PUBLIC MEETING AGENDA

July 20, 2006
9:00 a.m.

Agenda Items to be heard;

06-7-1: 06-7-2: 06-7-3:

06-7-4: 06-7-5:

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ELECTRONIC BOARD BOOK

California Environmental Protection Agency

Air Resources Board

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

PUBLIC MEETING AGENDA

This facility is accessible by public transit. For transit information, call (916) 321-BUSS, website: http://www.sacrt.com
(This facility is accessible to persons with disabilities.)

July 20, 2006
9:00 a.m.

Item #

06-7-1: Report to the Board on a Health Update: Current Issues in Ultrafine Particle Research – ARB's Health and Exposure Research Program

Ultrafine particles are under increasing scrutiny as having possibly significant health effects. The ARB is currently engaged in a number of research projects to address the sources, properties, and health effects of ultrafine particles. The sources include mobile and stationary combustion processes, secondary particle formation through atmospheric processes, and indoor sources. Health effects studies have implicated the role of ultrafine particles in respiratory and cardiovascular health. Staff will present the state of what we currently know and current research to learn about these particles.

06-7-2: Public Meeting to Brief Board Members on the San Pedro Bay Ports Clean Air Action Plan

Staff from the Ports of Los Angeles and Long Beach will provide the Board with an informational briefing on their joint Clean Air Action Plan. The draft plan identifies air quality goals proposed by the ports, along with emission reduction strategies that the ports propose to implement over the next five years. ARB staff will identify how the ports' own plan will be coordinated with the Board's recently adopted Emission Reduction Plan for Ports and Goods Movement in California.

06-7-3: Report to the Board on the Draft Planned Air Pollution Research for Fiscal Year 2006-2007

The draft report, "Planned Air Pollution Research for Fiscal Year 2006-2007" provides project concepts for the ARB's extramural research program for fiscal year 2006-2007. The proposed concepts in the plan will be brought to the Board in the future as fully designed research proposals.

06-7-4: Public Hearing to Consider Amendments to the California Regulations for New 1997 and Later Off-Highway Recreational Vehicles and Engines

Staff is proposing amendments to California's existing Off-Highway Recreational Vehicle (OHRV) regulations to add evaporative emission standards for new OHRVs, and to revise the riding seasons for OHRVs that do not meet California's exhaust emission standards. Staff also proposes to insert into section 2413, title 13, CCR, the specific language related to the labeling requirements for OHRVs, which was previously incorporated by reference and contained in a separate document, and to amend the All-Terrain Vehicle (ATV) category to better describe ATVs and to allow certain types of utility vehicles to certify to the ATV standards.

06-7-5: Public Meeting to Update the Board on the 2005 ARB/Railroad Statewide Agreement

Staff will provide an update to the Board on the implementation of the ARB/Railroad Statewide Agreement since the January 27, 2006 Board Meeting.

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 that do not specifically appear on the agenda. Each person will be allowed a maximum of five minutes to ensure that everyone has a chance to speak.

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,
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1001 I Street, 23rd Floor, Sacramento, CA 95814

(916) 322-5594
FAX: (916) 322-3928
ARB Homepage: www.arb.ca.gov

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- **For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services.**
- **If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.**

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING.

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

California Environmental Protection Agency

Air Resources Board

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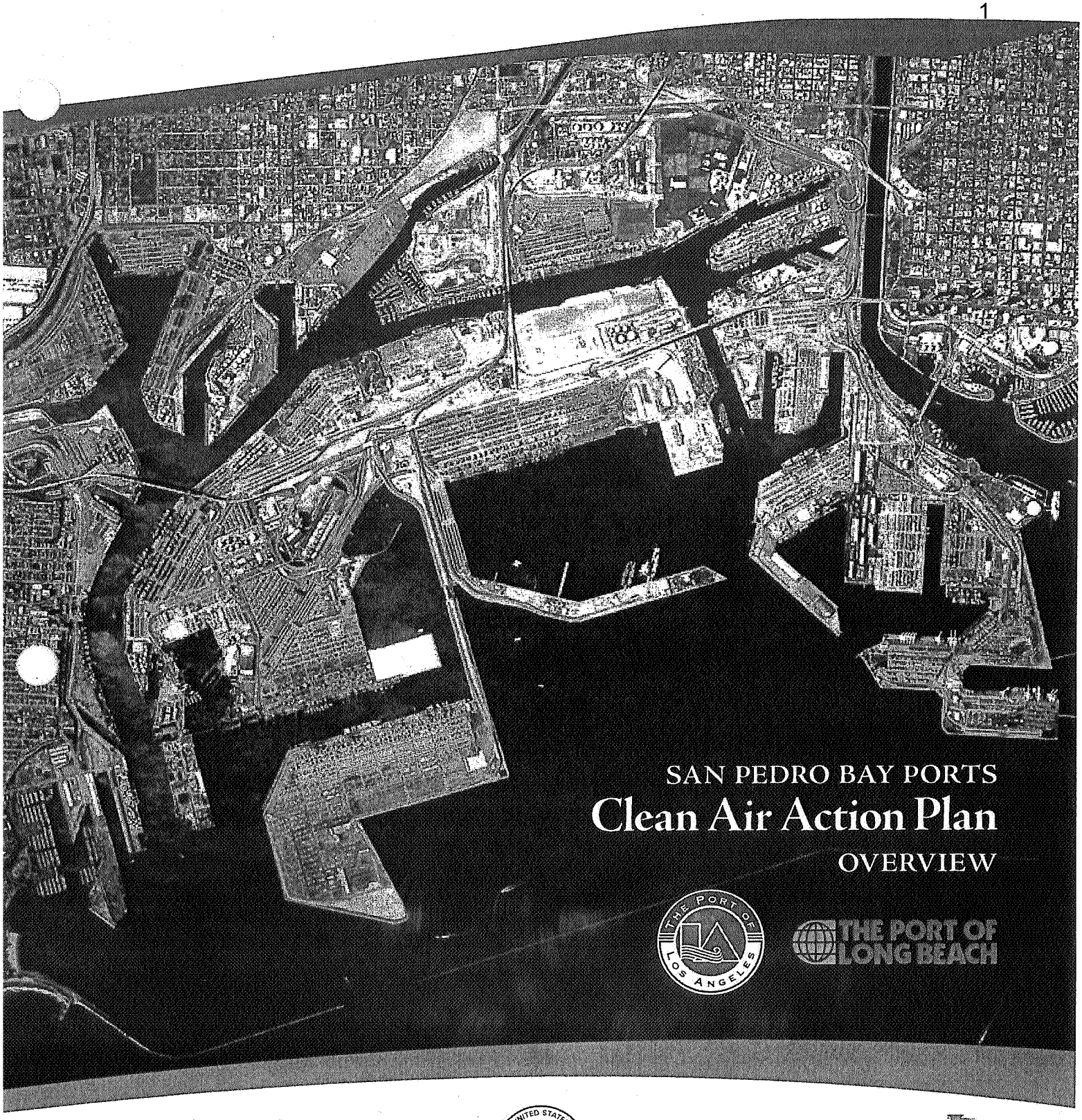


SAN PEDRO BAY PORTS

Clean Air Action Plan

OVERVIEW

THE PORT OF LOS ANGELES

THE PORT OF LONG BEACH

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

California Environmental Protection Agency

Air Resources Board

AQMD

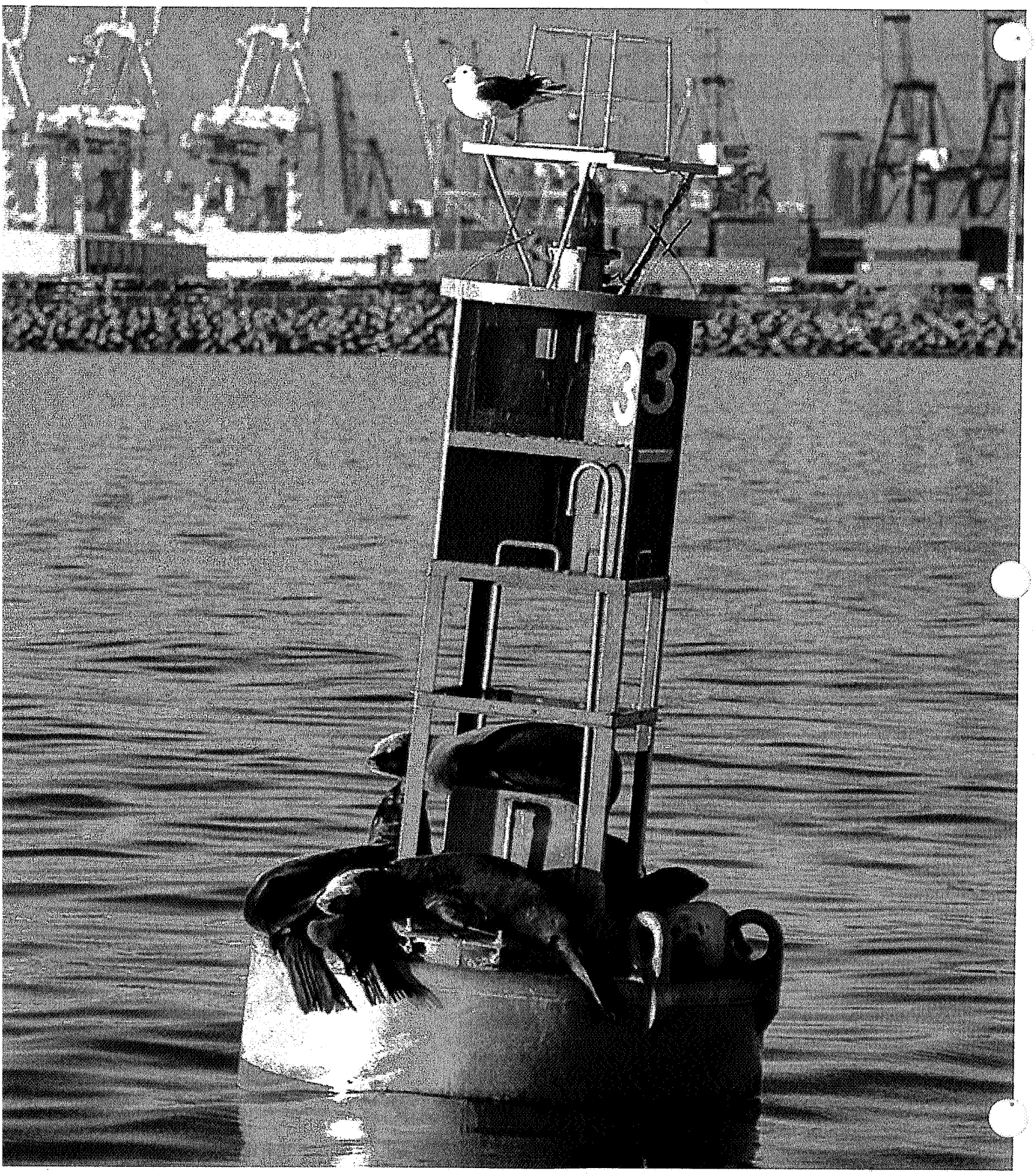
Presented for Public Review by the Port of Los Angeles and Port of Long Beach. Prepared with the participation and cooperation of the staff of the US Environmental Protection Agency, California Air Resources Board and the South Coast Air Quality Management District.

FOREWORD

To effectively integrate common goals for air quality in the South Coast Air Basin, the staff of the Port of Los Angeles (POLA) and the Port of Long Beach (POLB) have worked together to develop the initial San Pedro Bay Ports Clean Air Action Plan. The Ports have had extensive dialog with the staff of the South Coast Air Quality Management District, the California Air Resources Board, and the United States Environmental Protection Agency Region IX regarding air quality goals and appropriate control measures to achieve such goals. This groundbreaking plan reflects the input of those agencies and is now ready for public review and comments. Modifications will likely occur as a result of such review.

This plan is the first of its kind in the country, linking the emissions reduction efforts and visions of the two largest ports in the United States with similar efforts and goals of the regulatory agencies in charge of ensuring compliance with air quality standards. The collaborative effort will continue in the years to come with the review and update of the Clean Air Action Plan on an annual basis.

