% | 0.1% |
| | Total | | 57.0 | | 11.9% |
| Electricity Generation (Imports) | Fuel | Coal | 25.3 | 10.7% | 5.3% |
| | | Natural gas | 0.1 | 0.0% | 0.0% |
| | | Distillate | 0.0 | 0.0% | 0.0% |
| | | Residual fuel oil | 0.0 | 0.0% | 0.0% |
| | | Unspecified Imports | 24.3 | 10.3% | 5.1% |
| | Fugitive | SF ₆ | 0.3 | 0.1% | 0.1% |
| | | Total | 49.9 | | 10.4% |
| Industrial | Fuel | Natural gas | 37.4 | 36.4% | 7.8% |
| | | Refinery gas | 19.5 | 19.0% | 4.1% |
| | | Catalyst coke | 6.1 | 6.0% | 1.3% |
| | | Coal | 5.9 | 5.7% | 1.2% |

| | | | | | |
|--------------------------|-------------------|---------------------------|--------------|-------|--------------|
| | | Petroleum coke | 4.0 | 3.8% | 0.8% |
| | | Associated gas | 3.2 | 3.1% | 0.7% |
| | | Gasoline | 2.5 | 2.5% | 0.5% |
| | | LPG | 1.3 | 1.3% | 0.3% |
| | | Naphtha | 0.7 | 0.7% | 0.1% |
| | | Distillate | 0.7 | 0.6% | 0.1% |
| | | Other petroleum products | 0.2 | 0.2% | 0.0% |
| | | Tires | 0.2 | 0.2% | 0.0% |
| | | Residual fuel oil | 0.1 | 0.1% | 0.0% |
| | | Wood | 0.1 | 0.0% | 0.0% |
| | | Waste oil | 0.0 | 0.0% | 0.0% |
| | | Crude oil | 0.0 | 0.0% | 0.0% |
| | | Biomass | 0.0 | 0.0% | 0.0% |
| | | Kerosene | 0.0 | 0.0% | 0.0% |
| | | Propane | 0.0 | 0.0% | 0.0% |
| | | Biomass waste fuel | 0.0 | 0.0% | 0.0% |
| | Fugitive | Landfills | 6.3 | 6.1% | 1.3% |
| | | Lubricant Losses | 0.7 | 0.7% | 0.2% |
| | | Manufacturing | 1.2 | 1.2% | 0.3% |
| | | Oil & Gas Extraction | 0.8 | 0.7% | 0.2% |
| | | Petroleum Refining | 0.0 | 0.0% | 0.0% |
| | | Pipeline Losses | 1.9 | 1.8% | 0.4% |
| | | Wastewater Treatment | 2.9 | 2.8% | 0.6% |
| | Process Emissions | Cement Clinker Production | 5.8 | 5.6% | 1.2% |
| | | Manufacturing | 1.3 | 1.2% | 0.3% |
| | | Total | 102.9 | | 21.4% |
| Residential | Fuel | Natural gas | 26.4 | 84.9% | 5.5% |
| | | LPG | 4.3 | 13.8% | 0.9% |
| | | Wood | 0.2 | 0.7% | 0.0% |
| | | Kerosene | 0.1 | 0.4% | 0.0% |
| | | Distillate | 0.1 | 0.2% | 0.0% |
| | | Total | 31.1 | | 6.5% |
| Commercial | Fuel | Coal | 11.6 | 87.7% | 2.4% |
| | | Crude oil | 0.8 | 5.7% | 0.2% |
| | | Digester gas | 0.7 | 5.1% | 0.1% |
| | | Distillate | 0.1 | 0.8% | 0.0% |
| | | Gasoline | 0.0 | 0.4% | 0.0% |
| | | Kerosene | 0.0 | 0.2% | 0.0% |
| | | Landfill gas | 0.0 | 0.2% | 0.0% |
| | | LPG | 0.0 | 0.0% | 0.0% |
| | | Natural gas | 0.0 | 0.0% | 0.0% |
| | | Wood | 0.0 | 0.0% | 0.0% |
| | | Total | 13.2 | | 2.8% |
| Agriculture & | Fuel | Distillate | 3.8 | 14.6% | 0.8% |

| | | | | | |
|--------------------|--------------------------|----------------------------|--------------|--------------|---------------|
| Forestry | | Natural gas | 0.8 | 3.1% | 0.2% |
| | | Gasoline | 0.6 | 2.1% | 0.1% |
| | | Kerosene | 0.0 | 0.0% | 0.0% |
| | Fugitive | Crop Emissions | 9.2 | 35.0% | 1.9% |
| | | Livestock | 15.7 | 59.8% | 3.3% |
| | Managed Burning | Ag Burning | 0.1 | 0.3% | 0.0% |
| | | Forest & Rangeland Burning | 0.2 | 0.7% | 0.0% |
| | Net CO ₂ Flux | Net CO ₂ Flux | -4.1 | - | -0.8% |
| | | Total | 26.2 | 15.5% | -0.8% |
| Not Specified | Fugitive | High GWP | 13.4 | 99.0% | 2.8% |
| | | Solvent Evaporation | 0.1 | 1.0% | 0.0% |
| | | Total | 13.5 | | 2.8% |
| Grand Total | | | 479.7 | | 100.0% |

Source: Air Resources Board, 2006 Greenhouse Gas Inventory

CALIFORNIA AIR RESOURCES BOARD**NOTICE OF PUBLIC MEETING TO CONSIDER STAFF RECOMMENDATIONS TO PROVIDE FURTHER LOCOMOTIVE AND RAILYARD EMISSIONS REDUCTIONS**

The Air Resources Board (ARB or Board) will conduct a public meeting at the time and place noted below to consider staff recommendations to provide further locomotive and railyard emissions reductions.

DATE: September 24, 2009

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 Copley Drive
Diamond Bar, California 91765

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 24, 2009 and may continue at 8:30 a.m., on September 25, 2009. This item may not be considered until September 25, 2009. Please consult the agenda for the meeting, which will be available at least 10 days before September 24, 2009, to determine the day on which this item will be considered.

If you require special accommodations or need this document in an alternate format or language, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

At the April 2008 public meeting, the Board directed staff to develop a plan to further reduce emissions from locomotives and railyards. The emission reductions were to be beyond existing United States Environmental Protection Agency regulations and ARB regulations and agreements. Additional emission reductions are primarily needed to:

- Address the significant remaining public health risks associated with the diesel particulate matter (PM) emissions around California's railyards; and
- Assist in meeting the State Implementation Plan goals for attaining federal ambient air quality standards for ozone and fine particulate matter (PM_{2.5}).

Staff began this process by developing a Technical Options Report that evaluated 37 options to further reduce locomotive and railyard emissions. The 37 options were evaluated based on the following criteria: technical feasibility, potential emissions reductions, costs, and cost-effectiveness. Based on the Technical Options Report, staff is now recommending five locomotive measures as the highest priority options. In general, these measures involve replacing existing switch and medium horsepower locomotives with cleaner locomotives, retrofitting these locomotives with particulate matter and oxides of nitrogen (NOx) aftertreatment devices, and accelerating the introduction of Tier 4 line haul locomotives in 2015 when these cleaner locomotives become available. While costly, the measures are highly cost-effective.

In general, these measures would further reduce statewide locomotive NOx and diesel PM emissions about 30 percent by 2014 and about 70 percent by 2020. As locomotives represent the major emissions at the railyards after the implementation of the existing regulations and agreements, the reduction in locomotive diesel PM emissions translates to an average 65 percent reduction in potential cancer risks in communities surrounding railyards by 2015 and 85 percent reduction by 2020. These reductions are in addition to the significant reductions that have occurred from locomotives and railyards due to existing federal regulations and ARB regulations and agreements.

ARB staff will present a written report at the meeting. Copies of the report may be obtained from ARB's Public Information Office, 1001 I Street, First Floor, Environmental Services Center, Sacramento, California, 95814, at (916) 322-2990. The report may also be obtained from ARB's website at: <http://www.arb.ca.gov/railyard/railyard.htm>.

Interested members of the public may also present comments orally or in writing at the meeting and may be submitted by postal mail or by electronic submittal before the meeting. To be considered by the Board, written comments submissions not physically submitted at the meeting must be received **no later than 12:00 noon, September 23, 2009**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

1 The Technical Options Report was released as a draft in December 2008 and as a final in August 2009. The Report is available at <http://www.arb.ca.gov/railyard/ted/ted.htm>.

The Board requests, but does not require 20 copies of any written submission. Also, ARB requests that written and email statements be filed at least 10 days prior to the meeting so that ARB staff and Board members have time to fully consider each comment. Further inquiries regarding this matter should be directed to Mr. Harold Holmes, Manager, Engineering Evaluation Section at (916) 324-8029.

CALIFORNIA AIR RESOURCES BOARD



for James N. Goldstene
Executive Officer

Date: 9/9/09

Recommendations to Implement Further Locomotive and Railyard Emission Reductions



September 2009

California Environmental Protection Agency

 **Air Resources Board**

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**State of California
California Environmental Protection Agency
AIR RESOURCES BOARD
Stationary Source Division**

**Recommendations to Implement Further
Locomotive and Railyard Emission Reductions**

September 2009

This report has been reviewed by the staff of the Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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Acknowledgements

This report was prepared with assistance and support from the other divisions and offices of the Air Resources Board. In addition, we would like to acknowledge the assistance and cooperation that we have received from many individuals and organizations.

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Recommendations to Implement Further Locomotive and Railyard Emission Reductions

EXECUTIVE SUMMARY

Locomotives and railyards are significant sources of emissions. Consequently, there have been various measures taken to reduce these emissions. Staff estimates that these measures will reduce diesel particulate matter (PM) emissions from all sources at railyards by about 50 percent by 2015 and 65 percent by 2020, even with a strong projected growth in rail operations (See Figure 2 in main report). Reductions have been achieved from every source at railyards – transportation refrigeration units, ultra-low sulfur diesel fuel use, drayage trucks, cargo handling equipment, and locomotives – either through U.S. Environmental Protection Agency (U.S. EPA) regulations, Air Resources Board (ARB/Board) regulations and agreements, or incentive funding. However, the analysis also shows that the remaining emissions, and associated public health risks, are still too high.

Therefore, at the April 2008 public meeting, the Board directed staff to develop a plan to further reduce emissions from locomotives and railyards. The emission reductions were to be beyond existing U.S. EPA regulations and ARB regulations and agreements. Additional emission reductions are primarily needed to:

- Address the significant remaining public health risks associated with the diesel particulate matter (PM) emissions around California's railyards; and
- Assist in meeting the State Implementation Plan (SIP) goals for attaining federal ambient air quality standards for ozone and fine particulate matter (PM_{2.5}).

Staff began this process by developing a Technical Options Report that evaluated 37 options to further reduce locomotive and railyard emissions.¹ The 37 options were evaluated based on the following criteria: technical feasibility, potential emissions reductions, costs, and cost-effectiveness. The data used in the Technical Options Report represent a snapshot in time. Elements such as locomotive fleet composition data are fluid and are influenced by many factors. In addition, other data used to evaluate technological feasibility, potential emission reductions, and costs are also fluid and subject to change. The staff expects to provide updates as technology developments and demonstration project results warrant.

Based on the Technical Options Report, staff is now recommending five locomotive measures as the highest priority options. In addition to these five options, the staff is also recommending a number of additional actions that collectively will achieve additional emission reductions from locomotives and railyards, facilitate longer term

¹ The Technical Options Report was released as a draft in December 2008. The report was revised and released again in August 2009. The Report is available at <http://www.arb.ca.gov/railyard/ted/ted.htm>.

regulation of locomotives, and improve our understanding of the emissions from locomotives and railyards.

A summary of these actions is presented below and discussed in more detail in the main body of this report.

Repower, Retrofit, and Replace Locomotives. The Technical Options Report identified five specific measures for reducing emissions from locomotives. In general, these measures involve replacing existing switch and medium horsepower locomotives with cleaner locomotives, retrofitting these locomotives with particulate matter (PM) and oxides of nitrogen (NOx) aftertreatment devices, and accelerating the introduction of Tier 4 line haul locomotives. These measures have staggered implementation dates that coincide with the development of the necessary advanced engines and aftertreatment technologies. Table ES-1 summarizes the five recommended locomotive measures.

**Table ES-1
Recommended Locomotive Measures**

| Recommendations | Emission Reductions When Fully Implemented (tons per day) * | | | | | | Carl Moyer Program Cost- Effectiveness (\$ /lb) | Total Costs (millions) |
|---|--|------|---------------------------------|------|-----------------|------|--|------------------------------|
| | South Coast Air Basin | | San Joaquin Valley Air Basin | | Statewide | | | |
| | NO _x | PM | NO _x | PM | NO _x | PM | | |
| Repower older switch locomotives: 2010 – 2012 | 2.8 | 0.14 | 0.9 | 0.03 | 6.6 | 0.3 | \$1.70-\$2.80/lb | \$230 |
| Repower older MHP locomotives: 2011 – 2013 | 8.6** | 0.47 | 4.3 | 0.21 | 23 | 1.25 | \$2.80-\$4.60/lb | \$400 |
| Retrofit switch locomotives with DPF and SCR: 2012 – 2015 | 0.6 | 0.02 | 0.14 | 0.01 | 1.0 | 0.04 | \$0.80-\$1.40/lb | \$50 |
| Retrofit medium horsepower locomotives with DPF and SCR: 2012 – 2016 | 2.6 | 0.07 | 1.1 | 0.03 | 6.8 | 0.18 | \$2.00-\$3.30/lb | \$200 |
| Accelerate the introduction of Tier 4 line haul locomotives: 2015 – 2025 | 6.4 | 0.32 | 6.4 | 0.32 | 32.0 | 1.60 | \$4.00-\$8.60/lb | \$3,000 |
| Total Statewide Emission Reductions | 21.0 | 1.02 | 12.8 | 0.60 | 69.4 | 3.37 | \$1.30-\$4.00/lb | ~\$3,900 |

* These reductions are calculated based on an analysis of the emissions reductions achieved on an individual locomotive basis.