The air agencies have extensively reviewed and commented on the draft plan, support the collaborative process that has been established, and support of the goals delineated in the plan pending public review. By participating in the development and annual review of this plan, these regulatory agencies do not waive or forfeit their rights or obligations to continue to regulate emissions sources under their control. Participation in this process is voluntary by all parties and does not in any way inhibit or preclude agencies from any legal authorities and responsibilities to meet federal, state, and local air quality standards. Participation does not mean that the agencies necessarily endorse each of the measures and concepts proposed in the plan.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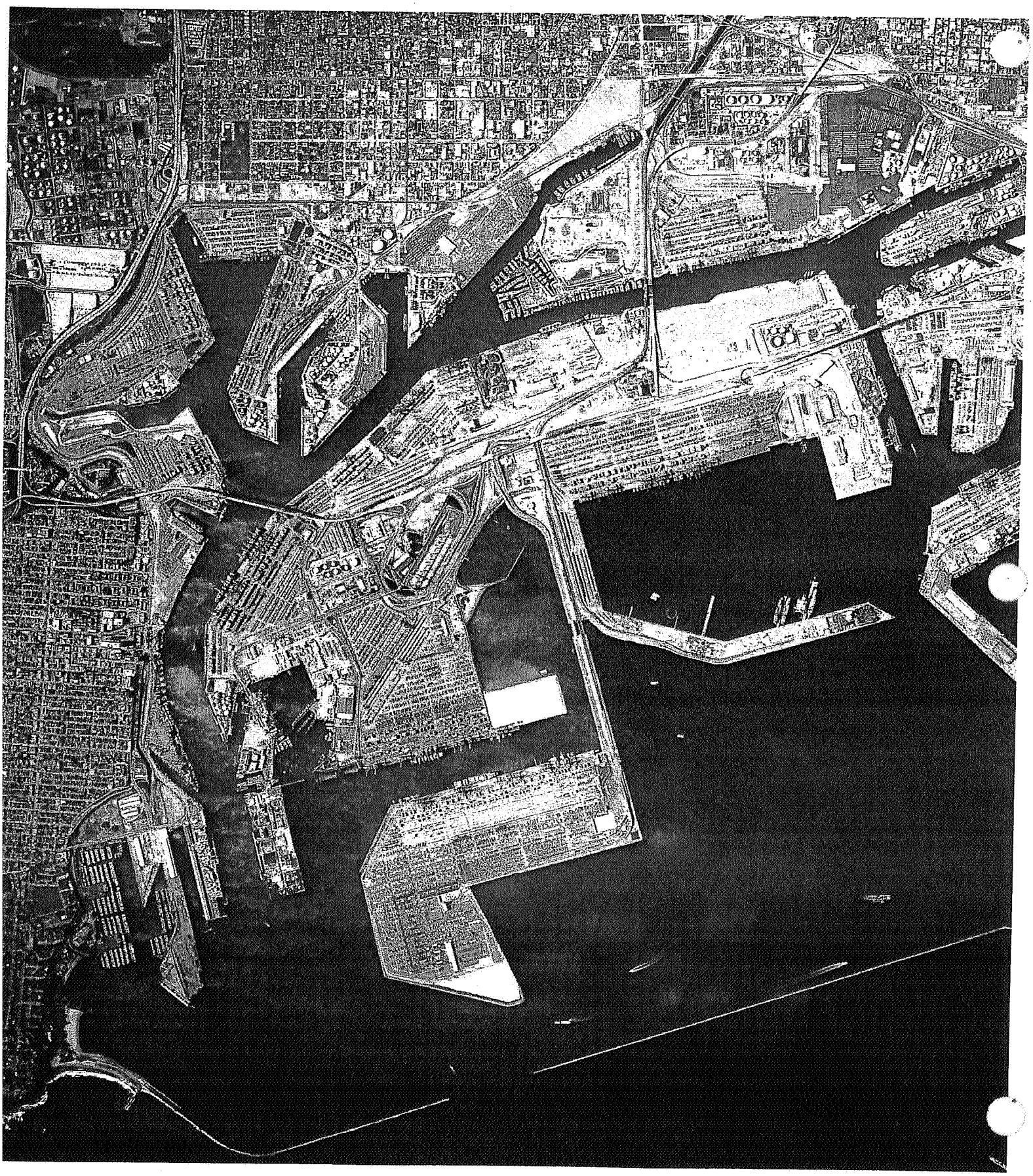
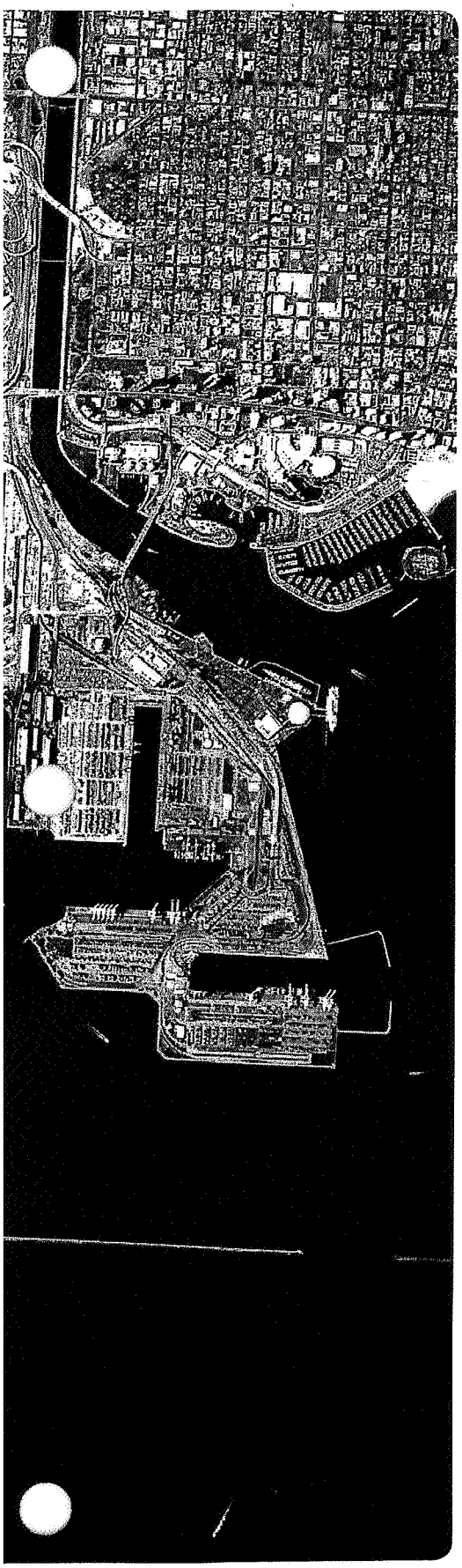
INTRODUCTION

This document is the first San Pedro Bay Ports Clean Air Action Plan. This joint Clean Air Action Plan describes the measures that the Ports of Los Angeles and Long Beach will take toward reducing emissions related to port operations.

In March 2006, a groundbreaking meeting occurred at the highest level between the two Ports and the South Coast Air Quality Management District (SCAQMD) where all parties expressed the need to work jointly toward solutions. Shortly thereafter, the Ports engaged the California Air Resources Board (CARB) and the United States Environmental Protection Agency Region IX (EPA) in the spirit of cooperation to help the Ports develop this Clean Air Action Plan. It should be emphasized that these entities have committed to continuing their efforts associated with the development, review, implementation, update/revision of the plan on an annual basis.





HISTORY

In the early 1900s, the State conveyed the Port tidelands to Los Angeles and Long Beach, as trustees for the people of the State of California, to accommodate and promote harbor commerce, navigation and fisheries.

The Ports are landlord ports; they build terminal facilities and lease them to shipping lines and stevedoring companies. The Ports do not operate the terminals, ships, yard equipment, trucks or trains that move the cargo. However, the Ports are determined to accelerate the effort to reduce air pollution from "goods movement" activities using all the powers available to them.

The San Pedro Bay Ports comprise a huge regional and national economic engine. The Los Angeles Customs District accounts for approximately $300 billion in annual trade. More than 40% of all containerized trade in the nation flows through the San Pedro Bay Ports. Economic forecasts suggest that the demand for containerized cargo moving through the San Pedro Bay region will more than double by the year 2020.

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HANJIN MIAMI

THE CHALLENGE

The San Pedro Bay Ports are located in the South Coast Air Basin (SoCAB). This Basin has some of the worst air quality in the nation, which represents a major health concern for its residents. Much of this air quality problem is attributable to the fact that the SoCAB is the second largest urban area in the nation (with all its associated emissions sources) and to the existence of topographical and meteorological conditions that enhance the formation of air pollution. Currently, the SoCAB is designated by the EPA as being in nonattainment of the National Ambient Air Quality Standards (NAAQS) for ozone and for particulate matter less than 2.5 microns (PM2.5). The ozone nonattainment level is rated "severe-17," with an attainment deadline year of 2021. The PM2.5 attainment deadline is 2015.

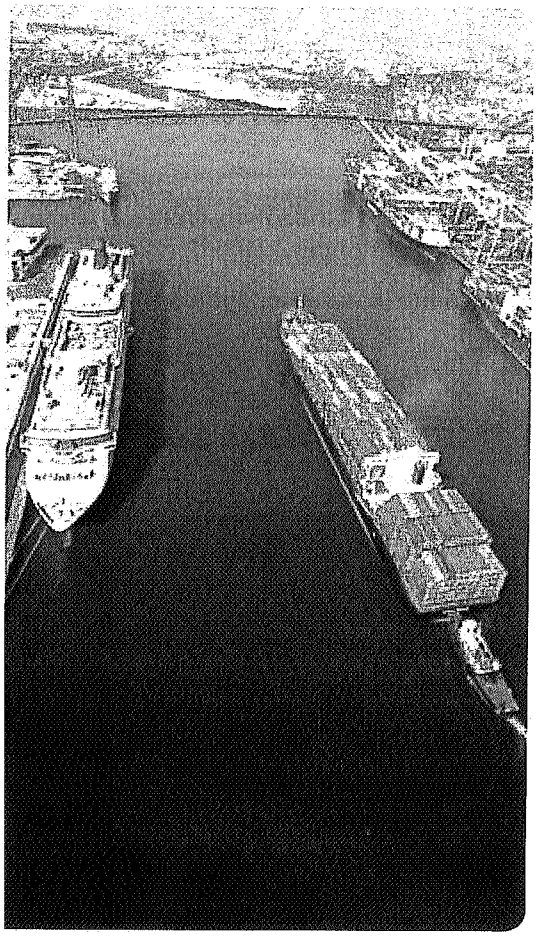
In addition, CARB has designated the exhaust from diesel-fueled engines as a toxic air contaminant, with diesel particulate matter (DPM) as a surrogate for total emissions. The EPA also lists diesel exhaust as a mobile source air toxic. According to CARB, about 70 percent of the potential cancer risk from toxic air contaminants in California can be attributed to DPM. Therefore, the concentration of DPM in communities has become a major public health concern and the focus of CARB and SCAQMD regulations.

In 2000, the SCAQMD released results from its second Multiple Air Toxics Exposure Study (MATES II), which raised concerns about the impact of emissions from ships, trucks and trains in the vicinity of the Ports and major transportation corridors. Since then, both Ports have had terminal development plans challenged and delayed due to concerns about the adequacy of environmental mitigation.

In order for the SoCAB to attain the NAAQS, and to protect public health, immediate action is necessary to significantly reduce emissions from all sectors, including "goods movement." Several port-related sources are subject to aggressive regulations yet, still fall short of the levels needed to accommodate growth while protecting public health. Recently, CARB undertook several actions targeted at reducing emissions from goods movement activities. These actions include:

- Ultra low sulfur diesel (ULSD) fuel requirements for on-road and off-road diesel engines fueled within the SoCAB
- Emissions standards for cargo handling equipment (CHE)
- Statewide Memorandum of Understanding between CARB and line haul railroads
- In addition to the focus on DPM, oxides of nitrogen (NOx) and oxides of sulfur (SOx) greenhouse gases (such as carbon dioxide, methane, etc.) are an important consideration when evaluating emissions from mobile sources, since they potentially affect public health on a global level. While the immediate purpose of this Clean Air Action Plan is to address emissions that affect public health on a local basis, certain proposed measures will result in a decrease in greenhouse gas emissions.

Both Ports have adopted and are implementing a wide range of new environmental initiatives. These efforts include better documentation of environmental impacts and more detailed evaluation of effective mitigation measures. The Ports are cognizant of the view of environmental groups, local residents and regulatory agencies that not enough is being done to address port-related air quality issues. The Ports are also aware of the views of port users and operators that inconsistent or conflicting environmental measures could have unintended and even counterproductive effects.



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THE VISION

The Ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. The Clean Air Action Plan is designed to develop mitigation measures and incentive programs necessary to reduce air emissions and health risks while allowing port development to continue.