** Note: Of the 8.6 tons per day of NO_x reductions in the SCAB, the SCAQMD expects to get 3.0 tons per day from proposed SCR retrofits to 37 Metrolink MHP passenger locomotives.

As shown in Table ES-1, the measures are costly, but highly cost-effective. To implement these measures, the staff recommends that the ARB work with the U.S. EPA, the local air districts, the railroads, and the stakeholders to seek incentive funds for implementing these measures.²

The emission reductions are presented as the total tons per day that would be achieved upon full implementation of the measure. In general, these additional reductions would reduce statewide locomotive NOx and diesel PM emissions by about 30 percent by 2014, and by about 70 percent by 2020. As locomotives represent the major emissions at the railyards after the implementation of the existing regulations and agreements, the reduction in locomotive diesel PM emissions translates to a 65 percent reduction in potential cancer risks in communities surrounding railyards by 2015 and 85 percent reduction by 2020.

In addition to the pursuing the locomotive measures and seeking incentive funds, the staff is recommending the following actions:

- **Continue to Investigate and Implement Specific Railyard Measures** – Staff recommends that work continue to expeditiously identify and implement specific railyard mitigation measures that would reduce the emissions and public health risk around railyards. Railyard-specific mitigation measures could include erecting walls, growing trees, installing air monitoring stations, and installing indoor air filters in residential homes. Also, the hood technology could potentially reduce some stationary locomotive emissions at large locomotive classification and mechanical and servicing railyards. Each railyard has unique operations, meteorology, emissions density, and levels of residential exposure that would affect the costs and benefits derived from these types of measures.

In addition, staff recommends that the local governments, railroads, and local communities continue to work together to identify legal and other approaches that could be used to further reduce emissions from railyards. Such actions might include changes in railyard operations, changes in traffic movements, and changes in land use around railyards.

- **Seek Changes in Federal Laws to Eliminate Federal Preemption** - In parallel with efforts to seek incentive funds, staff recommends that ARB work with stakeholders to seek changes in federal laws to provide California with clear authority to regulate locomotives. Staff has evaluated ARB's legal authority to regulate locomotives based on the federal Clean Air Act (CAA), U.S. EPA regulations, and the Interstate Commerce Commission Termination Act (ICCTA). While it appears as if there is some limited authority, staff believes that broader statutory and regulatory authority is necessary to effectively regulate locomotives to achieve the emission reductions necessary to address the public health and

² Possible incentive funds could come from the following programs: federal Diesel Emissions Reduction Act, Proposition 1B, Carl Moyer, the Air Quality Improvement Program, and the Alternative and Renewable Fuel and Vehicle Technology Program.

welfare. A more detailed discussion of this issue is presented in the main report and in Appendix A.

- **Consider Additional Measures for Cargo Handling Equipment** – Staff is currently evaluating a measure for reduced idling of cargo handling equipment. Cargo handling equipment generally includes yard trucks, top and side picks, and rubber-tired gantry (RTG) cranes. In addition, there are ongoing test programs of emission control measures that, if implemented, would further reduce emissions from cargo handling equipment beyond the existing ARB cargo handling equipment regulation adopted in 2005. These test programs include diesel, liquefied natural gas, and hydraulic hybrid yard trucks. Staff recommends that ARB support these test programs. If the ongoing test programs are successful and appear to be cost-effective, staff recommends initiating a rulemaking effort to modify the existing cargo handling equipment regulation to incorporate such measures.
- **Participate in the California Environmental Quality Act (CEQA) Process for the ICTF and SCIG Projects** – Staff recommends that ARB participate in the review of proposals to rebuild the Union Pacific International Container Transfer Facility (ICTF) and build the Southern California International Gateway (SCIG) railyard. As part of the review, staff should work to ensure that the best available emission controls are incorporated into the projects and that a full assessment of potential off-site mitigation is conducted.
- **Support the San Pedro Bay Ports Clean Air Action Plan Update** – The two San Pedro Bay Ports are currently updating the clean air action plan. Staff recommends that the ARB support the San Pedro Bay Ports efforts to accelerate the turnover of cleaner switch locomotives consistent with ARB's recommendations in this report. In addition, the staff recommends that ARB support the San Pedro Bay Ports efforts to accelerate the turnover of cleaner Tier 4 line haul locomotives serving port properties as expeditiously as possible following their introduction in 2015, with the goal of 95 percent Tier 4 line haul locomotives serving the ports by 2020.
- **Seek Changes in Federal Regulations for Switch and Line Haul Locomotives** – The U.S. EPA has the regulatory authority to establish more stringent requirements for switch and line haul locomotives that would accelerate emission reductions prior to the full implementation of the Tier 4 locomotives. These actions include requiring more stringent emission controls upon remanufacturing and to require that locomotives be remanufactured at specified intervals. Again, staff proposes to work with stakeholders to seek changes in the U.S. EPA regulations.
- **Continue to Develop the Goods Movement Efficiency Measure** – Staff recommends that ARB continue to evaluate the efficiency of goods movement in support of California's Scoping Plan for reducing greenhouse gas emissions from

the goods movement sector. In addition to reducing GHG emissions, staff expects such efficiencies would result in further reductions in criteria and toxic air pollutants from the freight transport sector as a whole.

- **Evaluate Electrification of Rail as a Long Term Measure** – In the Technical Options Report, staff evaluated electrification of rail as one potential option. Staff recommends that efforts continue to evaluate rail electrification, particularly in the South Coast Air Basin, as a potential long term control measure.
- **Develop Improved Emission Inventories for Locomotives and Railyards** – The ability to evaluate and assess the impact of various measures on emissions is dependent upon accurate emissions inventories. Staff has developed significant new information based on the work done on the health risk assessments and the draft mitigation plans. In addition, previous growth projections may need revision. Therefore, staff recommends that efforts continue to improve the statewide emissions inventory and the region-specific emission estimates for the South Coast and San Joaquin Valley needed to assess progress towards achieving SIP targets.
- **Continue Support for Advanced Locomotive Research Programs** – There are a number of ongoing and proposed research projects directed at the development of advanced locomotives and the application of aftertreatment devices on locomotives, both from a retrofit and new build perspective. Staff recommends that ARB continue to support these programs. Summaries of these ongoing and proposed test programs are presented in the main report.

In implementing these recommendations, staff will need to work closely with the U.S. EPA, the local air districts, the railyards, the local communities, and other stakeholders. Successful implementation of these measures will significantly further reduce the emissions from locomotives and railyards.

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Recommendations to Implement Further Locomotive and Railyard Emission Reductions

This document provides staff recommendations to the Air Resources Board (ARB/Board) on how to further reduce emissions from locomotives and railyards. The timeframe considered in the document is generally 2010 through 2025. These emission reductions are to be beyond reductions that have been achieved or would be achieved from previously adopted U.S. EPA regulations and ARB regulations and agreements.

A. Why did staff prepare this report?

At the April 2008 public meeting, the Board directed staff to develop a plan to provide further locomotive and railyard emissions reductions. In response to the Board's direction, ARB staff released a draft report entitled *Technical Options to Achieve Additional Emissions and Risk Reductions from California Locomotives and Railyards* (Technical Options Report) in December 2008. A revised Technical Options Report that incorporated public comments and update information was released in August 2009.³

In the Technical Options Report, staff evaluated 37 options to achieve additional emission reductions from locomotives and railyards. The Technical Options Report evaluated each option for: (1) technical feasibility, based on the state of development and the ability to implement a particular technology or operational measure; (2) potential emission reductions; (3) costs; and (4) cost-effectiveness. The data used in the Technical Options Report represent a snapshot in time. Elements such as locomotive fleet composition data are fluid and are influenced by many factors. In addition, other data used to evaluate technological feasibility, potential emission reductions, and costs are also fluid and subject to change. The staff expects to provide updates as technology developments and demonstration project results warrant.

Using the information presented in the Technical Options Report, staff developed recommendations based on those measures that had the greatest potential for emission reductions, with consideration of technical feasibility, cost-effectiveness, cost, and implementation timeframe. These recommendations are scheduled to be considered by the Board at the September 2009 public meeting.

B. Why does California need more locomotive and railyard emission reductions?

California needs to accelerate and provide additional locomotive and railyard emission reductions for two main reasons:

- To address the significant remaining public health risks associated with the diesel particulate matter (PM) emissions around California's railyards; and

³ The Technical Options Report is available at <http://www.arb.ca.gov/railyard/ted/ted.htm>.

- To assist in meeting the State Implementation Plan (SIP) goals for attaining federal ambient air quality standards for ozone and fine particulate matter (PM_{2.5}) by reducing emissions of oxides of nitrogen (NOx) and PM from locomotives.

In addition, there is an ongoing need to reduce greenhouse gas (GHG) emissions in support of the California Global Warming Solutions Act of 2006⁴ and California's Scoping Plan⁵ measure for improving the efficiency of goods movement within California. This document presents only a general consideration of GHG benefits, as a more detailed ongoing effort is underway to evaluate GHG emissions associated with goods movement.

Each of these reasons is discussed briefly in the following sections.

1. Reducing Diesel PM Emissions and Public Health Risks Near Railyards

Reducing the emissions of diesel PM is one of the Board's highest priorities. In 2000, the Board approved the Diesel Risk Reduction Plan that called for expedited diesel PM reductions within communities and an overall 85 percent reduction in diesel PM by 2020.⁶ In 2006, the Board approved the Goods Movement Emission Reduction Plan (Goods Movement Plan) that further supported the need for diesel PM reductions and specifically focused on emissions related to goods movement.⁷ In the Goods Movement Plan, the Board further identified the need to make every feasible effort to reduce localized risk in communities adjacent to major goods movement facilities, including railyards, as expeditiously as possible.

Over the last several years, ARB staff, in cooperation with Union Pacific Railroad (UP) and BNSF Railway (BNSF), completed 18 health risk assessments (HRAs) for 17 major railyards and one smaller railyard. These HRAs have clearly demonstrated that living around a railyard poses a significant public health risk resulting from the exposure to diesel PM, which is an identified toxic air contaminant. The HRAs found that over three million people are exposed to excess cancer risks of at least 10 chances per million due to diesel PM emissions from railyard-related sources within or near railyards.

2. Reducing NOx and PM from Locomotives to Meet SIP Targets

In September 2007, the Board adopted the 2007 State Strategy for the California State Implementation Plan (SIP) that included emission reduction targets for locomotives. These targets are a necessary part of the effort to meet health-based federal air quality standards for ozone and fine particulates (PM_{2.5}). Where necessary, the air pollution

⁴ Assembly Bill (AB) 32, Chapter 488, Statutes of 2006, Division 25.5, California Health and Safety Code, Division 25.5, sections 38500 et seq.

⁵ *Climate Change Scoping Plan: A Framework for Change*, California Air Resources Board, December 2008.

⁶ *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*, California Air Resources Board, Stationary Source Division and Mobile Source Control Division, October 2000.

⁷ *Goods Movement Emission Reduction Plan*, California Air Resources Board, 2006.

control and air quality management districts (local air districts) in federal nonattainment areas incorporated the 2007 State Strategy into an attainment demonstration that includes an overall commitment to achieve the emission reductions necessary to achieve federal 8-hour ozone and PM_{2.5} standards by the applicable attainment date.

The 2007 State Strategy targets specified emission reduction targets from locomotives in the South Coast and San Joaquin Valley – the two areas with the most extreme ozone and fine particulate matter attainment challenges. These targets were submitted to the U.S. EPA as an element of California's SIP. Other areas of California will benefit as emissions are reduced in these major upwind areas.

The SIP targets to reduce emissions from locomotives for the South Coast Air Basin and the San Joaquin Valley Air Basin are discussed below.

a. South Coast Air Basin (SCAB)

The 2007 State Strategy targets the need to reduce locomotive emissions to meet the federal ozone and PM_{2.5} ambient air quality standards by the 2014 federally mandated attainment date. The emission reduction targets are 4.3 tons per day of NOx and 0.20 tons per day of directly emitted PM. The SIP also established a 2023 target emission reduction of 15.6 tons per day for NOx, with an interim NOx target of 13.4 tons per day in 2020. The 2007 SIP also calls on U.S. EPA to provide 10 tons per day of NOx emission reductions by 2014 from sources under its control. This target is also principally predicated on the potential to achieve emission reductions from cleaner Tier 4 line haul locomotives, thus bringing the total South Coast locomotive NOx reductions to 14.3 tons per day by 2014, 23.4 tons per day by 2020, and 25.6 tons per day by 2023.⁸

b. San Joaquin Valley Air Basin (SJVAB)

Locomotive emission reductions targets were also included in the 2007 State Strategy for the San Joaquin Valley 2007 Ozone Plan and 2008 PM_{2.5} Attainment Plan. In the San Joaquin Valley, these targets would reduce line haul locomotive emissions by 7.2 tons per day and directly emitted PM_{2.5} by 0.18 tons per day in 2014. The 2023 target for NOx was 16.4 tons per day, with interim NOx targets in 2017 and 2020 of 11.4 tons per day and 15.6 tons per day, respectively.

3. Reducing Greenhouse Gas Emissions from the Transportation Sector

Through the Global Warming Solutions Act of 2006, California has committed to reducing greenhouse gas (GHG) emissions to 1990 levels by 2020. Transportation produced about 40 percent of the state's total GHG emissions in 2004. A significant portion of GHG emissions from transportation activities comes from the movement of freight or goods throughout the State. Both the Goods Movement Plan and the 2007 State Implementation Plan (SIP) contain numerous measures designed to reduce the

⁸ Substitution with NOx reductions from other federal sources is possible.

public health impact of goods movement activities in California. Proposition 1B funds, as well as clean air plans being implemented by California's ports, will also help reduce freight movement GHG emissions while cutting criteria pollutant and diesel PM emissions.