The Ports are determined to accelerate ongoing efforts to reduce air pollution from all modes of goods movement through the San Pedro Bay Ports. The Clean Air Action Plan is not only built upon the Ports' previous air quality mitigation efforts, but also on the efforts of the regulatory agencies, business stakeholders and concerned residents. This plan incorporates their concepts and control measures while establishing a new vision for port-related goods movement.

The Ports are pleased to note that from preliminary emissions inventory estimates for 2005, current emission levels from cargo handling equipment are lower than 2001/2002 levels, providing an immediate benefit to port workers and nearby residents. But having noted this encouraging progress, both Ports recognize that there is still a significant amount of work to be done.

The Ports share the goal of reducing air pollution from port operations to acceptable regulatory health risk thresholds. The Ports take responsibility to implement the measures in this plan. The generally accepted health risk threshold for individual projects is a 10 in 1,000,000 additional cancer risk. It is recognized that the standardized modeling used to measure this risk is imperfect. Therefore, the Clean Air Action Plan is multi-faceted. The Clean

Air Action Plan includes stringent San Pedro Bay-wide standards that achieve real emissions reductions; a nested set of implementation strategies; investment in the development and integration of new/cleaner technologies into port operations; and creating a comprehensive monitoring and tracking program that will document progress on all of these elements.

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The Ports also acknowledge the reality that reducing pollution to near zero levels would require massive conversion to electric, fuel cell or hydrogen vehicles, which are not yet commercially available for all applications. However, there are low-emissions technologies commercially available that slash pollution up to 90% from the 2004 on-road heavy-duty exhaust emissions standards. The Ports also recognize that the extensive scope of emission reductions necessary to achieve the goals envisioned in this plan will require more than a 5-year period to fully implement. This highlights the need for the plan to be adopted in 2006, and for aggressive implementation to commence with strong commitments by both Ports.

2401
RPRX 2401
Green Goat
RAILPOWER
Ultra Clean Hybrid
United States Patent No. 6,508,638

THE PLAN

The Clean Air Action Plan consists of the following eight elements:

1) Standards and Goals
2) Implementation Strategies
3) Control Measures
4) Technology Advancement Program
5) Infrastructure & Operational Efficiency Improvements Initiative
6) Estimated Emissions Reductions
7) Estimated Budget Requirements
8) Recommendations

This document represents a staff-prepared draft overview of the plan that is a work in progress. Staff intends to take a final plan to the respective Boards of Harbor Commissioners in September 2006 with incorporation of suggestions from agencies, tenants, and the public. In the meantime, current emissions reduction programs will be continued and some of the new initiatives included in the plan will be initiated before September 2006.

The plan is based on the following principles:

1) The Ports will work cooperatively to implement these strategies.
2) The Clean Air Action Plan, although built upon past efforts, will be continually updated and improved.
3) The Ports will be open to new technologies and other advancements to accelerate meeting the vision expressed above.
4) The Ports will achieve an appropriate fair share of necessary pollutant emission reductions which are cost effective and feasible.

Tenants, railroads, and the trucking industry will be expected to "sign-on" and participate in the Clean Air Action Plan beginning January 1, 2007. Before January 1, 2007, the Ports will work with tenants and

the railroads to assist them in developing their own programs to meet the plan's standards. These groups will be asked for a written explanation as to how they intend to meet or surpass the goals of the plan. The Ports are committed to working with industry stakeholders to assure speedy action.

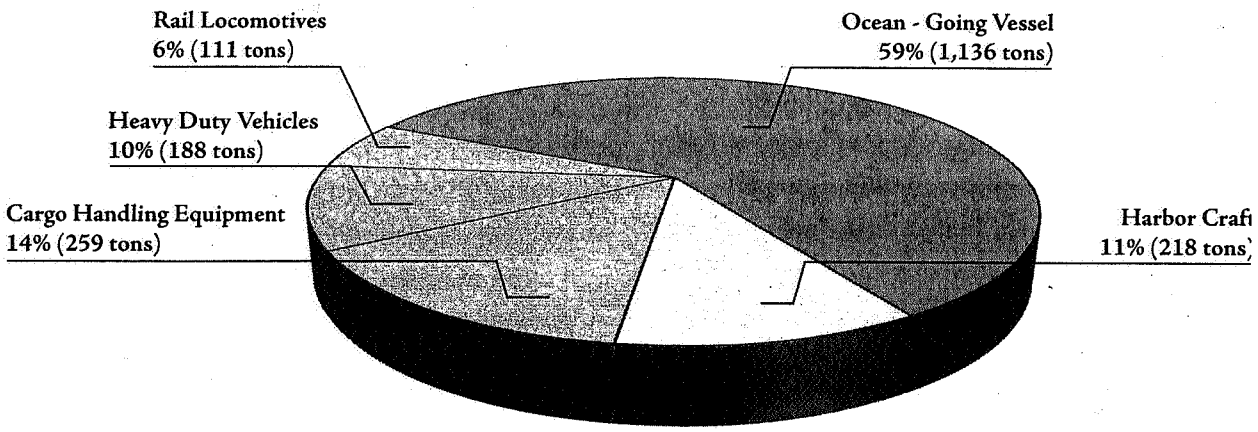
While many of the control measures are based in large part on the work of the No Net Increase Task Force, the Green Port Policy, and other initiatives, the Ports will remain open to innovative ideas that will achieve the same or better results.

The movement of goods by heavy-duty trucks from the Ports through local communities is an extraordinary challenge because it involves thousands of truck owner/operators who do not have the financial resources to acquire cleaner trucks on their own. The Ports are adopting a goal that will eliminate "dirty" trucks from the San Pedro Bay terminals within 5 years from adoption of this plan. The Ports will therefore work with all concerned parties to establish new relationships and business paradigms that will help secure the necessary funding to make this important transition. The Ports will also pursue "Green Container Transport" systems that can transport containers with "Green Power" to inland destinations so that, over time, the Ports can move toward a pollution-free transport system for goods movement.

EMISSIONS BY SOURCE CATEGORY

Both Ports are currently updating their 2005 emissions inventory by source category. Based on the baseline year emissions inventories for both Ports (Port of Los Angeles 2001, Port of Long Beach 2002), the contribution of emissions by the five port-related source categories (Heavy-Duty Vehicles (HDV or trucks), Ocean-Going Vessels (OGV or cargo ships), Cargo Handling Equipment (CHE), Harbor Craft (HC), and Railroad Locomotives (RL)) are shown on the following charts.

Baseline Year DPM Emissions Contributions by Source Category



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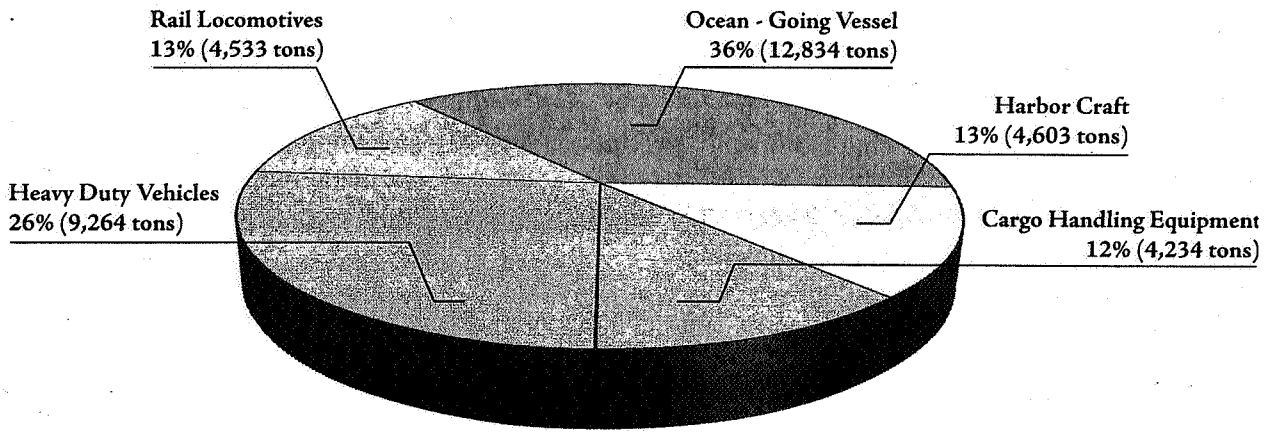
Baseline Year NOx Emissions Contributions by Source Category



THE STANDARDS

The principles upon which this plan is based set forth extremely ambitious goals for port-related goods movement. From the vision of reducing port-related health risk and the principles stated previously, it is the Ports' goal to establish standards at the following three levels:

(1) San Pedro Bay Standards

- Reduce public health risk from toxic air contaminants associated with port-related mobile sources to acceptable levels.
- Prevent port-related violations of the state and federal ambient air quality standards at air quality monitoring stations at both ports.
- Reduce criteria pollutant emissions to the levels that will assure that port-related sources contribute their "fair share" to enable the South Coast Air Basin to attain state and federal ambient air quality standards.

(2) Project Specific Standards – Projects must meet the 10 in 1,000,000 excess cancer risk threshold, as determined by health risk assessments conducted during California Environmental Quality Act (CEQA) review and implemented through required CEQA mitigations associated with lease negotiations. Projects that exceed the AQMD CEQA significance thresholds for criteria pollutants must implement the maximum available controls and feasible mitigations for any emissions increases.

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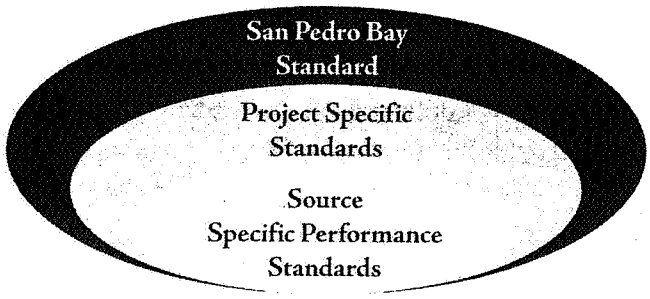
(3) Source Specific Performance Standards – A series of standards that will be met through port lease requirements, tariffs, incentives, and market-based mechanisms as outlined below.

Compliance with the Project Specific Standards may require that an individual terminal go beyond the Source Specific Performance Standards or advance the date of compliance with those performance standards.



The relationships between these three standards are illustrated in the chart.

The Source Specific Performance Standards are targeted at the five source categories of mobile equipment and vessels that are part of port-related goods movement. The Source Specific Performance Standards proposed by the plan are:

Heavy- Duty Vehicles/Trucks

- By the end of 2011, all trucks calling at the ports frequently or semi-frequently will meet or be cleaner than the EPA 2007 on-road PM emissions standards (0.01 g/bhp-hr for PM) and be the cleanest available NOx at the time of replacement or retrofit.

Ocean-Going Vessels

- 100% compliance with the Vessel Speed Reduction Program [initially out to a distance of 20 nautical miles (nm) from Point Fermin, and expanded to 40 nm].
- The use of 0.2% or lower sulfur Marine Gas Oil (MGO) fuel in vessel auxiliary and main engines at berth and out to a distance of 20 nm from Point Fermin, and expanded to 40 nm, or equivalent reduction.
- The use of shore-power (or equivalent) for hotelling emissions implemented at all major container, selected liquid bulk, and cruise terminals in POLA within five to ten years and at all container terminals and one crude oil terminal in

POLB within ten years (the implementation time difference being due to the Port of Long Beach's more extensive infrastructure development schedule).

- The use of NOx and PM control devices on auxiliary and main engines mandated on new vessel builds and existing frequent callers.

Cargo Handling Equipment

- Beginning 2007, all Cargo Handling Equipment (CHE) purchases will meet one of the following performance standards:
- Cleanest available NOx alternative-fueled engine, meeting 0.01 g/bhp-hr for PM, available at time of purchase, or
- Cleanest available NOx diesel-fueled engine, meeting 0.01 g/bhp-hr for PM, available at time of purchase.
- By the end of 2011, all remaining CHE will meet the EPA Tier 4 engine standards.

Harbor Craft

- By the second year of the plan, all Harbor Craft (HC) home-based at San Pedro Bay Ports will meet EPA Tier 2 for harbor craft or equivalent reductions.
- By the fifth year, all previously repowered HC home-based at San Pedro Bay Ports will be retrofitted with the most effective CARB verified NOx and/or PM emissions reduction technologies.
- When Tier 3 engines become available, within five years all HC home-based at San Pedro Bay Ports will be repowered with the new engines.