The Board adopted California's Scoping Plan to meet AB 32 requirements in December 2008. The Scoping Plan outlines the measures to be implemented to meet California's GHG reduction goals and calls on all sectors, including the freight transport sector, to reduce GHG emissions. Under the Scoping Plan, ARB is proposing to develop and implement additional measures to reduce greenhouse gas emissions due to goods movement from trucks, ports and other related facilities. The anticipated reductions would be above and beyond what is already expected from the Goods Movement Plan and the SIP. This effort should provide accompanying reductions in air toxics and smog forming emissions.

Measure T-6 in the AB 32 Scoping Plan, *Freight Transport Efficiency Measures*, is a broad-based and multi-faceted measure that will implement system-wide efficiency improvements to achieve a reduction in GHG emissions from the freight transport sector of at least 3.5 million metric tons of carbon dioxide equivalent by 2020.

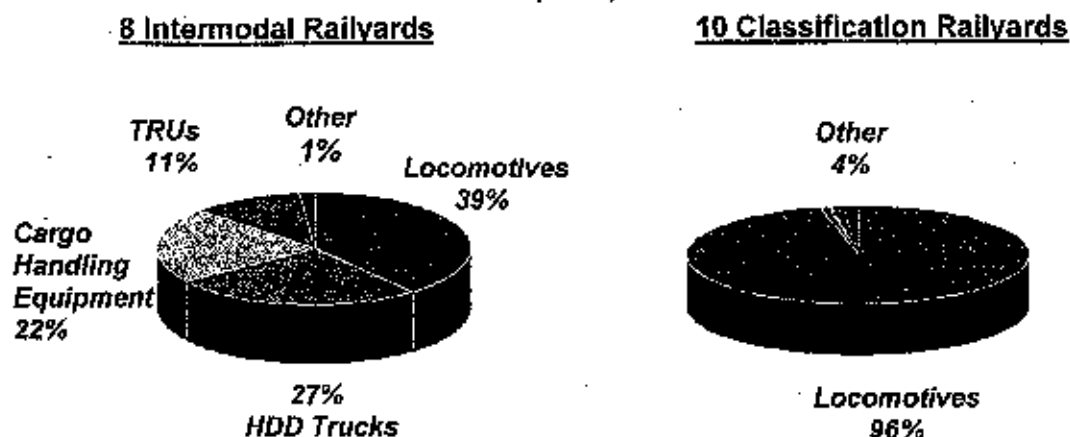
C. What are the emissions and emission trends from railyards and locomotives?

1. Railyards

Railyards are categorized as either classification railyards or intermodal railyards. In classification railyards, trains are formed by sorting and separating railcars in a bowl of multiple tracks and then are connected with a group of locomotive to form outbound trains. Classification railyards are also where railroads generally operate major maintenance facilities and large fueling stations. Intermodal railyards are designed to shift containers and trailers from trains to trucks and vice versa. Of the 18 California railyards with completed HRAs, ten were classification yards and eight were intermodal yards.

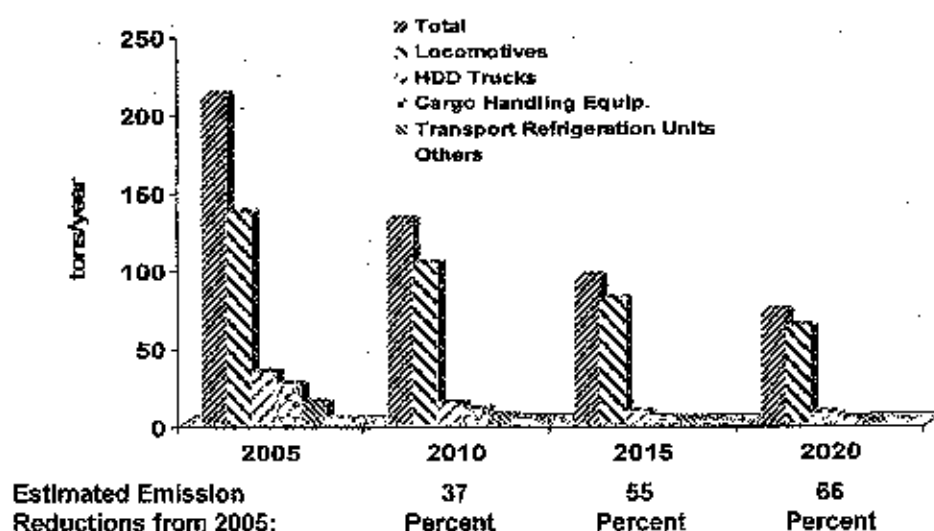
Emissions at the ten classification yards come almost exclusively from locomotives. At the eight intermodal railyards, locomotives accounted for about 40 percent of the emissions, with the balance coming from heavy-duty diesel trucks, cargo handling equipment, and transport refrigeration units (TRUs) operating at the railyards. Figure 1 presents the breakdown of emissions at classification and intermodal railyards in California.

Figure 1
Distribution of Railyard Diesel PM Emission Sources
(2005)



As shown in Figure 2, staff estimates that diesel PM emissions from all sources at railyards will be reduced by about one-third by 2010, about half by 2015, and about two-thirds by 2020, even with a strong projected growth in rail operations. These reductions have been achieved from every source at railyards using a variety of measures. The sources include transportation refrigeration units, ultra-low sulfur diesel fuel use, drayage trucks, cargo handling equipment, and locomotives. These reductions in railyard diesel PM emissions are expected to occur in large part due to U.S. EPA regulations and ARB regulation and agreements, including the 1998 railroad agreement, rather than any new initiatives at specific railyards.

Figure 2
Estimated Total Railyard Diesel PM Emissions From 18 Major Railyards
With Implementation of Existing
U.S. EPA Regulations and ARB Regulations and Agreements



As shown in Table 1, the diesel PM emission reductions from existing regulations and agreements would also lower population exposure above ten in a million excess cancer risks from three million residents in 2005 to about one million residents in 2015.

Table 1
Estimated Population Exposure From Diesel PM Emissions
At 18 Major Railyards

| Year | Diesel PM Emissions (tons per year) | Population Exposure Excess Cancer Risks (> 10 in a million) |
|------|--|---|
| 2005 | 210 | 3,000,000 |
| 2010 | 131 | 1,700,000 |
| 2015 | 94 | 1,000,000 |
| 2020 | 72 | 850,000 |

To put these tons in perspective, the estimated annual diesel PM emissions in 2005 were 7,800 tons in the South Coast Air Basin, 1,760 tons in the San Pedro Bay Ports, and 130 tons at the combined railyards in the South Coast Air Basin.

Table 2 presents an estimate of the potential cancer risks at each railyard through 2020 based on reductions in emissions that will be achieved from measures that have been adopted or have been implemented as part of agreements with the railroads.

The maximum individual cancer risk (MICR) is defined as the estimated probability of a potential maximally exposed individual contracting cancer as a result of exposure to toxic air contaminants: the exposure is over a period of 70 years for residential receptor locations, and 40 years for worker receptor locations. As shown in Table 2, for all but two of the smaller railyards, the estimated MICR in 2005 exceeded a potential risk of 100 per million, with five of the railyards having a potential cancer risk of at least 500 per million for a subset of the population.⁹ One small residential location near the railyard gate at the San Bernardino railyard had a peak potential cancer risk of approximately 2,500 per million.

While Table 2 shows that there is a continuous reduction in risk at each railyard from 2010 to 2020, the population exposures and remaining risk levels are still too high, and additional emissions reductions are necessary to reduce public health risks around railyards to acceptable levels. Note that the Table 2 emissions estimates are based on a one percent annual growth rate. The charts are presented as an indication of the effect that existing measures have on emissions. This growth estimate is the same as

⁹ The potential cancer risk is expressed as the maximum individual cancer risk per million people exposed.

that used in the Goods Movement Plan. As discussed in the section below, these estimates are likely overestimates of the growth for the current economy. This issue is discussed further in the following section.

Table 2
Estimated Maximum Individual Cancer Risks (MICR)
At 18 Major Railyards to Be Achieved by Actions Already Implemented
(2005 to 2020)

| Railyard | MICR (chances in a million) | | | |
|------------------------|--------------------------------|-------|------|------|
| | 2005 | 2010 | 2015 | 2020 |
| BNSF Hobart | 500 | 210 | 160 | 120 |
| BNSF Sheila Mechanical | 40 | 30 | 20 | 15 |
| BNSF Commerce Eastern | 100 | 35 | 30 | 20 |
| BNSF San Bernardino | 2,500 | 1,340 | 910 | 605 |
| UP Commerce | 500 | 225 | 155 | 120 |
| UP ICTF | 800 | 400 | 215 | 185 |
| UP Oakland | 460 | 240 | 165 | 130 |
| UP City of Industry | 450 | 200 | 135 | 105 |
| UP Colton | 150 | 120 | 105 | 85 |
| UP LATC | 250 | 160 | 110 | 90 |
| BNSF Barstow | 450 | 445 | 325 | 245 |
| BNSF Stockton | 120 | 110 | 75 | 65 |
| BNSF Watson | 175 | 115 | 85 | 65 |
| BNSF Richmond | 100 | 55 | 35 | 25 |
| BNSF San Diego | 70 | 65 | 40 | 25 |
| UP Stockton | 150 | 60 | 50 | 40 |
| UP Mira Loma | 100 | 55 | 40 | 35 |
| UP Roseville | 645 | 505 | 375 | 250 |

Note: MICR estimates for 2005 are based on emission inventories in the railyard HRAs. For 2010, 2015, and 2020, MICR estimates are based on estimated emission reductions for each railyard in the draft UP and BNSF railyard mitigation plans. For UP Roseville Railyard, 645 in a million is the average risk in the >500 in a million risk zone, and is the MICR for the entire railyard based on 2000 data.

2. Locomotives

For purposes of this analysis, we have divided locomotives into three groups: interstate line haul locomotives; medium horsepower (MHP) locomotives that are mostly in California or regional service; and switch locomotives. The groupings represent three generally different uses for locomotives within California. Specific details on these types of locomotives are presented in the Technical Options Report. In general, the use of these locomotives is summarized below.

- **Interstate Line Haul Locomotive** are generally newer (built 1995 and later) and high horsepower (greater than 4,000 hp) locomotives that typically operate over long distances and many states. On a typical trip, such as between Chicago and Los Angeles, an interstate line haul locomotive may operate in California only about 10 to 20 percent of the trip.
- **Medium Horsepower (MHP) Locomotives** are typically, older locomotives that may have once served in interstate line haul service, but are now used in regional service. Applications include large switching operations and local road service (2,301 hp to 2,999 hp), helpers and short haul service (3,000 hp to 3,299 hp), or intrastate line haul service (3,300 hp to 4,000 hp). This category also includes passenger locomotives, which typically are 3,000 hp to 3,600 hp.
- **Switch (Yard) Locomotives** are typically used to push railcars together to form trains within railyards, but can also be used to power local and regional service trains. They use engines that produce between about 1,000 hp to 2,300 hp.

In 2005, California's locomotive NOx and PM emissions were about 160 and 4.8 tons per day, respectively. As shown in Table 3, interstate locomotives account for about 63 percent of the emissions from locomotives. MHP locomotives account for about 22 percent, with passenger and switch locomotives accounting for about 15 percent combined. Similar data are presented in Tables 4 and 5 for the South Coast Air Basin and the San Joaquin Valley Air Basin, respectively.

Table 3
2005 Locomotive NOx and PM Emissions
Statewide

| Statewide Sources | NOx (tons/day) | Percent | PM (tons/day) | Percent |
|---|-------------------|---------|------------------|---------|
| All Locomotives | 158* | --- | 4.8 | --- |
| Contribution to Statewide NOx and Locomotive Emissions | | | | |
| Interstate Line Haul Locomotives | 103.0 | 63% | 3.2 | 67% |
| Medium HP Locomotives | 34.5 | 22% | 1.2 | 25% |
| Switch Locomotives | 9.4 | 6% | 0.2 | 4% |
| Passenger Locomotives | 10.3 | 9% | 0.2 | 4% |

* Numbers do not add precisely due to rounding.

Table 4
2005 Locomotive NOx and PM Emissions
South Coast Air Basin

| South Coast Sources | NOx (tons/day) | Percent | PM (tons/day) | Percent |
|--|---------------------------|----------------|--------------------------|----------------|
| All Locomotives | 32.3* | --- | 0.94 | --- |
| Contribution to South Coast NOx and PM Locomotive Emissions | | | | |
| Interstate Line Haul Locomotives | 17.8 | 55% | 0.56 | 60% |
| Medium HP Locomotives | 5.9 | 18% | 0.20 | 21% |
| Switch Locomotives | 4.6 | 14% | 0.10 | 11% |
| Passenger Locomotives | 3.9 | 13% | 0.08 | 8% |

* Numbers do not add precisely due to rounding.

Table 5
2005 Locomotive NOx and PM Emissions
San Joaquin Valley Air Basin

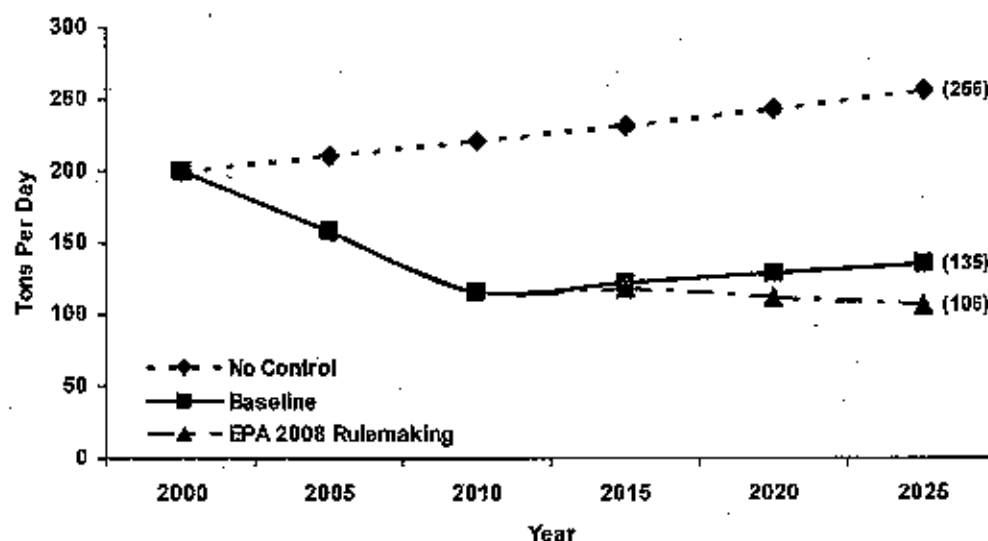
| San Joaquin Valley Sources | NOx (tons/day) | Percent | PM (tons/day) | Percent |
|---|---------------------------|----------------|--------------------------|----------------|
| All Locomotives | 23.6 | --- | 0.66* | --- |
| Contribution to San Joaquin Valley NOx and PM Locomotive Emissions | | | | |
| Interstate Line Haul Locomotives | 15.7 | 67% | 0.46 | 69% |
| Medium HP Locomotives | 5.3 | 22% | 0.15 | 22% |
| Switch Locomotives | 1.9 | 8% | 0.04 | 6% |
| Passenger Locomotives | 0.7 | 3% | 0.02 | 3% |

* Numbers do not add precisely due to rounding.

The 1998 ARB/UP/BNSF Locomotive NOx Fleet Average Agreement, the 2005 ARB/UP/BNSF Statewide Railroad Agreement, the 1998 U.S. EPA locomotive rulemaking, and the ARB diesel fuel regulation for intrastate locomotives provide substantial statewide locomotive NOx and PM emission reductions between 2000 and 2010. After 2010, without further controls, the ARB locomotive emission inventory assumes that growth will begin to erode the benefits of the existing measures, with a slight and gradual increase in statewide locomotive emissions occurring from 2010 to 2025. However, the recent 2008 U.S. EPA locomotive rulemaking will provide further NOx and PM emission reductions that should offset the reductions lost because of growth. Under the 2008 rulemaking, Tier 4 emission standards will begin to take effect in 2015, significantly reducing NOx and PM emissions for new locomotives. The 2008 rulemaking remanufacturing requirements provide relatively limited NOx reductions, but potentially significant PM reductions.

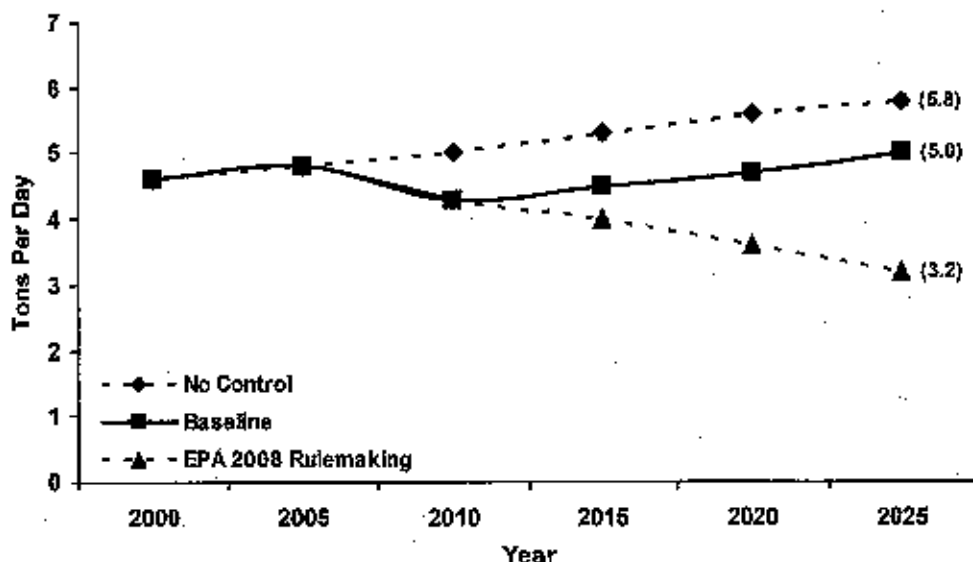
Figures 3 and 4 present ARB staff estimates of locomotive emission trends from 2010 through 2025.¹⁰ Again, these estimates are based on a one percent annual growth rate. As the graphs show, the projections show little benefit from U.S. EPA's 2008 rulemaking through 2015 for NOx, although there is some reduction in PM due to remanufacturing requirements. However, the potential NOx benefits in California are about 30 tons per day, or about a 20 percent statewide NOx reduction, by 2025. For PM, the potential statewide PM locomotive emissions could be reduced by about 35 percent in 2025, from the 5.0 tons per day baseline to 3.2 tons per day.

Figure 3
Estimated Statewide Locomotive NOx Emissions
 (Assumes 1 Percent Annual Growth Rate, 2010 to 2025)



¹⁰ These forecasts are based on locomotive emission control factors, UP and BNSF national diesel fuel consumption data, California diesel fuel dispensing data, and an assumed annual growth rate of one percent.

Figure 4
Estimated Statewide Locomotive PM Emissions
 (Assumes 1 Percent Annual Growth Rate, 2010 to 2025)

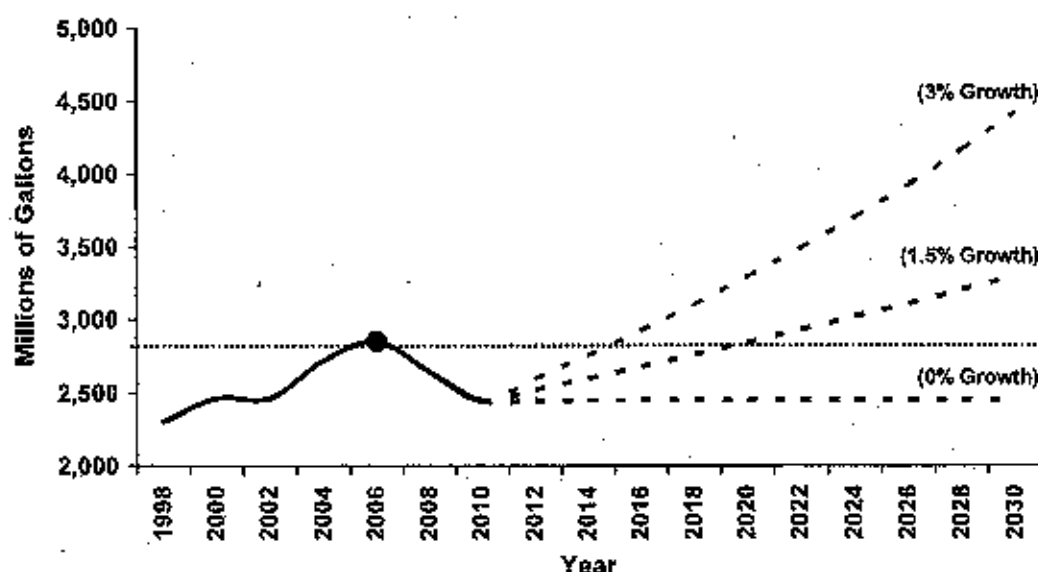


Figures 3 and 4 are presented to provide a graphic illustration of the potential impacts of existing measures on estimated NOx and PM emission reductions. However, it should be noted that the forecasts from 2010 to 2025 are based on updated control factors, UP and BNSF national diesel fuel consumption data, California diesel fuel dispensing data, and an assumed annual growth rate of one percent.¹¹ Further emission inventory work is underway to improve region-specific emission estimates for SIP purposes.

Figure 5 presents historic and projected growth rates of diesel fuel consumption for UP and BNSF from 1998 through 2030. Overall, from 1998 through 2008, UP and BNSF national diesel fuel consumption increased at an average annual rate of about 1.5 percent. Since 2006 (peak year) through 2009, UP and BNSF locomotive national diesel fuel consumption system wide has dropped by more than seven percent, partly due to the combined effects of fuel conservation efforts, the increased use of more fuel efficient locomotives, and the downturn in the economy.

¹¹ Current ARB emission inventories include a higher growth rate. Efforts are underway to update the ARB emissions inventories.

Figure 5
UP and BNSF Locomotive Diesel Fuel Consumption (1998 to 2009)
and Forecast Scenarios (2010 to 2030)



In California, economic conditions have led to less goods being transported by rail, especially imports, and a greater reduction in fuel consumption in California. Staff estimates that locomotive diesel fuel consumption may have decreased more than 20 percent since 2006. As shown in Figure 5, if fuel consumption begins to increase at peak rate of three percent per year, staff estimates fuel consumption could return to peak year (2006) levels as early as 2015; if fuel consumption begins to increase at an average rate of 1.5 percent per year, fuel consumption could return to 2006 levels around 2020. The realized and projected downturns in fuel consumption will also lower the emission estimates presented. Therefore, it will be important to reassess the emissions inventory estimates and projections to reflect the latest economic conditions.

D. What priority options does staff recommend to reduce emissions?

Due to the high diesel PM risk in and around railyards and the need to meet SIP targets by 2014, ARB staff is recommending specific options focused on upgrading the locomotive fleet to achieve reductions by 2014. In addition, staff recommends that ARB continue to focus on emission reductions that can be achieved at specific railyards and regions by phasing in advanced technology control measures. Long-term emission reduction efforts would be directed at measures that would begin to be implemented in 2015 and continue through 2020 and beyond.

Implementation of these options could substantially reduce emissions and public health risk in and around railyards and will help meet SIP targets by reducing locomotive emissions. In addition, the recommended options will help set the stage for reductions necessary to meet new federal standards. The recommended options are presented on a statewide basis, as well as specific recommendations for the South Coast and San Joaquin Valley Air Basins. All of the recommended measures are designed to achieve reductions over and above those that are to be achieved with existing State and federal regulations and State agreements.

The following sections present the staff's recommendations.

1. Repower Switch and Medium Horsepower Locomotives

The Technical Options Report identified significant emission reductions that can be cost-effectively achieved by repowering older switch and medium horsepower locomotives. These are the highest priority options. Full implementation of these two measures by 2014 can reduce statewide switch and medium horsepower locomotive NOx emissions by about 70 percent and diesel PM emissions by about 80 percent on average. Table 6 shows the number of switch locomotives and medium horsepower locomotives that must be replaced to achieve the emission reductions by 2014.

Table 6
Potential Total Number of Switch and Medium Horsepower Locomotives
To be Repowered by 2014
(2007 Data)

| Region | No. of Switch Locomotives | No. of Medium Horsepower Locomotives |
|------------------------------|---------------------------|--------------------------------------|
| South Coast Air Basin | 63 | 150* |
| San Joaquin Valley Air Basin | 28 | 67 |
| Rest of the State | 61 | 183 |
| Total | 152 | 400** |

* The SCAB total includes 37 Metrolink and 15 Amtrak MHP passenger locomotives. In 2008-2009, Metrolink purchased 15 additional passenger locomotives that are not included in these data.

** Includes 110 passenger locomotives.

Table 7 shows the overall emission reductions, costs, and cost-effectiveness of repowering these locomotives. The costs are based on the repowering of switch locomotives at a cost of \$1.5 million per switch locomotive, and the repowering of

medium horsepower locomotives at \$1.0 million per locomotive.¹² The cost-effectiveness is calculated based on the methodology presented in the Carl Moyer Program guidelines. As Table 7 shows, repowering of the locomotives is very cost-effective, ranging from about \$0.8 to \$3 per pound. For comparison, the typical Carl Moyer cost-effectiveness for approved projects is approximately \$1 to \$3 per pound, with a cap of \$8 per pound.

Table 7
Emission Reductions and Costs of Replacing or Repowering
Switch and Medium Horsepower Locomotives by 2014

| Recommendations | Emission Reductions in 2014 (tons per day)* | | | | | | Carl Moyer Program Cost Effectiveness (\$ /lb) | Total Costs (millions) |
|---|---|-------------|------------------------------|-------------|-----------------|-------------|--|------------------------|
| | South Coast Air Basin | | San Joaquin Valley Air Basin | | Statewide | | | |
| | NO _x | PM | NO _x | PM | NO _x | PM | | |
| Repower older switch locomotives: 2010-2012 | 2.8 | 0.14 | 0.9 | 0.03 | 6.6 | 0.30 | \$1.80 - \$3.00/lb | \$230 |
| Repower older MHP locomotives: 2011-2013 | 8.6 | 0.47 | 4.3 | 0.21 | 23 | 1.25 | \$0.80 - \$1.30/lb | \$400 |
| Total Emission Reductions in 2014 | 11.4 | 0.61 | 5.2 | 0.24 | 29.6 | 1.55 | \$0.80 - \$3.00/lb | \$630 |

* These reductions are calculated based on an analysis of the emissions reductions achieved on an individual locomotive basis. Staff has assumed that there will be no increase in the number of these types of locomotives through 2015.

** Note: Of the 8.6 tons per day of NO_x reductions in the SCAB, the SCAQMD expects to get 3.0 tons per day from proposed SCR retrofits to 37 Metrolink MHP passenger locomotives.

ARB has limited authority to directly establish emission standards for locomotives (See Appendix A and discussion, *infra*, at pages 20-21.). Therefore, staff recommends that ARB work cooperatively to combine investments from the railroads with a mix of federal and state incentive programs to achieve the emission reductions. The most likely sources of incentive funding are the federal Diesel Emissions Reduction Act (DERA), the American Recovery and Reinvestment Act (ARRA), and Proposition 1B, with additional funds possibly available through the Carl Moyer Program, or other potential sources such as the local air districts. Assembly Bill 118 established the California Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program; a component of this program is the ARB's Air Quality Improvement Program. Funds can be sought from both programs.

For the 2007-2011 fiscal years, DERA authorizes \$200 million per year in incentive funding for diesel projects. ARRA authorizes an additional allocation of \$300 million in

¹² For a medium horsepower locomotive repower the engine is replaced, whereas for a switch locomotive repower nearly the entire locomotive is rebuilt (except for the chassis); hence the higher cost for the switch locomotive repower.