Railroad Locomotives

- By 2008, all existing switch engines in the Ports shall be replaced with Tier 2 engines equipped with 15-minute idling devices and shall use emulsified fuels as available.
- By 2011, all diesel-powered line-haul locomotives entering the San Pedro Bay Ports shall meet or be cleaner than EPA Tier 2 rail standards, with use of after-treatment controls and Ultra Low Sulfur Diesel (ULSD).
- Any new switch engine acquired after the initial Pacific Harbor Line replacement must meet EPA Tier 3 standards or equivalent to 3 grams NOx/bhp-hr and 0.023 g PM/bhp-hr.
- Any new rail yard developed at the San Pedro Bay Ports, or any rail yard significantly redesigned, shall be required to operate the cleanest locomotive technologies currently available (alternative fueled locomotives, hybrid, electric, multi-engine generator set, etc.), use yard equipment meeting the cargo handling equipment standards specified above, and will be serviced only by the cleanest commercially available heavy-duty trucks meeting or exceeding the EPA 2007 on-road emissions standards.

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IMPLEMENTATION

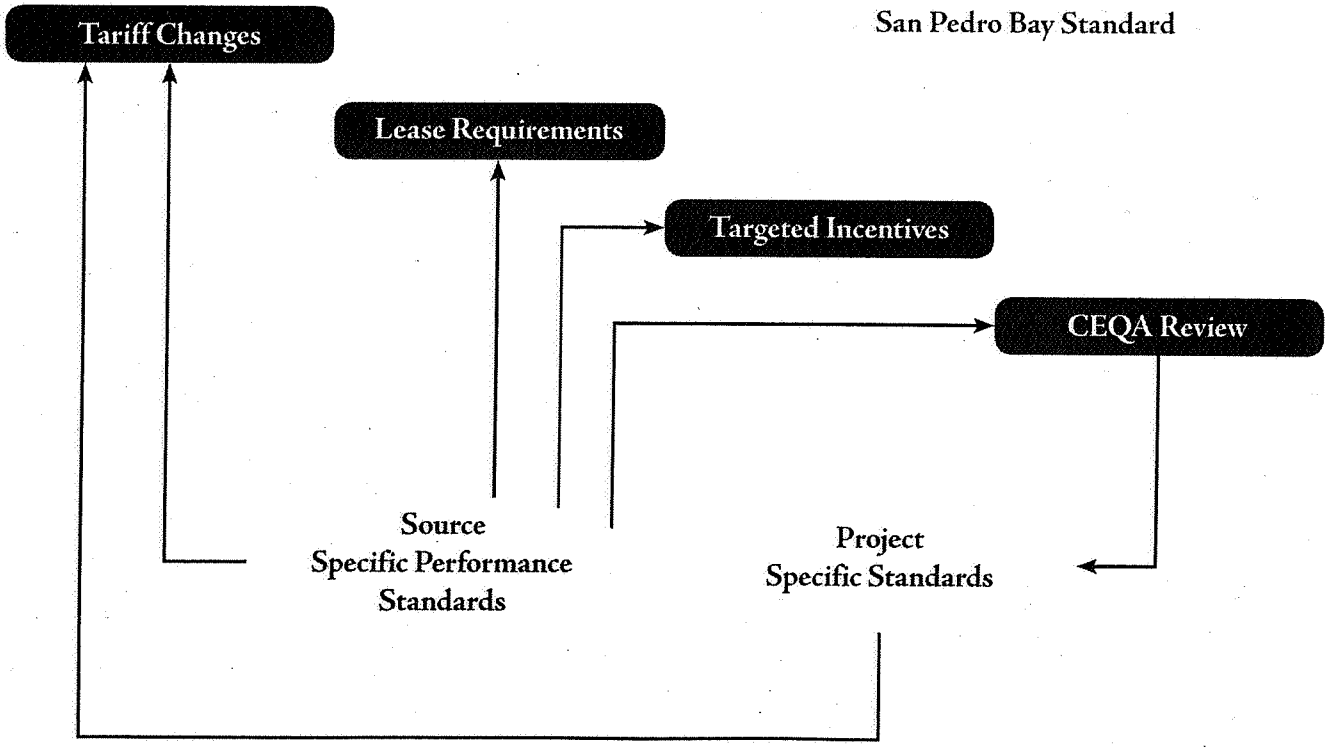
The Ports have evaluated numerous implementation strategies for the proposed standards, extensively reviewed options, and evaluated several scenarios. The strategies that have been evaluated to date are:

- Lease Requirements
- Tariff Changes
- CEQA Mitigations
- Incentives
- Voluntary Measures
- Credit Trading
- Capital Lease Backs
- Government-Backed Loan Guarantees for Trucks

The most effective combination of implementation strategies identified at this time is a mix of lease requirements, tariff changes, CEQA mitigations, and incentives. This combination provides redundancy in implementing the Source Specific Performance Standards should any one of the other specific strategies fail to be applied. Tariff changes offer an opportunity to affect a broader range of tenants but have potential implementation issues. Lease requirements may be able to go further than tariffs, but requirements can generally only be negotiated when the lease is reopened, such as when:

- A terminal change/modification triggers an EIR
- A new lease is sought
- An existing lease comes up for renewal

The following flow diagram illustrates how the Source Specific Performance Standards and the Project Specific Standard will be implemented, and how the performance and project standards are related.



The following table presents the Port of Los Angeles' major leases, expiration dates, and currently anticipated upcoming Board action dates related to Environmental Impact Reports and/or leases.

Land Use	Grantee	Terms of Agreement	Date Expires	Anticipated Board Action
Container	POLA Container Terminal (berths 206-209)	vacant	vacant	within 5 years
Container	Eagle Marine Services, Ltd.	30 Years	12/31/2026	7/1/2011
Container	APM Terminals Pacific, Ltd	25 Years	7/31/2027	not in 5 yr period
Container	China Shipping Holding Company, Ltd.	25 Years	New	11/1/2006
Container	Evergreen Marine Corporation, LTD.	32 Years	12/31/2028	7/1/2007
Container	TraPac	15 Years	9/30/2002	6/1/2006
Container	Yang Ming Marine Transport Corporation, Ltd.	20 Years	10/10/2021	8/1/2007
Container	Yusen Terminals Inc.	25 Years	9/30/2016	8/1/2007
Passengers/Sup Com.	Pacific Cruise Ship Terminals, LLC	18 Months	6/30/2005	within 5 years
Automobile	Distribution & Auto Services, Inc.			n/a
General Cargo	Rio Doce Pasha Terminal, L.P. (berths 174-181)	15 Years	12/31/2000	11/1/2006
General Cargo	Stevedoring Services of America (berths 54-55)	10 Years	10/31/2009	12/1/2009
Dry Bulk	Hugo Neu-Proler Company	30 Years	8/30/2024	not in 5 yr period
Dry Bulk	Los Angeles Export Terminal Corporation	35 Years	8/30/2032	n/a
Liquid Bulk	Equilon (berths 167-169)	35 Years	2/11/2023	not in 5 yr period
Liquid Bulk	Exxon Mobil Corporation (berths 238-240)	25 Years	12/31/2015	not in 5 yr period
Liquid Bulk	Pacific Energy Marine Oil (pier 400)	tbd	New	12/1/2006
Liquid Bulk	Conoco Phillips (berths 148-151)		holdover	12/1/2007
Liquid Bulk	Ultramar (berth 164)	25 Years	1/1/2001	9/1/2006
Liquid Bulk	Vopak (berths 187-191)	38 Years	8/29/2023	not in 5 yr period
Liquid Bulk	Westway Terminal Company, Inc. (berths 70-71)	30 Years	3/23/2025	not in 5 yr period

(The following table continued from page 21)

Land Use	Grantee	Terms of Agreement	Date Expires	Anticipated Board Action
Liquid Bulk	GATX Tank Storage (berths 118-119)	25 Years	4/13/2013	unknown
Liquid Bulk	Amerigas (berth 120)		holdover	12/1/2007
Liquid Bulk	Valero (berth 163)	20 Years	6/24/2014	not in 5 yr period

The following table presents the Port of Long Beach's major leases, expiration dates, and currently anticipated upcoming Board action dates.

Land Use	Grantee	Terms of Agreement	Date Expires	Anticipated Board Action
Container	PCT	20 Years	4/30/2022	not in 5 yr period
Container	SSAT - Pier C	20 Years	4/30/2022	5/15/2006
Container	SSAT Long Beach - Pier A	25 Years	10/21/2027	not in 5 yr period
Container	TTI	25 Years	8/11/2027	not in 5 yr period
Container	CUT	30 Years	6/30/2009	12/1/2007
Container	LBCT	25 Years	6/30/2011	12/1/2007
Container	Pier S	tbd	new lease	8/31/2007
Container	ITS	34 Years	8/31/2006	5/22/2006
Auto	Toyota	16 Years	12/31/2006	12/31/2006
Break Bulk	Cooper/T. Smith	20 Years	12/31/2008	8/1/2007
Break Bulk	Crescent Terminals	15 Years	6/30/2015	10/1/2006
Break Bulk	Fremont	40 Years	4/30/2036	not in 5 yr period
Break Bulk	Catalyst Paper (USA) Inc.	3 Years	8/31/2008	8/31/2008
Break Bulk	Pacific Coast Recycling	25 Years	11/13/2019	not in 5 yr period
Break Bulk	Weyerhaeuser	36 Years	1/31/2011	1/31/2011
Dry Bulk	BP West Coast Products	40 Years	12/31/2009	12/31/2009
Dry Bulk	CEMEX Pacific Coast Cement	40 Years	8/31/2021	not in 5 yr period
Dry Bulk	Koch Carbon	40 Years	12/31/2027	not in 5 yr period

(The following table continued from page 21)

Land Use	Grantee	Terms of Agreement	Date Expires	Anticipated Board Action
Dry Bulk	Marsulex	20 Years	5/31/2005	12/31/2006
Dry Bulk	MMC (Mitsubishi)	33 Years	6/13/2022	not in 5 yr period
Dry Bulk	Metropolitan Stevedore	35 Years	3/31/2016	not in 5 yr period
Dry Bulk	Morton	15 Years	7/31/2005	12/31/2006
Dry Bulk	NGC	60 Years	11/30/2024	not in 5 yr period
Dry Bulk	G-P Gypsum	n/a (private)	n/a (private)	n/a (private)
Dry Bulk	Oxbow (East)	20 Years	11/3/2019	not in 5 yr period
Dry Bulk	Oxbow (Pad 14)	31 Years	6/30/2021	not in 5 yr period
Dry Bulk	Oxbow (South)	32 Years	6/30/2021	not in 5 yr period
Dry Bulk	Oxbow (West)	41 Years	12/31/2027	not in 5 yr period
Liquid Bulk	BP/ARCO	40 Years	5/30/2023	8/31/2007
Liquid Bulk	ATSC	20 Years	12/31/2014	not in 5 yr period
Liquid Bulk	BP Terminal 3	n/a (private)	n/a (private)	n/a (private)
Liquid Bulk	World Oil	n/a (private)	n/a (private)	n/a (private)
Liquid Bulk	Baker Commodities	n/a (private)	n/a (private)	n/a (private)
Liquid Bulk	Chemoil	36 Years	6/30/2010	10/31/2007
Liquid Bulk	Equilon (Shell)	40 Years	10/31/2006	12/31/2006
Liquid Bulk	Petro-Diamon	20 Years	9/30/2022	not in 5 yr period
Liquid Bulk	VOPAK	n/a (private)	n/a (private)	n/a (private)