2009. Proposition 1B authorizes \$1 billion in total to fund emission reductions programs. Of the \$1 billion, the Board has targeted \$100 million for potential use for upgrading or replacing locomotives.

Table 8 presents a targeted incentive program by year to achieve the necessary emission reductions. This proposal is based on a 50 percent match from participating railroads. Clearly, the Board will need to work closely with the U.S. EPA, the local air districts, the participating railroads, and other stakeholders to solicit funding opportunities.

In July 2009, the U.S. EPA awarded ARB almost \$9 million for the replacement of at least eight switch locomotives in the South Coast Air Basin. These funds, which must be matched by at least \$3 million from participating railroads, were released through DERA via the ARRA of 2009. A solicitation for proposals is currently in preparation, and should be released in September 2009. Two other proposals for use of locomotive funds in California were not approved.

Table 8
Potential Amount of Incentive Funds Necessary
To Achieve Emission Reductions from Repowering of
Switch Locomotives and Medium Horsepower Locomotives

| Funding Source | Funds Needed (millions) ^a | | | | |
|--------------------------------------|--------------------------------------|------|------|------|------|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| Incentive Funds | 9 | 100 | 100 | 60 | 49 |
| Railroad Matching Funds ^b | 3 | 100 | 100 | 60 | 49 |
| Total | 12 | 200 | 200 | 120 | 98 |
| Cumulative Total | 12 | 212 | 412 | 532 | 630 |

^a Funds are rounded. In 2009, DERA grant provided about \$9 million in incentive funds.

^b Matching funds assumed to be 50 percent, except for 2009.

2. Retrofit Switch and Medium Horsepower Locomotives with Aftertreatment Devices

The Technical Options Report identified that significant emission reductions can be cost-effectively achieved by retrofitting switch and medium horsepower locomotives with advanced aftertreatment devices. As discussed in the previous section, there are a number of ongoing research projects devoted to the development and application of this technology. Implementation of these two measures by 2014 in the South Coast Air Basin and San Joaquin Valley would reduce NOx and PM emissions from switch and medium horsepower locomotives beyond the reductions achieved by repowering; the NOx emissions would be further reduced by about 15 percent, and diesel PM emissions

would be further reduced by about 10 percent. Table 9 shows the number of switch locomotives and medium horsepower locomotives that must be replaced; priority would be placed on repowering the locomotives in the South Coast Air Basin and San Joaquin Valley to help meet 2014 SIP goals; Table 10 shows the overall emission reductions from and costs of repowering these locomotives.

The cost to retrofit a switch locomotive is approximately \$200,000 and the cost to retrofit a medium horsepower locomotive is approximately \$500,000 per locomotive. The cost-effectiveness of the measure is based on the Carl Moyer Program guidelines and assumes no matching funds in the calculation. The use of matching funds would improve the program's cost-effectiveness. As Table 10 shows, retrofitting of the locomotives is very cost-effective, ranging from \$0.8 to \$3.30 per pound with no matching funds. For comparison, the typical Carl Moyer cost-effectiveness for approved projects is approximately \$1 to \$3 per pound, with a cap of \$8 per pound.

Table 9
Potential Total Number of Switch and Medium Horsepower Locomotives
To Be Retrofitted by 2016
(2007 Data)

| Region | No. of Switch Locomotives | No. of Medium Horsepower Locomotives |
|------------------------------|---------------------------|--------------------------------------|
| South Coast Air Basin | 139 | 150* |
| San Joaquin Valley Air Basin | 28 | 67 |
| Rest of the State | 77 | 183 |
| Total | 244 | 400** |

* The SCAB total includes 37 Metrolink and 15 Amtrak MHP passenger locomotives. In 2008-2009, Metrolink purchased 15 additional passenger locomotives that are not included in these data.

** Includes 110 passenger locomotives.

Table 10
Emission Reductions and Costs to Retrofit DPF and SCR on All
Switch and Medium Horsepower Locomotives

| Recommendations | Emission Reductions (tons per day)* | | | | | | Carl Moyer Program Cost Effectiveness (\$ /lb) | Total Costs (millions) |
|---|-------------------------------------|-------------|---------------------------------|-------------|-----------------|-------------|---|---------------------------|
| | South Coast Air Basin | | San Joaquin Valley Air Basin | | Statewide | | | |
| | NO _x | PM | NO _x | PM | NO _x | PM | | |
| Retrofit switch locomotives with DPF and SCR: 2012 – 2015 | 0.6 | 0.02 | 0.2 | 0.01 | 1.0 | 0.04 | \$2.00 - \$3.30/lb | \$50 |
| Retrofit MHP locomotives with DPF and SCR: 2012 – 2016 | 2.6 | 0.07 | 1.1 | 0.03 | 6.8 | 0.18 | \$0.80 - \$1.40/lb | \$200 |
| Total Emission Reductions | 3.2 | 0.09 | 1.3 | 0.04 | 7.8 | 0.22 | \$0.80 - \$3.30/lb | \$250 |

* The emission reductions are based on full implementation. For the South Coast and San Joaquin Valley, this is assumed to be 2014; for statewide, the estimates are for 2016.

As with the repowering option, the recommended implementation mechanism would be contributions from the participating railroads combined with incentive funds. Again, the most likely source of incentive funding is the federal DERA, although other sources of incentive funds may be available.

Table 11 presents a targeted incentive program by year to achieve the necessary emission reductions. This proposal is based on a 50 percent match from participating railroads. The Board will clearly need to coordinate with the U.S. EPA, the local air districts, the participating railroads, and the other stakeholders to solicit funding opportunities.

Table 11
Potential Amount of Incentive Funds Necessary
To Achieve Emission Reductions from Retrofit of
Switch Locomotives and Medium Horsepower Locomotives

| Funding | Funds Needed (millions) ^a | | | | | |
|--------------------------------------|--------------------------------------|-----------|------------|------------|------------|------------|
| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Incentive Funds | 10 | 25 | 25 | 25 | 20 | 20 |
| Railroad Matching Funds ^b | 10 | 25 | 25 | 25 | 20 | 20 |
| Total | 20 | 50 | 50 | 50 | 40 | 40 |
| Cumulative Total | 20 | 70 | 120 | 170 | 210 | 250 |

^a Funds are rounded.

^b Matching funds assumed to be 50 percent.

3. Accelerate the Introduction of Tier 4 Interstate Line Haul Locomotives

The last high priority recommendation is the acceleration of deployment of Tier 4 line haul locomotives in California rail operation. The U.S. EPA has recently promulgated a new rule that requires any new locomotive to meet Tier 4 standards beginning in 2015, with a two year extension under certain conditions. The Tier 4 standards require very clean locomotives with both NOx and diesel PM aftertreatment devices. The Technical Options Report discusses the new federal rulemaking. The accelerated replacement of existing line haul locomotives with Tier 4 locomotives has the potential to achieve significant reductions.

Staff estimates that up to 1,200 interstate line haul locomotives will operate in California on any given day by 2020. To meet this number of locomotives under current operating scenarios, staff estimates that UP and BNSF will need a national pool of up to 5,000 Tier 4 interstate line haul locomotives to ensure that up to 1,200 Tier 4 interstate line haul locomotives will be able to operate in California. This estimate assumes that there is no change in the operation of the railroads.

Based on prior experience, it may take more than 30 years (i.e., to 2045) for national interstate fleets to turn over to the new Tier 4 interstate line haul locomotives and fully realize the Tier 4 emission benefits. In 2020, for analyses purposes in this report, we assumed all line haul locomotives operating in California would be Tier 2, so we have assumed only the emissions differences between Tier 2 and Tier 4 locomotives in California by 2025. If Tier 2 baseline emissions are assumed, a statewide Tier 4 interstate line haul locomotive fleet of 1,200 locomotives could provide up to 32.0 tons per day of NOx and 1.3 tons per day of PM emission reductions, respectively. The emission reductions, cost, and cost-effectiveness are presented in Table 12.

Table 12
Emission Reductions and Costs for Accelerating
the Replacement of Interstate Line Haul Locomotives

| Line Haul Locomotive Recommendation | Time Frame | Emission Reductions (tons/day) in California by 2025 | | Cost-Effectiveness* (\$/lb NO _x +20xPM) | California Share of Capital Costs*** (in millions) |
|---|-------------|--|-----|---|---|
| | | NOx | PM | | |
| Procure up to 5,000 Tier 4 interstate line haul locomotives** | 2015 – 2025 | 32.0 | 1.3 | \$2 – 8.6/lb (10 – 30 years) | \$3,000 |

* Carl Moyer cost-effectiveness methodology.

** To ensure 1,200 Tier 4 interstate line haul locomotives operate in California on any given day.

*** Total costs are \$15 billion. California's share of the capital cost would be about 20 percent, or about \$3 billion.

A national pool of up to 5,000 UP and BNSF Tier 4 interstate line haul locomotives would cost approximately \$15 billion. This estimate is based on an approximate cost of \$3 million per locomotive. Staff assumed that the line haul locomotives operate in California about 20 percent of the time; therefore, California's fair share of the cost would be about \$3 billion.

The implementation mechanism or mechanisms for this measure are uncertain. The staff's preferred option is to implement this program through a combination of railroad and incentive funds. To pursue this effort, staff recommends that ARB form a coalition comprised of local air districts, local governments, other states, the railroads, and other stakeholders to seek additional incentive funds.

However, other potential implementation mechanisms include: federal action to provide states greater authority to regulate existing locomotives (see discussion below); an amendment to U.S. EPA regulations for locomotives; or an enforceable agreement with the railroads and other stakeholders. As required by Board Resolution 05-40, any enforceable agreement must be initiated by being formally announced and authorized by the Board at a public meeting. Staff is not requesting that such an effort be initiated at this time, pending the success of the other efforts noted above.

E. What additional actions does staff recommend?

1. Continue to Investigate and Implement Specific Railyard Measures

Staff recommends that ARB continue to work with local air districts, the local communities, and the railroads to expeditiously identify and implement specific railyard mitigation measures that would reduce the emissions and public health risks around railyards. Each railyard has unique operations, meteorology, emissions density, and levels of residential exposure that would affect the costs and benefits derived from these types of measures. Additional time is needed to conduct site specific analyses would need to be performed to assess the potential benefits of individual railyard-specific measures.

Railyard-specific mitigation measures could include erecting walls, growing trees, installing air monitoring stations, and installing indoor air filters in residential homes. Also, hood technology could potentially reduce some stationary locomotive emissions at large locomotive classification and mechanical and servicing railyards.

In addition, staff recommends that the local governments, railroads, and local communities continue to work together to identify legal and other approaches that could be used to further reduce emissions from railyards. Such actions might include changes in railyard operations, changes in traffic movements, and changes in land use around railyards.

2. Seek Changes in Federal Laws to Eliminate Federal Preemptions

Staff has evaluated ARB legal authority to regulate locomotives based on the federal Clean Air Act (CAA), U.S. EPA regulations, and the Interstate Commerce Commission Termination Act (ICCTA). Section 209(e)(1) of the CAA expressly preempts states from adopting emission standards for new locomotives, and section 209(e)(2) implicitly preempts all states other than California from adopting independent emission standards for non-new locomotives. Under section 209(e)(2)(A), California may, however, adopt and enforce its own emission standards for locomotives not directly preempted under section 209(e)(1), upon receiving authorization from the Administrator of the U.S. EPA.¹³

In 1998, U.S. EPA adopted a final rule that interpreted "new" to mean the time that a locomotive is initially manufactured or remanufactured and that the preemption against state regulation ran through 133 percent of the locomotive's useful life (approximately 10 years).¹⁴ Under the federal rule, Class I and II railroad¹⁵ locomotives that were manufactured prior to 1973 and have not been upgraded (remanufactured) after 2000 or locomotives initially manufactured in or after 1973 but have exceeded their useful lives since initial manufacture or last manufacture, whichever is later, are not preempted.¹⁶ The remanufacturing of a locomotive effectively re-starts the "useful life" clock and preemption.

The railroads could avoid state requirements by electing to remanufacture older pre-Tier 0 and Tier 0 locomotives to the Tier 0 remanufacturing standard, or to replace non-preempted locomotives with locomotives that have been remanufactured to the Tier 0 standard and are still within their useful lives.

Based on staff's recent estimates, Table 13 shows that there are a significant number of locomotives operating in California that have not been remanufactured, or that have been remanufactured but not for at least 10 years, and could be governed by ARB regulation. These locomotive counts are subject to change. However, staff is not proposing to adopt standards that would apply to these locomotives, because doing so would likely lead to replacing existing units with remanufactured locomotives only with Tier 0 emission levels. A more detailed discussion of legal authority is presented in Appendix A.

¹³ Once California has received authorization, other states may elect to adopt emission standards and other requirements identical to those adopted by California. (CAA section 209(e)(2)(B).)

¹⁴ 63 Fed. Reg., 18978 (April 16, 1998).

¹⁵ The Surface Transportation Board defines a Class 1 railroad as a railroad with annual operating revenues (in inflation-adjusted 1991 dollars) of \$250 million or more; a Class 2 railroad has annual operating revenues between \$20 million and \$250 million in inflation-adjusted 1991 dollars.

¹⁶ 63 Fed. Reg., 18978 (April 16, 1998).

Table 13
Summary of Potential Number of Older
Switch and Medium Horsepower Locomotives By Region

| Type of Older Locomotives | Status | Statewide | South Coast | San Joaquin Valley |
|-------------------------------|--|-----------|-------------|--------------------|
| Switch Locomotives | Pre-Tier 0 (Potentially Subject to State Regulation) | 103 | 43 | 15 |
| | Remanufactured to Tier 0 | 49 | 20 | 7 |
| | Total Older Switch Locomotives | 152 | 63 | 22 |
| Medium Horsepower Locomotives | Pre-Tier 0 (Potentially Subject to State Regulation) | 360 | 135 | 61 |
| | Remanufactured to Tier 0 | 40 | 15 | 6 |
| | Total Older MHP Locomotives | 400 | 150 | 67 |

* The percentages of NOx and PM emissions are presented in Table 3, Table 4, and Table 5.