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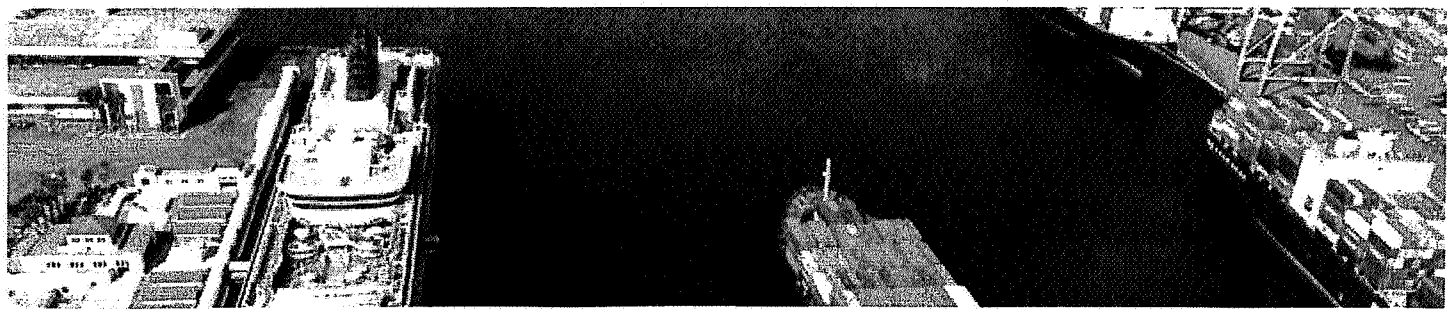
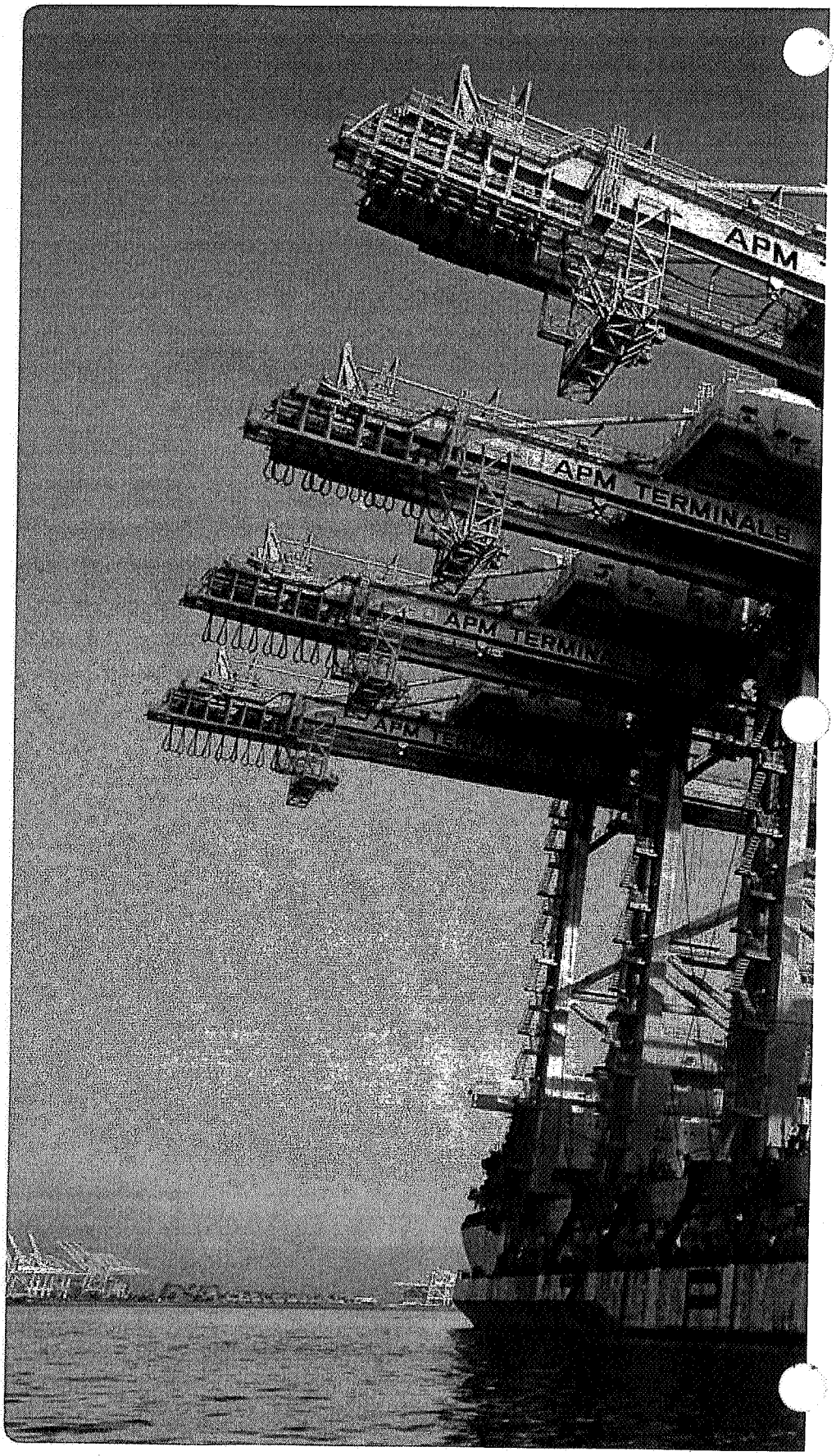


FUNDING

The standards being set forth in this plan will require significant funding beyond what the Ports can provide. Port's funding will be focused on performing infrastructure improvements; assisting in the turnover of owner/operator and fleet-owned trucks with alternative fueled/clean diesel trucks; and investing in a Technology Advancement Program. The SCAQMD has committed to provide funding in 2006, and has further proposed to continue to fund the plan through the next five fiscal years. The estimated range of funding for the Clean Air Action Plan (for the various scenarios) is is $194 million to $2.6 billion.

Even with the significant commitment of funding from both Ports and the SCAQMD, a sizeable infusion of additional funding will be required to execute the plan just to ensure turnover of the frequent-caller truck fleet (trucks that call at the Ports seven or more times per week).

The California Legislature recently passed a long-awaited infrastructure bond package that includes monies for port infrastructure and trade related air quality improvements. If approved by California voters this November, these funds could be used to supplement Port and SCAQMD funding. Both the regulatory agencies and the Ports will need to push for the required additional funding through legislative solutions and public awareness of the issues.



TERMINALS

THE CONTROL MEASURES AND INITIATIVES

The broad range of control measures and initiatives included in the plan are:

- SPBP-HDV1: Performance Standards for On-Road Heavy Duty Vehicles
- SPBP-HDV2: Alternative Fuel Infrastructure for On-Road Heavy Duty Vehicles
- SPBP-OGV1: Vessel Speed Reduction
- SPBP-OGV2: Reduction of At-Berth Ocean-Going Vessel Emissions
- SPBP-OGV3: Ocean-Going Vessel Auxiliary Engine Fuel Improvement Standards
- SPBP-OGV4: Ocean-Going Vessel Main Engine Fuel Improvement Standards
- SPBP-OGV5: Ocean-Going Vessel Main Engine Emissions Improvements
- SPBP-CHE1: Performance Standards for Cargo Handling Equipment
- SPBP-HC1: Performance Standards for Existing Harbor Craft
- SPBP-RL1: Rail Switch Engine Modernization
- SPBP-RL2: Operational Controls for Line Haul Railroads
- SPBP-RL3: Clean Rail yard Standards
- Construction Standards
- Technology Advancement Program
- Infrastructure and Operational Efficiency Improvements Initiative
- Port of Los Angeles China Shipping Settlement

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Details of the individual control measures and initiatives are provided in the San Pedro Bay Ports Clean Air Action Plan Technical Report. However, further explanation on the heavy-duty vehicle and shore power measures are included in this Overview document.

Many of the measures proposed in the Clean Air Action Plan advance the requirements and implementation of upcoming regulations, as did several of the NNI

SPBP Measure Number	New Control Measure/ Progrma Name	Non Regulatory NNI Measures
SPBP-HDV1	Performance Standards for On-road Heavy-Duty Vehicles	HDV3, HDV10 HDV12, HDV14
SPBP-HDV2	Alternate Fuel Infrastructure for On-Road HDVs	
SPBP-OGV1	Vessel Speed Reduction	OGV2, OGV15
SPBP-OGV2	Reduction of At-Berth OGV Emissions	OGV3, OGV16
SPBP-OGV3	OGV Auxiliary Engine Fuel Improvement Standards	OGV4, OGV11
SPBP-OGV4	OGV Main Engine Fuel Improvement Standards	OGV9, OGV12
SPBP-OGV5	OGV Main Engine Emissions Improvements	OGV7, OGV13, OGV14
SPBP-CHE1	Repower or Retrofit Existing Harbor Craft	CHE2, CHE3, CHE4, CHE5, CHE7, CHE8
SPBP-HC1	Performance Standards for Harbor Craft	HC9, HC10
SPBP-RL1	Rail Switch Engine Modernization	R5, R6
SPBP-RL2	Operational Controls for Line Haul Railroads	R7, R10, R11
SPBP-RL3	Clean Rail yard Standards	R7, R10, R11
	Technology Advancement Program	HDV13, HDV14, HDV18, HDV19, OGV7, OGV13, OGV14, HC3, HC7, R7, R9, R12
	POLA China Shipping Settlement	CHE6, HC5

measures. Non-regulatory NNI measures have been incorporated into the Clean Air Action Plan control measures. Regulatory NNI measures are part of the on-going regulatory programs implemented by the federal, state, and local agencies and are the responsibility of those agencies. The following table details how each San Pedro Bay Ports Clean Air Action Plan measure relates to the 38 non-regulatory NNI control measures.

Heavy-Duty Vehicles (Trucks)

By far, the single most challenging component of the Clean Air Action Plan will be the implementation and funding associated with the mass turnover of frequent-caller trucks (and ultimately all trucks) calling at both Ports in order to meet the proposed "clean truck" standards. On-road heavy-duty diesel vehicle (truck) travel is an integral part of port operations, moving containers from the Ports into the SoCAB and beyond. The focus of the measures addressing HDVs is the replacement or upgrade of all frequent and semi-frequent caller trucks, and all older (Model Year 1993 and older) trucks that call at the Ports.

In order to accelerate the emission reductions from the heavy-duty truck sector, the Ports are proposing an extensive fleet modernization program currently focused on two paths: alternative fuels and cleaner diesel. To highlight the importance of this strategy in achieving near-term emission reductions, the Ports and SCAQMD are proposing to commit over $200 million during the next five years to replace and retrofit heavy-duty trucks (or finance the replacement and retrofit). The current cost projections (detailed in the San Pedro Bay Ports Clean Air Action Plan Technical Report) call for a total investment from all funding sources of just over $1.7 billion on HDV replacements or upgrades (installation of emission controls) over the five-year period covered by the plan.

This measure focuses on making significant emissions reductions improvements to the approximately 16,300 individual frequent- and semi-frequent-caller trucks that account for around 80% of all truck visits at the Ports. Several scenarios were developed (these are detailed in the Technical Report and its appendices). The scenario selected for planning purposes (Budget

Scenario 7) calls for all frequent-caller trucks and semi-frequent-caller trucks Model Year (MY) 1992 and older to be replaced (with either new alternative fuel or cleaner diesel engines), and semi-frequent-caller trucks MY1993 to MY2003 to be at a minimum retrofitted with DPM and NOx reduction equipment. The Ports envision tackling this measure using several potential approaches, including incentives to replace trucks; lease requirements to require the use of "clean trucks"; a green lane program to expedite clean trucks; a medallion program to limit "dirty trucks"; tariff changes; or a sliding fee mechanism that favors "clean trucks."

The next steps include releasing a request for proposals on an alternative fueling and maintenance station (currently underway); and development of a specific list of projects suitable for bond funding, finalizing measure implementation details (fleets and owner/operator), purchase or financing of "clean trucks," construction and operation of the station, etc.

Shore Power

Another primary focus of the plan is reducing the emissions from ocean-going vessels (OGV) during hotelling (tied up at berth transferring cargo) at terminals. Both Ports currently have separate and distinct programs. However, they share a common ultimate goal of moving all container berths, cruise

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ship operations, selected tanker operations, and other frequent vessel types calling in the San Pedro Bay to shore power, and to move other vessel types toward alternative emissions reduction technologies that achieve equivalent reductions.

The Plan focuses on two primary approaches for reducing at-berth emissions: shore power (transferring the electrical generation needs for OGV while at berth from onboard diesel-electric generators to the cleaner shore-side power grid, which generates power through regulated/controlled stationary sources) and hotelling emissions reduction requirements through alternative technologies, for ships that do not fit the shore power model. Finally, both Ports will also build plugs-ins so that all future port dredging can be accomplished using electric dredges.

The Port of Los Angeles' program for shore power is called Alternative Maritime Power (AMP™), and the Port of Long Beach's program is referred to as shore-side power or cold ironing. With regards to shore power, the Ports are in significantly different positions from an infrastructure standpoint. The Port of Los Angeles generally has the main electrical trunk lines in place from which to "step-down" and condition power for ships. The Port of Long Beach, however, needs to bring trunk lines down from Interstate 405 into the port to supply the appropriate power. This will likely require additional time for implementation.

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Over the next five years, the Port of Los Angeles will conduct a massive infrastructure improvement program to make AMP™ available at a number of berths at container, selected liquid bulk terminals, cruise terminals, and dredge plug-in locations. The following draft table (Table A) presents the berths at the Port of Los Angeles that are currently planned to be improved and operational by the end of the fifth year of the Clean Air Action Plan.

Over the next five years, the Port of Long Beach currently plans to have crude oil Berth T121 and six container berths operational with shore power. In addition, the Port will be undergoing a massive electrical infrastructure improvement program to bring main trunk lines down from Interstate 405, and complete infrastructure improvements for the remaining container terminals, electric dredge plug-ins, and additional infrastructure for electrification of certain types of yard equipment. The following table (Table B) presents the berths at the Port of Long Beach that will be improved and operational by the end of the fifth year.

The Port of Long Beach has committed to providing cold-ironing infrastructure at all container and one crude oil terminal within the next five to ten years. However, the Port does not anticipate the opportunity, through facility redevelopment or master lease renewal, in the next five years to incorporate cold-ironing infrastructure

Table A

Note: LTT – Long Term Tenant

Site	Number of Berths	Date Operational
B90-93 (Cruise Terminal)	2 Berths (2 Vessels)	Jan 2008
B100-102 (CS)	1 Completed, 1 To Go	Jan 2009
B121-131 (WBCT)	2 Berths	Jul 2010
B136-147 (TraPac)	2 Berths	Jul 2009
B175-181(Pasha)	1 Berth	Jan 2011
B206-209 (LTT)	1 Berth	Jan 2011
B212-218 (YTI)	1 Berth	Dec 2006
B224-236 (Evergreen)	1 Berth	Jan 2008
Pier 300 (APL)	1 Berth	Jan 2011
Pier 400 (APM)	1 Berth	Jan 2011
Pier 400 (Liquid Bulk)	1 Berth	Jan 2009
Total AMP'd Berths	15 Berths	

Table B

Site	Number of Berths	Date Operational
Pier C (Matson)	1 Berth	Jan 2011
Piers D, E, F (Middle Harbor)	1 Berth	Sept 2011
Pier G (ITS)	2 Berths	Jan 2011
Pier S	2 Berths	Sept 2011
Pier T, berth T 121 (BP)	1 Berth	4th qtr. 2007
Total Shore Power Power Berths	7 Berths	

Table C

Site	Number of Berths	Date Operational
Pier A	1 Berth	2011
Piers H (Carnival)	1 Berth	2011
Pier J	1 Berth	2011
Navy Mole (Sea-Launch)	2 Berths	2011
Pier T (TTI)	1 Berth	2011
Total Shore Power Power Berths	6 Berths	

at the facilities identified in (Table C), including Pier H where the City of Long Beach serves as the landlord. The Port is committed to expeditiously work with the leaseholders and City of Long Beach, and if necessary take other actions, to install cold-ironing infrastructure as soon as possible. The potential additional locations are listed in (Table C).

Both Ports are also exploring the purchase of "Green Power" for their respective shore power programs.

For vessels that do not fit the shore power model, hotelling emission reductions will be required through alternative technologies that achieve equivalent emissions reductions. These alternative technologies are in various states of development from design to operational. Examples of these alternative technologies include exhaust gas scrubbing technologies (capture vessel stack emissions while at berth and remove pollutants from exhaust streams either on-shore or on a barge); emerging emissions reduction technologies (such as sea water scrubbers, selective catalytic reduction, etc.); and shore-powered dockside electrical pumps for tankers which reduce onboard pumping loads (generally these onboard pumps are driven by steam power).

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Some of these technologies can potentially achieve equivalent emissions reductions of shore power, while others have the potential for significant reduction of hotelling emissions.

TECHNOLOGY ADVANCEMENT PROGRAM

Another significant initiative of the Clean Air Action Plan is the Technology Advancement Program, which will evaluate, demonstrate, and incorporate new strategies into the suite of control measures that will ultimately result in significant reductions of DPM, NOx, and other criteria pollutants. This initiative builds on the success and synergies of the San Pedro Bay Ports, CARB, SCAQMD, US EPA, tenants, and other stakeholders working together to find joint solutions.

Several successful projects have occurred over the years between these entities, and this program would help to build on those early successes. A coordination committee will be established consisting of funding partners that include both Ports, SCAQMD, CARB, and the US EPA. Other stakeholders may become involved in relation to specific projects, as approved by the coordination committee. There are fundamental areas in which the program will focus its initial work:

1) Source Category Reductions
2) "Green Container Transport" Solutions
   - Heavy-duty hybrid trucks
   - Shuttle systems including magnetic levitation, linear induction motors, etc.
   - Others as identified and developed
3) Emissions Inventory Improvements

The program will be primarily funded by both Ports and the participating agencies. Projects will be developed and implemented under each of the areas listed above. Successful demonstration projects will then be incorporated into the next annual update of the Clean Air Action Plan as control measures or additional emissions reduction strategies.

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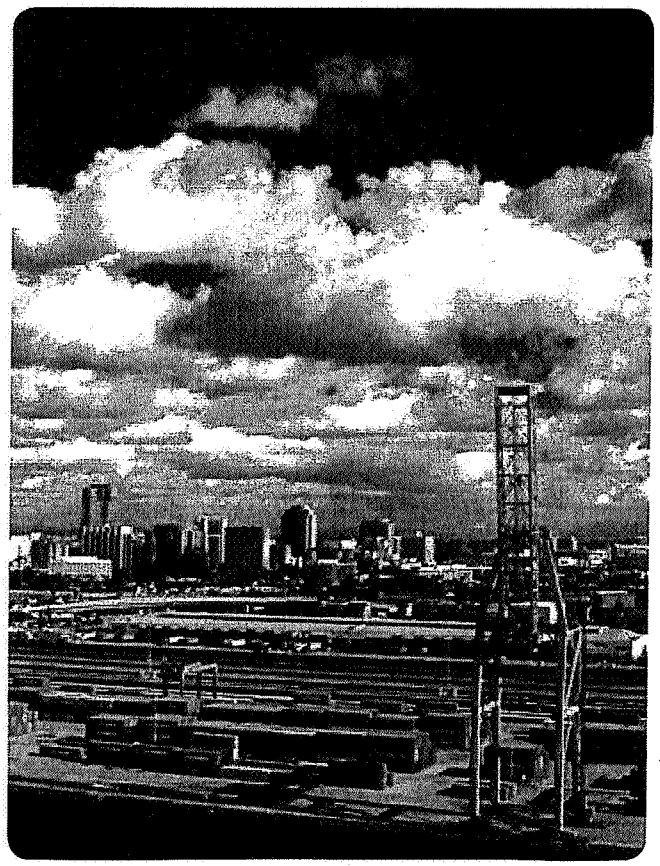
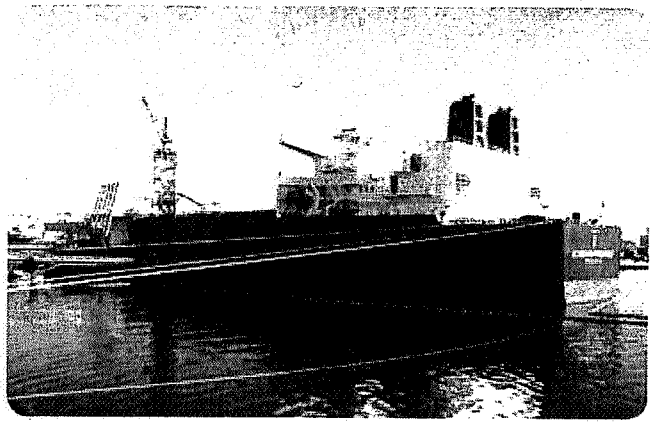
INFRASTRUCTURE AND OPERATIONAL EFFICIENCY IMPROVEMENTS INITIATIVE

This initiative identifies projects at the San Pedro Bay Ports that improve infrastructure and operational efficiencies that have an added air quality benefit. The initiative includes, but is not limited to:

- Focus on on-dock vs. near-dock rail infrastructure
- Grade separations
- Optical character recognition (OCR) gates at terminals
- Terminal cargo handling/configuration efficiency improvements
- Radio Frequency Identification (RFID)
- Virtual Container Yards

The emissions reduced by these projects would be quantified and reported in emissions inventory updates.



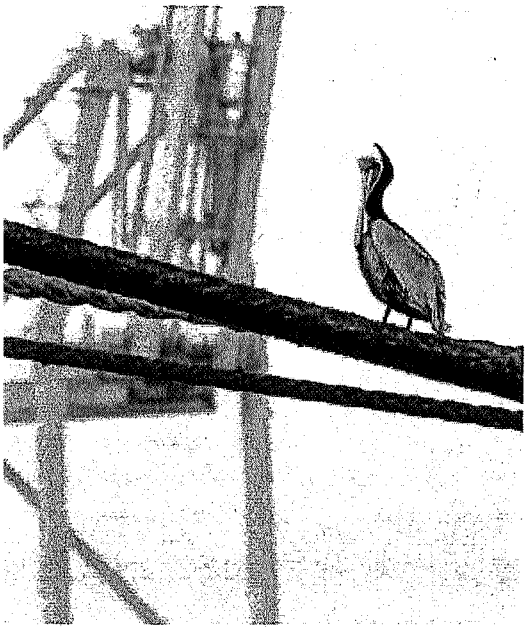


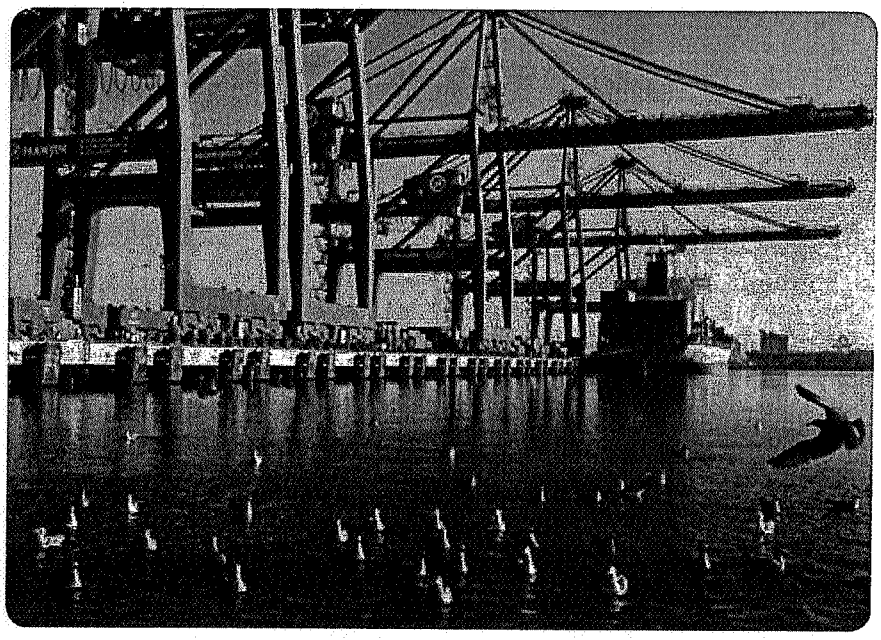
CLEAN AIR ACTION PLAN TRACKING AND MONITORING

The Ports will track, monitor, and demonstrate the progress of the Clean Air Action Plan. In addition, both Ports will enhance existing monitoring programs to encompass the breadth of actions proposed in the Clean Air Action Plan. These enhancements include:

- Expanding the Bay-wide ambient air quality monitoring network to monitor actual air pollution concentrations in and around the San Pedro Bay Ports.
- Updating the Bay-wide air emissions inventories annually to track control measure compliance and emissions benefits.
- Tracking Clean Air Action Plan progress, expenditures, reductions, etc., in a comprehensive database for each Port.
- Using agency approved protocols, the Port of Los Angeles will develop a port-wide health risk assessment in coordination with the air agencies.

Monitoring and tracking of the plan will initially take place either monthly or quarterly (depending on the control measure/program). Results will be briefed to each Port's Board and a detailed annual overall progress reporting of the San Pedro Bay Ports Clean Air Action Plan will also be reported to the Boards and published. The metrics that are tracked and reported will be reviewed annually and adjusted, added to, or removed as needed for greater clarity and accuracy.