As stated, the restart of a locomotive's "useful life" clock under the U.S. EPA rulemaking, by remanufacturing it to Tier 0 emission standards, potentially limits states' abilities to regulate emissions from older locomotives. If the railroads were able to limit the state's authority to require non-preempted locomotives to meet the most stringent emission standards achievable by remanufacturing such locomotives to Tier 0 levels, relatively small emission reductions, on the order of about 30 percent for NOx and 50 percent for PM, would be achieved. Staff believes California needs to pursue a strategy that will result in the repower and retrofit of locomotives to Tier 4 levels or by requiring that new Tier 4 locomotives be put into service, as opposed to a strategy that would likely produce only small, incremental Tier 0 level emissions reductions.

ICCTA provides another set of legal challenges. ICCTA preempts state regulations which can cause an undue burden on railroad operations, especially interstate operations. All locomotives, even those that may operate for longer periods of the time within the state – such as switch and MHP locomotives – will often ultimately cross states lines periodically. Although ARB has authority under State law to regulate locomotives, any regulation would need to be harmonized with both the CAA preemption. To the extent that ARB has authority under the CAA, that authority would need to be harmonized with ICCTA's proscriptions.

Another concern relates to the 1998 Locomotive NOx Fleet Average Agreement (Agreement) in the South Coast Air Basin. The Agreement has a termination clause

which could be potentially invoked by the railroads if the ARB approved a locomotive regulation. Were the 1998 Fleet Average Agreement to be terminated, staff believes that significant emission reductions would be foregone in the South Coast Air Basin starting as early as 2010. In addition, as these locomotives move through the San Joaquin, Salton Sea, and Mojave air basins, emissions benefits from the Agreement would be lost in these areas as well.

Therefore, the staff's preferred option is to implement this program through a combination of railroad and incentive funds. However, incentive funds are uncertain. Therefore, staff is proposing to work with the local air districts and other stakeholders to seek changes to federal laws that would provide clear authority for the ARB to adopt emission controls for existing locomotives that would avoid all federal preemption issues under either the CCA or ICCTA. While such an effort is unlikely to yield results in the near term, initiating this activity now may facilitate acceleration of the introduction of line haul locomotives.

3. Consider Additional Measures for Cargo Handling Equipment

Staff is currently evaluating a measure for reduced idling of cargo handling equipment. Cargo handling equipment generally includes yard trucks, top and side picks, and rubber tired gantry (RTG) cranes. In addition, staff recommends that the Board support ongoing test programs of cargo handling equipment that seek to achieve emission reductions beyond the reductions being achieved under the existing ARB cargo handling equipment regulation adopted in 2005. Current test programs include diesel, liquefied natural gas (LNG), and hydraulic hybrid yard trucks. If the ongoing test programs are successful and appear to be cost-effective, staff recommends initiating a rulemaking to modify the existing cargo handling equipment regulation to include such emission requirements.

4. Participate in the CEQA Process for the ICTF and SCIG Projects

Staff recommends that ARB participate in the review of the CEQA reports for rebuilding the Union Pacific International Container Transfer Facility (ICTF) and building the Southern California International Gateway (SCIG) railyard. As part of the review, staff should work to ensure that the best available emission controls are incorporated into the projects and that a full assessment of potential off-site mitigation is conducted.

5. Support the San Pedro Bay Ports Clean Air Action Plan Update

The two San Pedro Bay Ports are currently updating their clean air action plan. Staff recommends that the ARB support the San Pedro Bay Ports efforts to accelerate the turnover of cleaner switch locomotives consistent with ARB's recommendations in this report. In addition, the staff recommends that ARB support the San Pedro Bay Ports efforts to accelerate the turnover of cleaner Tier 4 line haul locomotives serving port properties as expeditiously as possible following their introduction in 2015, with the goal of 95 percent Tier 4 locomotives serving the ports by 2020.

Based on 2007 data, ARB staff estimated that UP and BNSF had about 150 trains per day entering and exiting the South Coast Air Basin (SCAB). Current data suggest that, on average, UP and BNSF typically use about four locomotives to pull trains as they enter and exit the SCAB. As the economic downturn has continued, staff estimates that line haul locomotive activity in the SCAB may have decreased by as much as 33 percent, to about 100 trains per day.

Line haul locomotive activity at the San Pedro Bay Ports is a part of the total line haul locomotive activity within in the SCAB. In 2007, activity along the Alameda Corridor was about 50 trains per day combined for UP and BNSF. Staff estimates that UP and BNSF employ an average of about 3.5 locomotives per Alameda Corridor train, which is equivalent to about 175 locomotives per day, or about 30 percent of all the line haul locomotives that operate in the SCAB. As economic conditions have led to a decrease in goods movement, activity along the Alameda Corridor has also decreased. The Alameda Corridor Transport Authority has reported the average daily train counts to be 36 trains per day as of mid-2009, a nearly 30 percent decrease from 2007 levels.

When Tier 4 locomotives become available, Class I railroads can introduce Tier 4 models into national service at the same pace as they are currently introducing Tier 2 models. We expect the Tier 4 locomotives will be available beginning in 2015. This accelerated incentive program could provide sufficient locomotives to ensure that at least 95 percent of all interstate line haul locomotives operating on port properties would comply with Tier 4 standards, without a dedicated Tier 4 fleet in California. Given that there are about 175 line haul locomotives per day along the Alameda Corridor, there would need to be about 700 Tier 4 locomotives in the national fleet to dedicate 95 percent Tier 4 locomotives to the San Pedro Bay Ports. Staff will continue to work with the San Pedro Bay Ports, the South Coast Air Quality Management District, and other stakeholders to develop, support, and implement this measure.

6. Seek Changes in Federal Regulations for Line Haul and Switch Locomotives

The U.S. EPA has the regulatory authority to establish more stringent requirements for line haul and switch locomotives that would accelerate emission reductions prior to the full implementation of the Tier 4 locomotives. Additional reductions could be mandated by the U.S. EPA if the agency were willing to modify the current regulations for locomotives. For example, the following actions could produce accelerated emission reductions:

- Require a 50 percent reduction of NOx for each tier level in the 2008 locomotive emission standards for remanufacture of existing line haul and switch locomotives. This recommendation would include retention of the current 2008 PM locomotive remanufacture emission standards, which represent about a 50 percent reduction for each tier level from existing line haul and switch locomotives.

- Require that Class I railroads remanufacture existing line haul and switch locomotives, at specified intervals, to meet the existing PM and the proposed NOx emissions standards (i.e., about 50 percent reduction for each tier level on remanufacture). Only pre-1973 model year line haul and switch locomotives would be exempted from the proposed remanufacture requirements.

To pursue this effort, staff recommends that ARB form a coalition comprised of local air districts, local governments, and other states impacted by locomotive and railyard diesel PM and NOx emissions, associated cancer risks, and associated non-cancer health effects. This coalition would recommend that U.S. EPA provide greater and earlier emission reductions from interstate line haul locomotives, thereby providing significant air quality benefits to other states and regions impacted by locomotive emissions. As part of the process, ARB would solicit input from all stakeholders in a public process.

7. Continue to Develop the Goods Movement Efficiency Measure

Staff recommends that efforts to evaluate the efficiency of goods movement continue in support of California's Scoping Plan for reducing greenhouse gas emissions from the goods movement sector. In addition to reducing GHG emissions, staff expects that such efficiencies would result in commensurate reductions in criteria and toxic air pollutants.

8. Evaluate Electrification of Rail as a Long Term Measure

In the Technical Options Report, staff evaluated electrification of rail as one of the options. Staff recommends that efforts continue to evaluate the long term potential of rail electrification, particularly in the South Coast Air Basin, as a long term measure.

9. Develop Improved Emission Inventories for Locomotives and Railyards

The ability to evaluate and assess the impact of various measures on emissions is dependent upon accurate emissions estimates. Staff has developed significant new information based on the work done on the health risk assessments and the draft mitigation plans. There is also an ongoing effort to reassess the emissions inventory for locomotives based on average fuel consumption data by line segment. In addition, growth projections may need revision, and actual in-use locomotive emissions may be less than anticipated due to the use of cleaner diesel fuels. Therefore, staff recommends that efforts continue to improve the statewide emissions inventory and the region-specific emission estimates for the South Coast and San Joaquin Valley needed to assess progress towards achieving SIP targets.

10. Continue Support for Advanced Locomotive Research Programs

The technology already exists to implement the first recommended option, the repowering of 152 older switch locomotives with gen-set engines. However, there is

additional development work that needs to be done for the implementation of the other recommendations – e.g., the repowering of MHP locomotives and the incorporation of aftertreatment devices. Much of this work is underway, and in some cases, is supported by ARB funding. These efforts are critical in being able to develop the technology needed to implement the other locomotive recommendations:

Therefore, ARB staff supports ongoing test programs of switch, medium horsepower, passenger, and interstate line haul locomotives to evaluate advanced emissions controls and advanced technologies to set the stage for additional near term or medium term emission reductions. A summary of the ongoing test programs is presented below.

Approved and Ongoing Test Programs

- Retrofit Diesel Particulate Filters (DPF) on a National Railway Equipment Company (NREC) existing gen-set switch locomotives powered by Cummins engines (Fall 2009 to Fall 2010);
- Retrofit DPFs on Railpower existing gen-set switch locomotives powered by Deutz engines (Fall 2009 to Fall 2010);
- Repower a medium horsepower (MHP) Tier 2 Caterpillar/Progress Rail engine and retrofit selective catalytic reduction (SCR) and diesel oxidation catalyst (DOC) aftertreatment to meet Tier 4 NOx and Tier 3 PM standards (Fall 2009 to Fall 2010);
- Repower a MHP ultra low-emitting locomotive (ULEL) engine (Fall 2009 to Fall 2010);
- Support efforts of Alternative Hybrid Locomotive Technologies (AHL-TECH) to develop a prototype ethanol-hybrid locomotive; and
- Support BNSF efforts to research and demonstrate a fuel cell-powered hybrid switch locomotive that will be conducting field demonstration testing in Los Angeles in the fall of 2009.

Proposed Test Programs Pending Funding

- Retrofit SCR and DPF on an existing gen-set switch locomotive (Spring 2010 to 2012);
- Retrofit a DPF on to the MHP Tier 2 Caterpillar/Progress Rail engine repower with retrofit of SCR and DOC to meet Tier 4 NOx and Tier 4 PM standard (Fall 2011 to 2012);
- Support a University of California, Irvine research team on the development of a solid oxide fuel cell/gas turbine hybrid locomotive;

F. What are the overall benefits of implementing the recommendations?

1. Railyards

Implementation of the five locomotive recommendations is expected to substantially reduce diesel PM emissions around railyards and thus substantially reduce the potential cancer risks. Table 14 presents an estimate of the potential cancer risks around each railyard if the five locomotive recommendations are implemented. This table shows that the remaining potential cancer risks would be reduced on average by about 85 percent by 2020. The table also shows that only four railyards would have a remaining risk of greater than 100 chances per million. As recommended previously, staff will continue to work with the railroads, the local air districts, and the local communities to address specific railyard mitigation measures to further reduce the risk.

Table 14
Estimated Maximum Individual Cancer Risks (MICR)
At 18 Major Railyards with Cleaner Locomotives
(2005 to 2020)

| Railyard | MICR (chances in a million) | | | |
|------------------------|--------------------------------|-------|------|------|
| | 2005 | 2010 | 2015 | 2020 |
| BNSF Hobart | 500 | 210 | 135 | 85 |
| BNSF Sheila Mechanical | 40 | 30 | 20 | 10 |
| BNSF Commerce Eastern | 100 | 35 | 20 | 5 |
| BNSF San Bernardino | 2,500 | 1,340 | 770 | 285 |
| UP Commerce | 500 | 225 | 145 | 95 |
| UP ICTF | 800 | 400 | 190 | 135 |
| UP Oakland | 460 | 240 | 110 | 60 |
| UP City of Industry | 450 | 200 | 125 | 75 |
| UP Colton | 150 | 120 | 55 | 30 |
| UP LATC | 250 | 160 | 55 | 25 |
| BNSF Barstow | 450 | 445 | 290 | 130 |
| BNSF Stockton | 120 | 110 | 50 | 20 |
| BNSF Watson | 175 | 115 | 65 | 25 |
| BNSF Richmond | 100 | 55 | 25 | 15 |
| BNSF San Diego | 70 | 65 | 40 | 10 |
| UP Stockton | 150 | 60 | 35 | 15 |
| UP Mira Loma | 100 | 55 | 35 | 15 |
| UP Roseville | 645 | 505 | 265 | 135 |

Note: MICR estimates for 2005 are based on emission inventories in the railyard HRAs. For UP Roseville Railyard, 645 in a million is the average risk in the >500 in a million risk zone, and is the MICR for the entire railyard based on 2000 data. For 2010, 2015, and 2020, MICR estimates are based on estimated emission reductions for each railyard achieved with cleaner locomotives, in addition to the emission reductions in the draft UP and BNSF railyard mitigation plans.

2. Locomotives

Based on estimated annual diesel fuel consumption, implementing the five locomotive recommendations is expected to reduce NOx and diesel PM emissions from locomotives by about 70 percent on a statewide basis by 2020. These reductions are shown graphically in Figures 6 and 7.