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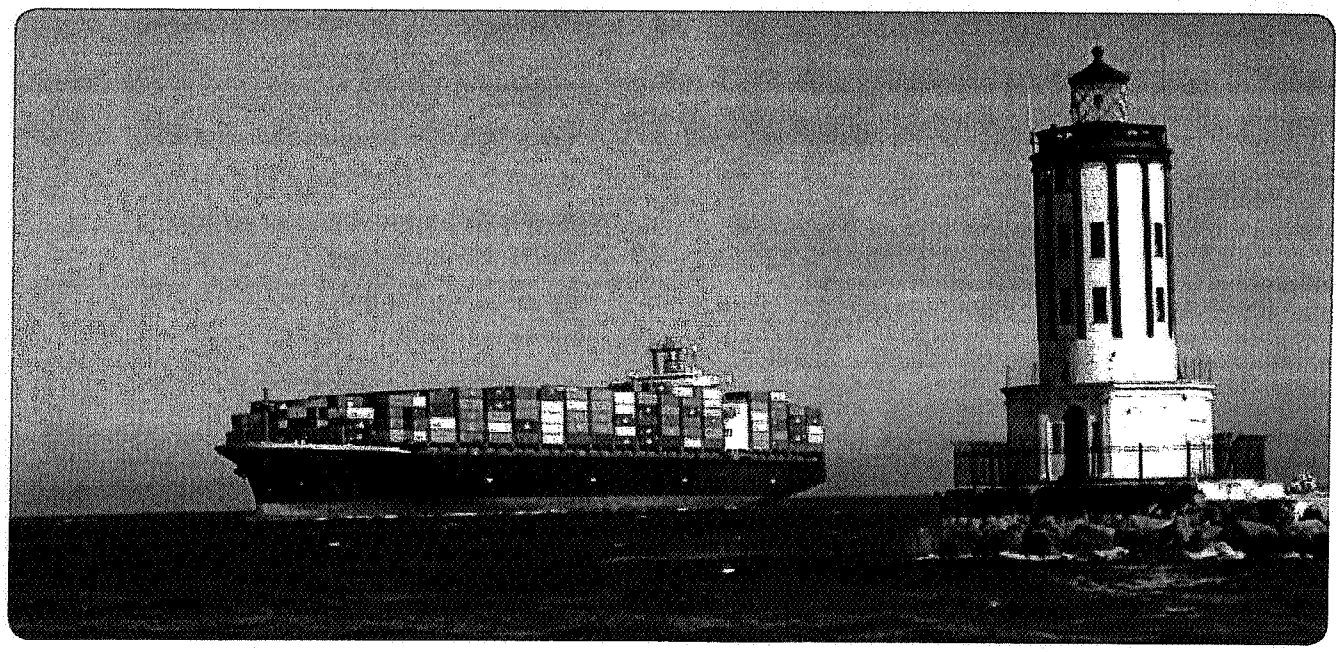

SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN RESULTS

The Clean Air Action Plan will result in significant emission reductions over the course of its five-year timeframe. By the end of the five-year period covered by this initial plan, emissions of diesel particulate matter from heavy-duty trucks will be reduced by approximately 80%, from ocean-going vessels by approximately 35%, and from cargo handling equipment by approximately 19%. From all port related sources, particulate matter emissions will be reduced by more than 50%. These reductions are over and above the effects of recently enacted state regulations affecting ocean-going vessels and cargo handling equipment. The percentage reductions are based on what would be emitted in the absence of a plan – that is, they are not compared with a specific period in the past but instead, are focused on the reductions achievable in the years shown.

The reductions of emissions from ocean-going vessels and cargo handling equipment will occur in conjunction with ARB's coast-wide vessel fuel improvement regulation and their cargo handling equipment rule. Overall, by the end of the five-year period it is estimated that DPM emissions will be reduced by at least 1,200 tons per year and NOx emissions will be reduced by over 12,000 tons per year from port-related sources in the SoCAB over uncontrolled conditions. Similarly, significant reductions of emissions of other pollutants will also be achieved.

In order to evaluate the effectiveness of the CAAP, the plan has been compared with two other emission reduction plans prepared for the region: ARB's Goods Movement Plan (GMP) and the City of Los Angeles' No Net Increase (NNI) strategies applied to both ports. To do this, ARB's estimates of emissions and emissions growth in the SoCAB related to international goods movement (prior to consideration of GMP reductions) were used to represent the growth of San Pedro Bay port emissions over time. These estimates include the effects of anticipated activity increases as well as emission control regulations in place as of October 2005. They do not include the effects of ARB's recently enacted regulations affecting cargo handling equipment and ocean-going vessel fuels.

It should be noted that the ARB's estimates of emissions related to international goods movement are not necessarily the same as the ports' estimates of port-related emissions. The 2005 emissions inventory updates for each port, due to be completed later this year, will provide information on the actual rate of emissions growth over the period from the 2001/2002 baseline emissions inventories through 2005, and annual updates to the emissions inventories will provide one mechanism for evaluating the effects and effectiveness of the Clean Air Action Plan. Although the ARB international goods movement emission estimates are not precisely the same as the ports' emission estimates, they cover essentially the same emission sources and have been used as a consistent basis for the comparison of the Clean Air Action Plan with the GMP and the NNI report.

For the comparison, the anticipated effectiveness (percentage reduction) of the three programs was applied to this backdrop of projected growth by multiplying the estimated emissions for each year by the projected control effectiveness of each program. The results of these calculations are shown in the charts on the following pages for DPM and NOx emissions.

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Different methods were used in developing the projected control effectiveness of the three emission reduction programs:

- For the GMP, the effectiveness was determined from ARB's statewide estimates of goods movement-related emissions by comparing their estimates of emissions without the GMP and emissions with the GMP. The difference between the two is the reduction resulting from the GMP. The statewide emission projections were used because ARB has not completed their estimates of SoCAB international emissions after implementation of the GMP, so a

- comparison could not be made with the SoCAB international goods movement growth estimates discussed above.
- For NNI, the effectiveness was estimated by comparing the estimates of emissions by year before application of NNI measures to the reductions projected for each source category. This is analogous to the method used for the GMP. The percent reductions were applied to the GMP's SoCAB international goods movement emissions growth scenario.
- Control factors and percent reductions for the Clean Air Action Plan were developed for each measure and these were also applied to the GMP's growth scenario.

The following figures evaluate the relative effectiveness of the plans, and illustrate the overall reduction percentages projected for each plan (Clean Air Action Plan, GMP, and NNI report) for DPM and NOx for the period 2004 through 2012, which includes the years covered by this edition of the Clean Air Action Plan. The figures show the estimated emissions by year that are projected to occur under each plan Each line shows the estimated tons of emissions from all source categories.

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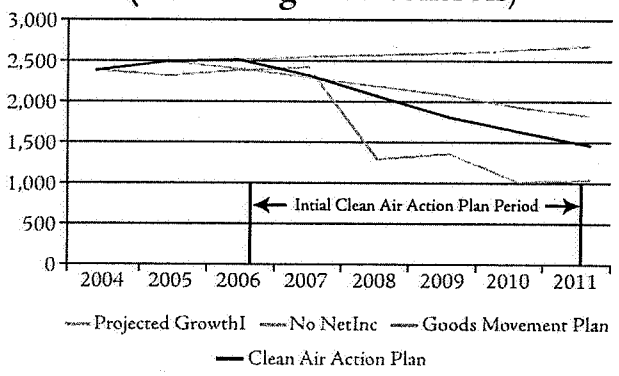
Except for the projected emissions used to estimate growth without the plans (the red line on the charts), the emission estimates and the reduction percentages shown for the ARB's GMP are based on the statewide projections of emissions, calculated as the difference in emissions with and without the plan, since the directly applicable numbers for the South Coast Air Basin are not yet available. While the local effects of the GMP may be somewhat different than presented in these charts, the general trend can be seen.

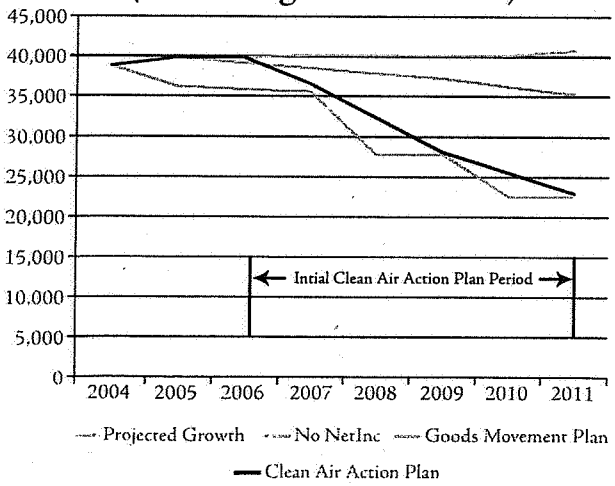
The NNI projections of DPM reductions appear to be greater than the Clean Air Action Plan reductions in part due to differing implementation schedules and assumptions. The Clean Air Action Plan emissions reductions are based on a more detailed analysis of available implementation mechanisms. As an example, a large part of the DPM reductions projected by NNI relied on rapid and extensive implementation of the low-sulfur fuels requirements for ocean-going vessels without specifying particular, enforceable methods that would be used to implement the requirements. In contrast, the Clean Air Action Plan's measures relating to low-sulfur marine fuels have been based on a detailed assessment of the timing of lease openings, because lease provisions will provide the most certainty in implementing the requirements. If faster methods of implementation (such as tariffs) are found to be feasible, then the emission reductions projected by the plan will be accelerated and more closely match the NNI line.

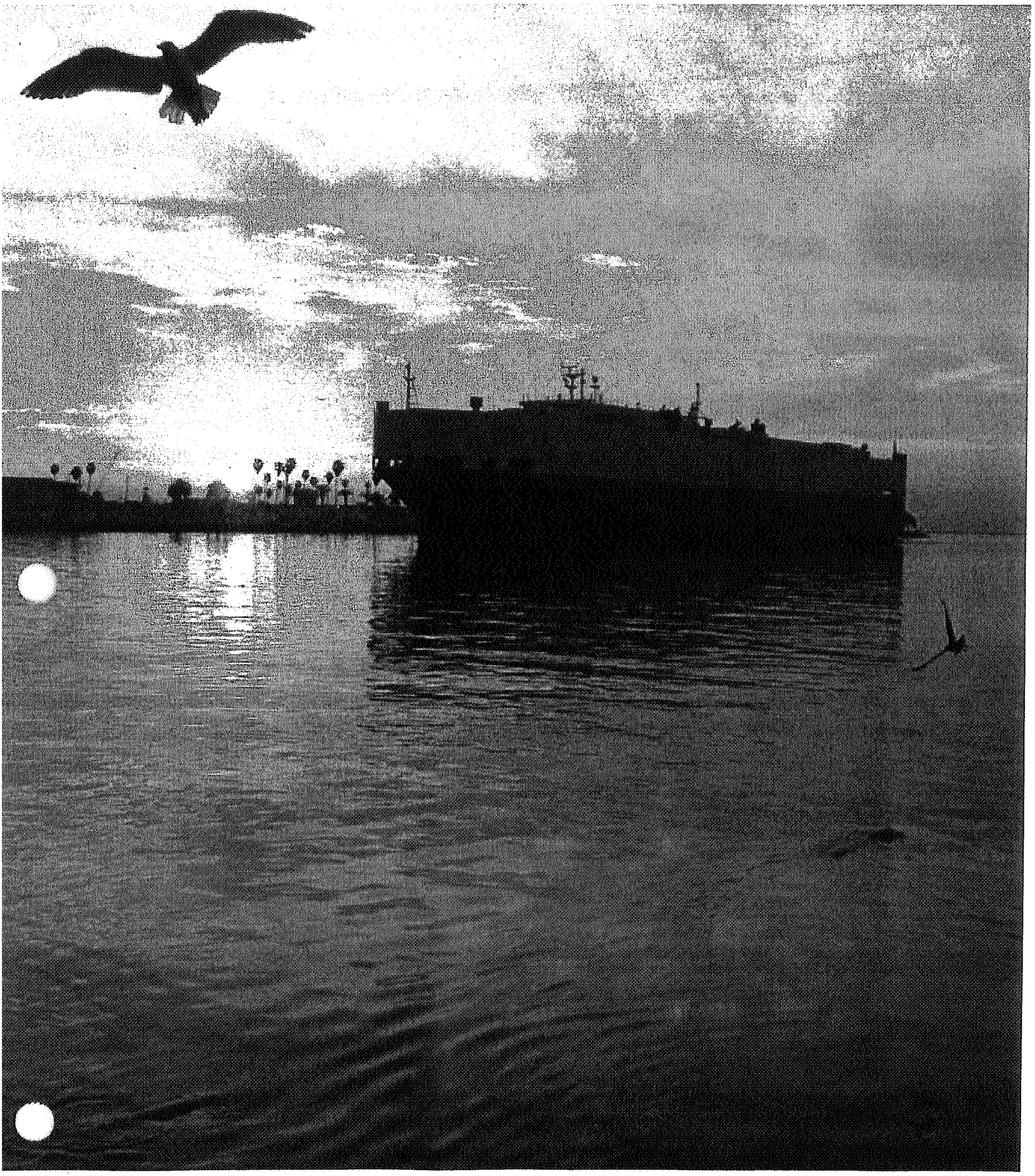
Reductions of NOx from the Clean Air Action Plan will be similar to those projected by NNI. A more complete comparison of the effectiveness of the various emission reduction programs is presented in the Technical Report being issued in conjunction with this Overview.