Figure 6
Estimated Statewide Locomotive NOx Emissions with
Locomotive Emission Reductions Recommendations
 (Assumes 1 Percent Annual Growth Rate from 2010-2020)

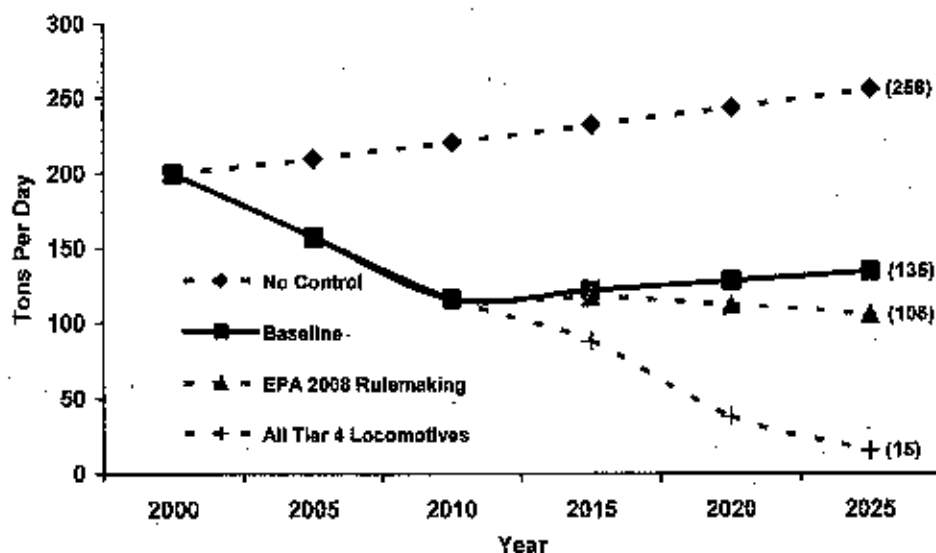
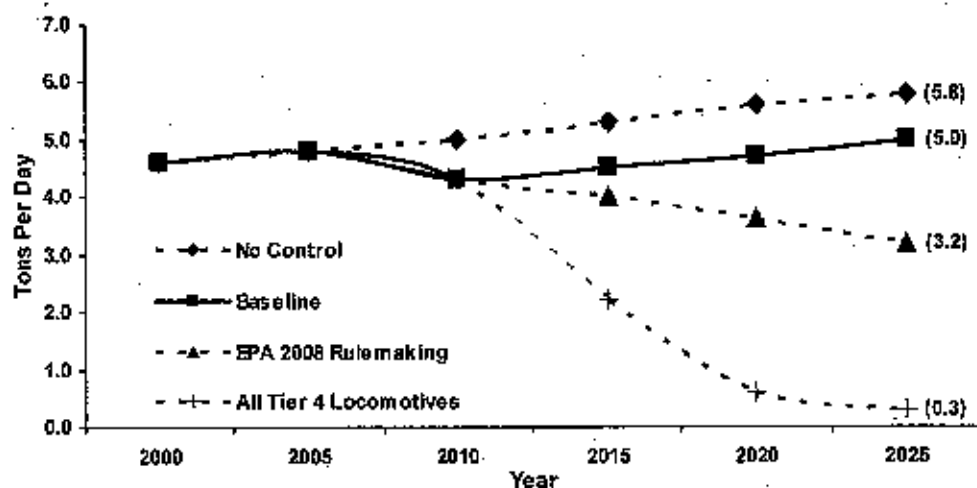


Figure 7
Estimated Statewide Locomotive PM Emissions with
Locomotive Emission Reductions Recommendations
 (Assumes 1 Percent Annual Growth Rate from 2010-2020)



In the South Coast Air Basin, implementation of the recommendations by 2014 should reduce NOx and diesel PM emissions by about 40 percent; for 2020, implementing the recommendations would reduce NOx emissions by about 50 percent and diesel PM emissions by about 80 percent over today's projection of emissions. For the San Joaquin Valley, implementation of the recommendations by 2014 should reduce NOx emissions by about 30 percent and diesel PM emissions by about 40 percent; for 2020, implementing the recommendations would reduce NOx emissions by about 40 percent and diesel PM emissions by about 70 percent over today's projection of emissions.

There are a number of factors that affect estimates of the specific emission reductions. As indicated in the recommendations, staff is proposing to continue to update the emissions inventory, including growth assumptions, in order to improve the emissions inventory as well as determine progress towards SIP targets.

3. GHG Benefits

Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, mandates that California reduce its GHG emissions to 1990 levels by 2020. Transportation is the single largest contributor to California's GHG emissions, producing about 39 percent of the state's total GHG emissions in 2004, including the emission sources of locomotives operated in California.

Locomotives have historically been efficient in moving goods on land due to the amount of tons a locomotive can pull and the lower fuel consumption on a gallon per ton-mile basis. These efficiencies result in relatively fewer GHG emissions compared to most

other modes of freight transportation because a train's wheel steel-on-steel resistance is much lower than rubber wheels subject to road resistance.¹⁷ Trains continue to be about three or more times more fuel efficient than trucks on a gallon per ton-mile basis. Improved rail efficiencies should result in even greater GHG reductions.

a. National Locomotive Diesel Fuel Consumption

According to American Association of Railroads (AAR) data for 2007, the nation's seven major railroad companies reported moving 1.77 trillion ton-miles of freight and consuming 4.06 billion gallons of diesel fuel for freight trains and trains in switching yards. This gives an average national locomotive fuel efficiency of 436 ton-miles per gallon of diesel fuel in 2007. The 2007 average national locomotive fuel efficiency includes a 3.1 percent increase from the 423 ton-miles per gallon reached in 2006.

The railroad industry suggests the factors for such significant reductions in diesel fuel consumption are:

- Using newer, larger horsepower, and more fuel efficient locomotives to pull longer trains
- Double stacking of container cars, and other system efficiencies
- Training engineers to operate locomotives to conserve fuel
- Using computers to assemble trains more efficiently in the yard and to plan trips more efficiently to avoid congestion
- Reducing the amount of time engines are idling with manual procedures and installation of idle reduction devices

b. Tier 2 Interstate Line Haul Locomotive Diesel Fuel Savings

Both General Electric (GE) and Electro Motive Division (EMD) developed new advanced technology line haul locomotives to meet the U.S. EPA Tier 2 locomotive emissions standards in 2005. These 4,300 horsepower new line haul locomotives have advanced engine design and timing, cooling systems, and traction systems that reduce diesel fuel consumption by as much as 3 to 5 percent in comparison with older line haul locomotives (3,000 to 4,000 horsepower)

Over an expected 20 year service life, a Tier 2 line haul locomotive can reduce diesel fuel consumption by up to 300,000 gallons, which is equivalent to about one year's diesel fuel consumption.

c. Ultra Low Emitting Switch Locomotive (ULESL) Diesel Fuel Savings

National Railway Equipment Company (NREC) and Railpower (RP) have developed gen-set and electric hybrid switch locomotives (about 2,000 horsepower equivalent).

¹⁷ G. Gould and D. Niemeier, *Review of Regional Locomotive Emission Modeling and the Constraints Posed by Activity Data*, Research Report, UCD-ITS-RP-09-19, University of California, Davis, June (2009).

These locomotives can provide reductions of 20 to 60 percent in diesel fuel consumption and GHG emissions. Switch locomotives typically operate in and around railyards, and consume an average of about 50,000 gallons of diesel fuel annually.

With CO₂ emissions estimated at 22.4 pounds per gallon of diesel fuel¹⁸, a 20 percent reduction (about 10,000 gallons annually) in diesel fuel consumption would provide more than 100 tons per year of GHG reductions per gen-set switch locomotive. UP and BNSF currently operate about 76 gen-set switch locomotives, 12 electric hybrid, and four liquefied natural gas (LNG) captive switch locomotives in California.

d. California Locomotive Diesel Fuel Savings

Within California, total annual locomotive diesel fuel consumption for UP, BNSF, passenger, and smaller railroads is estimated at about 200 million gallons: approximately 30 million gallons for Class I and Class III/military industrial switch locomotives, and approximately 170 million gallons for line haul, MHP, and passenger locomotives.

The following assumptions are made for diesel fuel savings:

- 3 percent for Tier 2 line haul, MHP, and passenger locomotives
- 20 percent for ULESLs

The annual savings in diesel fuel would then be an estimated 7.5 million gallons. With CO₂ emissions estimated at 22.2 pounds per gallon of diesel fuel, an annual savings of 7.5 million gallons of diesel fuel corresponds to an annual savings of 84,000 tons of CO₂ emissions, or about 230 tons of CO₂ per day.

¹⁸ <http://www.eia.doe.gov/oiaf/1805/coefficients.html>

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APPENDIX A**LEGAL ANALYSIS OF ARB AUTHORITY TO REGULATE LOCOMOTIVES**

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**ARB's Authority to Adopt Emission Standards and
Other Emission-Related Requirements for
Locomotives and Other Railway Sources:
A Legal Review of Proposed Options¹**

To determine the extent of the ARB's authority to adopt emission standards for railway sources, including locomotives, the Board must review and consider state and federal law; specifically, one must carefully consider ARB's authority in relation to the authority granted to ARB under the Health and Safety Code and the federal Clean Air Act (CAA) and the constraints imposed by the preemptions of state regulation under the CAA and the Interstate Commerce Commission Termination Act of 1995 (ICCTA).

ARB Authority under California Law

Under California law, the Air Resources Board (ARB) is the designated state agency responsible for preparing state implementation plans (SIPs) under the federal Clean Air Act (CAA). (Health & Saf. Code § 39602.) It has also been entrusted by the California Legislature to adopt emission standards, regulations, and airborne toxic control measures for off-road engines and vehicular and nonvehicular sources that use such engines, including locomotives, unless preempted under federal law. (Health and Saf. Code §§ 39650 et seq., 43013, and 43018.)

ARB Authority under the CAA

Under CAA § 110, each state must adopt and submit to the United States Environmental Protection Agency (U.S. EPA) SIPs that provides for the implementation, maintenance, and enforcement of the national ambient air quality standards (NAAQS) for each air quality control region (or portion thereof) within the state. Among other things, the SIP must include "enforceable emission limitations and other control measures, means, or techniques . . . as may be necessary or appropriate to meet the applicable requirements of [the CAA]." As stated, ARB is the designated state agency responsible for preparing, adopting, and forwarding SIPs to U.S. EPA.

The 1990 amendments to the CAA entrusted U.S. EPA with authority to regulate and adopt emission standards for new nonroad engines including locomotives and locomotive engines. (CAA § 213.) Concurrently, Congress expressly preempted all states, including California, from adopting emission standards and other requirements related to the control of emissions from new locomotives and engines and new nonroad engines less than 175 horsepower used in farm and construction vehicles and equipment. (CAA § 209(e)(1).) The Supreme Court has concluded that the term "standard" as used in Title II of the CAA – of which section 209(e) is a part – refers to the emission characteristics of a vehicle or engine and can include a numerical

¹ This review addresses only the authority of the ARB and makes no representations as to the authority of local air quality management districts to adopt emission control requirements.

emission requirement that limits the amount of a pollutant that a vehicle or engine can emit or a requirement that a vehicle or engine be equipped with a certain type of pollution-control device or some other design feature related to the control of emissions. (*Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756.). Requirements related to the control of emissions were found by the D.C. Circuit to mean "certification, inspection, or approval" requirements which are related to the control of emissions and are conditions precedent to the initial retail sale, titling, or registration of a nonroad engine or vehicle." (*Engine Manufacturers Association v. U.S. EPA* (D.C. Cir. 1996) 88 F.3d 1075, 1093 (EMA)).

In addition to the express preemption under CAA section 209(e)(1), the CAA impliedly preempts states from adopting emission standards and other emission related requirements for other new and non-new nonroad engines, including locomotive engines and other engines not otherwise preempted under section 209(e)(1). (CAA § 209(e)(2).) However, CAA section 209(e)(2)(A) effectively provides California with a waiver from the implied preemption, so long as it obtains authorization from U.S. EPA. The Administrator is required to grant California authorization, unless she specifically finds that conditions identified in section 209(e)(2)(A) that require denial of California's request to exist.²

In 1994, U.S. EPA promulgated final rules interpreting CAA section 209(e) and establishing emission standards for new compression-ignition engines greater than 37 kilowatts. (*Air Pollution Control; Preemption of State Regulation for Nonroad Engine and Vehicle Standards*, 59 Fed. Reg. 36969 (July 20, 1994) (*Final 209(e) Rule*); *Control of Air Pollution; Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression-Ignition Engines At or Above 37 Kilowatts*, 59 Fed. Reg. 31306 (June 17, 1994) (*37 kW Rule*).) In that rule, U.S. EPA defined "new" and the effective scope of the expressed preemption for new nonroad engines, other than locomotives, covered under section 209(e)(1). "New" was found to mean "showroom new" – that is engines and vehicles the equitable or legal title to which has not been transferred to an ultimate purchaser. (*Final 209(e) Rule*, 59 Fed. Reg. at 39672.)

With regard to the scope of preemption, U.S. EPA found that it may actually go beyond the transfer to an ultimate purchaser and may cover state regulations that directly relate back to the design and manufacture of such engines and impose a burden on manufacturers. (*Final 209(e) Rule*, 59 Fed. Reg. at 36973, relying on *Allway Taxi v. City of New York* (S.D.N.Y.) 340 F. Supp. 1120, aff'd, 468 F.2d 624 (2d Cir. 1972); *EMA* 88 F.3d at 1086, 1090.) Additionally, U.S. EPA interpreted CAA 209(e) to not preempt states from adopting in-use operational control requirements such as hours of operation limits, daily mass emission limits, and fuel specification standards. (*37 kW Rule*, 59 Fed. Reg. at 31313.)

² Once California has received authorization, other states may elect to adopt emission standards and other requirements identical to those adopted by California. (CAA section 209(e)(2)(B).)

In its 1998 final locomotive rule, U.S. EPA interpreted the scope of the new locomotive preemption under CAA § 209(e)(1) and distinguished locomotives from other nonroad engines; specifically finding that "new," as it applies to locomotives and locomotive engines, means both original manufacture of locomotives and engines and their subsequent remanufacture.³ (*Emission Standards for Locomotives and Locomotive Engines*, 63 Fed.Reg. 18978, at 18994 (April 16, 1998) (1998 *Final Locomotive Rule*)). Additionally, U.S. EPA found that states are preempted from adopting emission standards for new locomotives and engines for 133 percent of their useful lives (estimated to be about ten years or longer). The 1998 *Final Locomotive Rule* also clarified that a locomotive or locomotive engine owned by a Class 1 railroad would not be considered either new or preempted if it was manufactured prior to January 1, 1973 and has not been upgraded (remanufactured) to Tier 0 or higher emissions standards after January 1, 2000. (*Id.*, at 18999) Finally, the 1998 *Final Locomotive Rule* set forth specific requirements, including but not limited to, emission standards, mandatory fleet average standards, certification requirements, aftermarket equipment requirements, and nonfederal in-use testing requirements that it determined to be categorically preempted because of their significant effect on the design and manufacture of new locomotives and locomotive engines. (40 Code of Federal Regulation (CFR) Part 1074, §1074.12; 1998 *Final Locomotive Rule*, 63 Fed.Reg., at 18993-18994.) In listing what it considered to be categorically preempted, U.S. EPA impliedly recognized that certain in-use operational control requirements that do not affect the design and manufacturer of the locomotive are not preempted.

In summary, as interpreted by U.S. EPA in the 1998 *Final Locomotive Rule*, the express preemption of CAA section 209(e)(1) preempts all states, with limited exceptions, from adopting emission standards for locomotives and locomotive engines. Those locomotives and locomotive engines that are not preempted include those that were manufactured prior to 1973 and have not been upgraded (remanufactured) after 2000 and all locomotives that have exceeded 133 percent of their useful life since original manufacture or remanufacture, whichever is later.

Authority of States, in General, to Regulate under the ICCTA

In 1995, Congress enacted the ICCTA, 49 U.S.C. § 10101, et seq., which effectively deregulated the rail industry. As generally interpreted by the courts and the Surface Transportation Board (STB) – the administrative agency entrusted by Congress to implement and interpret the ICCTA – the legislation preempts states from adopting rules that impermissibly burden national railroad transportation. Section 10501(b) sets forth the jurisdiction of the STB over rail carriers that are part of an interstate rail network and the scope of preemption as it applies to the states. Its jurisdiction over the following is characterized as being exclusive:

³ In 1994, U.S. EPA adopted its first rule regulating new nonroad engines. In that rule, it defined "new," as it applies to nonroad engines other than locomotives, as "showroom" new and that once a vehicle or engine leaves the showroom, it is no longer new. (37 *kW Rule*.)

- (1) transportation by rail carriers, and the remedies provided in this part with respect to . . . rules (including car service, interchange, and other operating rules), practices, routes, services and facilities of such carriers; and
- (2) the construction, acquisition, operation, abandonment, or discontinuance of . . . switching, or side tracks, or facilities, even if the tracks are located, or intended to be located, entirely in one State, is exclusive. Except as otherwise provided in this part, the remedies provided under this part with respect to regulation of rail transportation are exclusive and preempt the remedies provided under Federal or State law. (Emphasis added.)

Courts and the STB have recognized that the ICCTA does not foreclose states and local jurisdictions from all regulation that affects railroads, recognizing that local governments have certain authority to regulate matters of traditional local concern, including matters related to public health and safety, under their traditional police powers. To this end, courts and the STB have held that ICCTA does not preempt all state regulation that affects transportation by a rail carrier. Among the factors considered in determining whether a local regulation is preempted is whether the regulations discriminates against and unduly burdens rail transportation. The courts have further found that although the ICCTA preemption is broad, it does not per se deprive states and local jurisdictions of authority to regulate under previously existing federal statutes, including environmental statutes such as the CAA, and that the rights and obligations granted to states under such laws should be weighed against preemption under ICCTA where possible.

Harmonizing ARB's Authority under the CAA and the ICCTA Preemption

Options Affecting Locomotives

To the extent that ARB has authority under the CAA to adopt emission standards for locomotives manufactured prior to 1973 and non-new locomotives that have exceeded 133 percent of their useful lives, that authority must be harmonized with the purposes and intent of the ICCTA preemption. Harmonization involves a factual inquiry. Based on the facts and rationale summarized below, ARB staff believes that ARB likely possesses authority to establish emission standards for switcher and medium horsepower locomotives that principally operate in intrastate service. On balance, the strong federal directives under the CAA to achieve attainment of NAAQS and the express authority given to California to regulate non-preempted locomotives, the limited regulation of such intrastate locomotives, as described below, would seem to outweigh any potential undue impairment to railroad operations.

The Union Pacific Railroad Company (UP) and BNSF Railway Corporation (BNSF) operate 244 switcher locomotives that operate within California at any point in time. Although these locomotives may principally operate intrastate, they are part of a larger western regional pool and may be moved outside of the state for maintenance or other reasons and replaced by other switchers that from other states. Of the 244 switcher

locomotives, UP and BNSF have upgraded 92 switchers to ultra low emission levels. Of the remaining 152 older switchers, UP and BNSF have remanufactured 49 to meet federal Tier 0 emissions standards and 103 are pre-Tier 0 (i.e., unregulated switch locomotives). Of the 103 unregulated switch locomotives, about 40 were built before 1973, which are exempt from U.S. EPA regulations and are not covered by the CAA new locomotive preemption. Sixty-three of these switchers were built between 1973 and 1999, with most of them estimated to have been initially manufactured between 1973 and 1980.

ARB has authority under the CAA to adopt standards for all CAA non-preempted locomotives. Undisputedly under the CAA, this would include the 40 pre-1973 switchers that have not been remanufactured after 1999. Additionally, it is extremely likely that the 63 switchers that were built on or after 1973 and have not been remanufactured to Tier 0 levels are not preempted in that they likely exceed 133 percent of their useful lives since original manufacture. Of the 49 locomotives that have been remanufactured, preemption would depend upon when they were last remanufactured and whether they have exceeded 133 percent of their useful life since remanufacture.

MHP locomotives are used both in freight and passenger locomotive operations, with UP and BNSF operating 290 or more intrastate and captive freight MHP locomotives statewide. An additional 110 MHP locomotives are operated as passenger locomotives statewide. ARB has determined that these locomotives engage significantly in intrastate operations, with the caveat similar to that for switchers, that they are part of a larger western regional pool and may be moved outside of the state for maintenance or other reasons and replaced by other MHP locomotives from other states. We believe that a significant portion of the approximate 400 MHP freight and passenger locomotives were manufactured prior to 1973 or exceed 133 percent of their useful lives since manufacture or last remanufacture and would fall outside of the CAA preemption.

To the extent that switcher and MHP locomotives are not preempted under the CAA, ARB has authority under California law to adopt emission standards for these in-use locomotives. As stated, whether these locomotives are preempted under ICCTA is a factual question. One issue that would need to be considered is whether individual locomotives operate exclusively or principally in intrastate service or are routinely moved out-of-state and could be considered engaged in interstate operations. The more a locomotive operates intrastate, the less likely regulation of such locomotives would impair interstate operations. Also, a factual inquiry would have to be made as to whether regulation of all non-CAA preempted locomotives that come into the state as part of a larger pool of western regional locomotives would impose a significant burden on railroad operations. A third factual question would be the cost of the proposed regulation. To the extent that ARB could arguably only require locomotives to be remanufactured to federal remanufacturing standards under the CAA – and then the locomotive once again falls under the CAA preemption – the costs of the regulation would be relatively low and not overly burdensome to railroad operations.

In contrast to intrastate switcher and MHP locomotives, ARB staff believes that locomotives that are engaged in line-haul interstate operations may be preempted under the CAA in that they were likely manufactured on or after 1973 and are within 133 percent of their useful lives since initial manufacture or subsequent remanufacture. To the extent that they are not preempted under the CAA, it could be argued that the interstate nature of these locomotives makes adoption of state emission standards unduly burdensome to railroad operations and, therefore, preempted under ICCTA.

Similar potential preemption issues under the CAA and ICCTA arise for other of the proposed locomotive options considered in the final Technical Options Report. For example, although ARB has authority to establish fuel specification requirements under the CAA, it could be argued that the proposal to require interstate locomotives be fueled with CARB diesel before entering California is unduly burdensome and preempted under ICCTA. Other proposed options include requirements for ethanol-fueled or hydrogen fuel cell locomotives, linear induction motor retrofits, and electrification of major freight rail lines in the South Coast Air Basin. These options may be preempted under the CAA in that they potentially require modifications that affect the design and manufacture of locomotives. They may also arguably be preempted under ICCTA, in that upon review they may be found to impose overly burdensome requirements that may impair railroad operations.

Options Affecting Other Railyard Sources

The other 28 options considered by staff involve local railyard sources and intrastate activities. These options do not apply to new nonroad engines under 175 horsepower used in farm and construction and are therefore not preempted under CAA section 209(e)(1). ARB thus has authority under California law and CAA section 209(e)(2) to adopt emission standards for most, if not all, of the sources covered by the options. ARB staff believes that, upon harmonizing ARB's authority under the CAA with the ICCTA preemption, ARB would likely be able to regulate these sources so long as the regulations are not unduly burdensome. In evaluating the burdensomeness of a proposed regulation, ARB would consider, among other things, the cost-effectiveness of any proposed regulation.

Conclusion

For the reasons stated above, ARB staff recognizes that its authority to regulate locomotives and other sources under California law is circumscribed in varying degrees by the CAA and ICCTA. To the extent that ARB has authority to adopt regulations under the CAA, its authority must be harmonized with the ICCTA preemption.

SUMMARY OF PUBLIC INCENTIVE FUNDING PROGRAMS

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APPENDIX B

SUMMARY OF PUBLIC INCENTIVE FUNDING PROGRAMS

Implementation of the recommendations for switchers and medium horsepower (MHP) locomotives could occur through a number of mechanisms including the use of public incentive programs, railroad agreements, ARB regulations, voluntary actions on the part of UP and BNSF, or some combination thereof. However, based on the ARB legal analysis (see Appendix A) staff recommends that ARB pursue a voluntary agreement or a regulation, combined with a formal public incentive funding program. An agreement or regulation, in combination with the use of public incentive funding, could commit UP and BNSF to specific targets for locomotive repowers and aftertreatment retrofits.

Regarding acceleration of Tier 4 interstate line haul locomotives operating into California, staff believes UP and BNSF will need a national pool of up to 5,000 Tier 4 interstate line haul locomotives to ensure that up to 1,200 Tier 4 interstate line haul locomotives are operating in California on any given day. Staff believes ARB could enter into an agreement with UP and BNSF, similar to the 1998 Locomotive NOx Fleet Average Agreement, to direct 1,200 Tier 4 locomotives to operate in California on any given day. Staff believes multiple states or national funding should be provided for this effort, since the Tier 4 interstate line haul emission reductions benefits will be spread over UP's 23-state and BNSF's 28-state operating system.

These are the various public incentive funding programs that could potentially be available to complement a California locomotive repower, retrofit, and replacement program:

A. Diesel Emissions Reduction Act (DERA)

DERA, signed into law in August 2005, establishes a voluntary national and state-level grant and loan program to reduce diesel emissions. Specifically, DERA:

- Authorizes \$1 billion over 5 years (\$200 million annually)
- Authorizes EPA to oversee the expenditure of 70 percent of funds
- Allocates 20 percent of funds to states to develop retrofit programs with an additional 10 percent as an incentive for states to match federal dollars
- Establishes project priorities (for public fleets and projects that are more cost-effective and affect the greatest number of people)
- Includes provisions to stimulate the development of new technologies, encourage more action through non-financial incentives and require program accountability

The American Recovery and Reinvestment Act (ARRA), signed into law February 2009, include an additional stimulus DERA allocation of \$300 million in 2009.

B. Goods Movement Emission Reduction Program (GMERP, Proposition 1B)

GMERP, approved by California voters in 2006, is a partnership between the ARB and local agencies (such as air districts and seaports) to achieve quick reductions in air pollution emissions and health risk from freight movement along California's trade corridors. Local agencies apply to ARB for funding; those agencies then offer financial incentives to owners of equipment used in freight movement to upgrade to cleaner technologies. Projects funded under this Program must achieve early or extra emission reductions not otherwise required by law or regulation.

Proposition 1B authorizes \$1 billion in total to fund emission reductions programs. ARB has allocated \$100 million of the \$1 billion to clean up diesel freight switch and line haul locomotives. The availability of these funds depends on California's ability to sell bonds.

C. Carl Moyer Program (CMP)

This program, created by the State legislature in 1998, provides incentive grants for cleaner-than-required engines, equipment and other sources of pollution providing early or extra emission reductions. Eligible projects include cleaner on-road, off-road, marine, locomotive and stationary agricultural pump engines. The program achieves near-term reductions in emissions of NOx, PM, and reactive organic gas, which are necessary for California to meet its clean air commitments under the SIP.

Legislative changes enacted in 2004 provided increased and continued funding for the CMP and other incentive programs -- up to \$141 million a year statewide through 2015. This funding is available to UP and BNSF if funding is not available through the Proposition 1B program (e.g., for areas in California that are outside the Goods Movement Trade Corridors).

D. California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 and the ARB's Air Quality Improvement Program (AQIP, AB 118)

Assembly Bill (AB) 118 created the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007*. One component of AB 118 is a California Energy Commission program that administers \$120 million per year for alternative fuel projects, which can potentially include locomotives. In addition, the ARB administers the AQIP, which is funded for \$50 million per year for clean vehicle and equipment projects. Funds can be sought from both programs.

The ARB's AQIP program has the following key elements:

- Clean vehicle and equipment projects which reduce criteria and toxic air pollutants,
- Research on the air quality impacts of alternative fuels, and
- Workforce training.

The AQIP is funded through 2015 at \$50 million annually.

In April 2009, the ARB Board approved guidelines for administering the program and an AQIP funding plan for fiscal year 2009/10. The funding plan serves as the blueprint for expending the funds that will be appropriated to ARB in the fiscal year 2009/10 state budget, and includes up to \$2 million for locomotive demonstration projects to demonstrate technologies that are nearly ready for commercial production. The AB 118 locomotive demonstration projects may include the use of DPFs on gen-set switch locomotives and the demonstration of MHP locomotive engine repowers and aftertreatment retrofits.

On an annual basis, the AQIP funding plan will be updated and brought to the Board for its consideration. As advanced emission control technologies for locomotives become commercially available, ARB would consider them for future AQIP funding.