DPM Emissions Comparison tons per year (remaining after controls)



NOx Emissions Comparison tons per year (remaining after controls)





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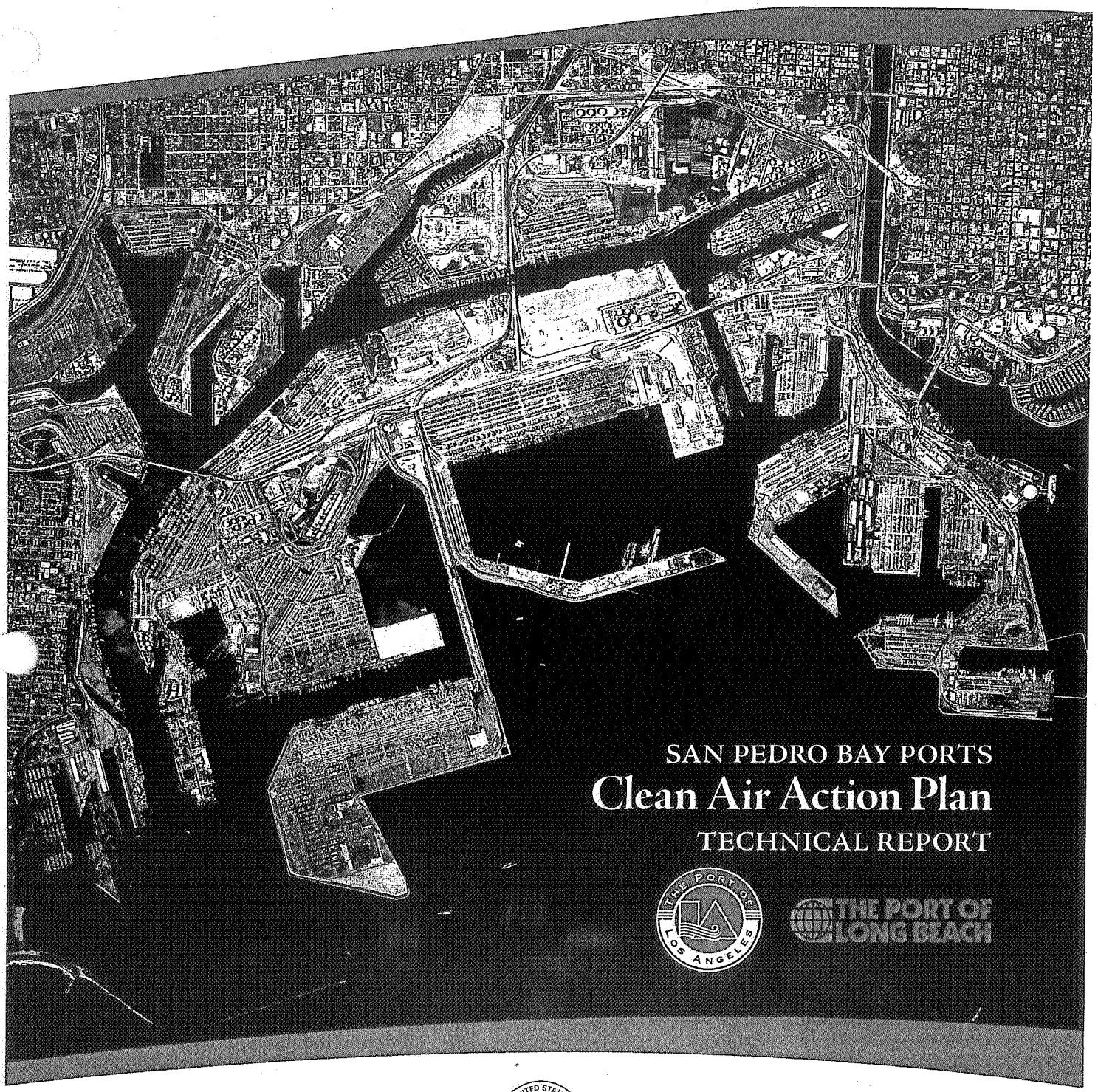

SAN PEDRO BAY PORTS
Clean Air Action Plan
TECHNICAL REPORT

THE PORT OF LOS ANGELES

THE PORT OF LONG BEACH

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

California Environmental Protection Agency
Air Resources Board

Presented for Public Review by the Port of Los Angeles and Port of Long Beach. Prepared with the participation and cooperation of the staff of the US Environmental Protection Agency, California Air Resources Board and the South Coast Air Quality Management District.

SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN
TECHNICAL REPORT

DRAFT

THE PORT OF LOS ANGELES

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Prepared with the participation & cooperation of the staff of:

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California Environmental Protection Agency
Air Resources Board

AQMD

June 2006

FOREWORD

To effectively integrate common goals for air quality in the South Coast Air Basin, the staff of the Port of Los Angeles (POLA) and the Port of Long Beach (POLB) have worked together to develop the initial San Pedro Bay Ports Clean Air Action Plan. The Ports have had extensive dialog with the staff of the South Coast Air Quality Management District, the California Air Resources Board, and the United States Environmental Protection Agency Region IX regarding air quality goals and appropriate control measures to achieve such goals. This groundbreaking draft plan reflects the input of those agencies and is now ready for public review and comments. Modifications will likely occur as a result of such review.

This plan is the first of its kind in the country, linking the emissions reduction efforts and visions of the two largest ports in the United States with similar efforts and goals of the regulatory agencies in charge of ensuring compliance with air quality standards. The collaborative effort will continue in the years to come with the review and update of the Clean Air Action Plan on an annual basis.

The air agencies have extensively reviewed and commented on the draft plan, support the collaborative process that has been established, and support of the goals delineated in the plan pending public review. By participating in the development and annual review of this plan, these regulatory agencies do not waive or forfeit their rights or obligations to continue to regulate emissions sources under their control. Participation in this process is voluntary by all parties and does not in any way inhibit or preclude agencies from any legal authorities and responsibilities to meet federal, state, and local air quality standards. Participation does not mean that the agencies necessarily endorse each of the measures and concepts proposed in the plan.

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Acronyms & Abbreviations

AMP™	Alternative Maritime Power
APL	American Presidents Line
AQMP	Air Quality Management Plan
ATCM	Air Toxic Control Measure
AVL	Automatic Vehicle Locator
BACT	Best Available Control Technology
BMP	Best Management Practices
BNSF	Burlington Northern Santa Fe Railway
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CHE	Cargo Handling Equipment
CNG	Compressed Natural Gas
CO	Carbon Monoxide
COG	Council of Governments
CS	China Shipping
DOC	Diesel Oxidation Catalyst
DPF	Diesel Particulate Filters
DPM	Diesel Particulate Matter
DWP	City of Los Angeles Department of Water and Power
EI	Emissions inventory
EIR	Environmental Impact Report
EMC	Environmental Mitigation Coordinator
EMD	Environmental Management Division
EPA	Environmental Protection Agency
FY	Fiscal Year
g/bhp-hr	grams per break horsepower – hour
g/kw-hr	grams per kilowatt - hour
GVW	Gross Vehicle Weight
HD	Heavy-Duty
HDV	Heavy-Duty Vehicles
HC	Harbor Craft
HFO	Heavy Fuel Oil
IFO	Intermediate Fuel Oil
IMO	International Maritime Organization
ITS	International Transportation Service
LNG	Liquefied Natural Gas
LTT	Long Term Tennant
MDO	Marine Diesel Oil
MGO	Marine Gas Oil

Acronyms & Abbreviations (cont'd)

MOU	Memorandum of Understanding
LNG	Liquefied Natural Gas
LTT	Long Term Tennant
MATES II	Multiple Air Toxics Exposure Study (Second)
MDO	Marine Diesel Oil
MGO	Marine Gas Oil
MOU	Memorandum of Understanding
MSRC	Mobile Source Air Pollution Reduction Review Committee
MY	Model year
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
nm	nautical miles
NNI	No Net Increase
NOx	Oxides of Nitrogen
NYK	Nippon Yusen Kaisha (NYK Line)
OBD	On-Board Diagnostics
OCR	Optical Character Recognition
OGV	Ocean-going vessels
PAQMIP	Port Air Quality Mitigation Incentive Program
PCAC	Port of Los Angeles Port Community Advisory Committee
PHL	Pacific Harbor Lines
PM	Particulate Matter
PM_{10}	Particulate matter less than 10 micrometers in diameter
$PM_{2.5}$	Particulate matter less than 2.5 micrometers in diameter
PMSA	Pacific Merchant Shipping Association
POLA	Port of Los Angeles
POLB	Port of Long Beach
Port TAC	Port of Los Angeles Technical Advisory Committee
ppm	parts per million
RFID	Radio Frequency Identification
RFP	Request for Proposal
RL	Railroad Locomotives
rpm	revolutions per minute
S	Sulfur
SCAQMD	South Coast Air Quality Management District
SCR	Selective Catalytic Reduction
SECA	Sulfur Emission Control Area
SIP	State Implementation Plan

Acronyms & Abbreviations (cont'd)

SoCAB	South Coast Air Basin
SOx	Sulfur oxides
SPBP	San Pedro Bay Ports
tpd	tons per day
tpy	tons per year
ULSD	Ultra-low sulfur diesel (fuel)
UP	Union Pacific Railroad
VOCs	Volatile organic compounds
VSR	Vessel Speed Reduction
YTI	Yusen Terminals, Inc.

SECTION 1: INTRODUCTION

This document is the first San Pedro Bay Ports Clean Air Action Plan (Clean Air Action Plan). This joint Clean Air Action Plan describes the measures that the Ports of Los Angeles and Long Beach will take toward reducing emissions related to port operations. In March 2006, a groundbreaking meeting occurred at the highest level between the two Ports and the South Coast Air Quality Management District (SCAQMD) where all parties expressed the need to work jointly toward solutions. Shortly thereafter, the Ports engaged the California Air Resources Board (CARB) and the United States Environmental Protection Agency Region IX (EPA) in the spirit of cooperation to help the Ports develop this draft Clean Air Action Plan for public review. It should be emphasized that these entities have committed to continuing their efforts associated with the development, review, implementation, update/revision of the Action Plan on an annual basis.

The five-year Action Plan highlights the goals, emissions reductions, and budgetary needs for fiscal years (FY) 2006/2007 through 2010/2011. By the end of the five-year period, virtually all needed measures to meet the goals will be in place. Staff from both ports intends to regularly evaluate progress towards meeting the Clean Air Action Plan goals, review status of existing control measures, evaluate new measures, and jointly develop a revised Action Plan each year.

1.1 The Ports' Mandate

In the early 1900s, the State conveyed the Port tidelands to Los Angeles and Long Beach, as trustees for the people of the State of California, to accommodate and promote harbor commerce, navigation and fisheries. The Ports are landlord ports; they build terminal facilities and lease them to shipping lines and stevedoring companies. The Ports do not operate the terminals, ships, yard equipment, trucks or trains that move the cargo. However, the Ports are determined to accelerate the effort to reduce air pollution from "goods movement" activities using all the powers available to them.

The San Pedro Bay Ports comprise a huge regional and national economic engine. The Los Angeles Customs District accounts for approximately $300 billion in annual trade. More than 40% of all containerized trade in the nation flows through the San Pedro Bay Ports. Economic forecasts suggest that the demand for containerized cargo moving through the San Pedro Bay region will more than double by the year 2020.

The economic benefits of the Ports are felt throughout the nation; however, the environmental impacts of trade are more locally concentrated. In 2000, the SCAQMD released their second Multiple Air Toxics Exposure Study (MATES II), which raised concerns about the impact of emissions from ships, trucks and trains in the vicinity of the Ports and major transportation corridors. Since then, both Ports have had terminal development plans challenged and delayed due to concerns about the adequacy of environmental mitigation.

Both Ports have adopted and are implementing a wide range of new environmental initiatives. These efforts include better documentation of environmental impacts and more detailed evaluation of effective mitigation measures. The Ports are cognizant of the view of environmental groups, local residents and regulatory agencies that not enough is being done to address port-related air quality issues. The Ports are also aware of the views of port users and operators that inconsistent or conflicting environmental measures could have unintended and even counterproductive effects.

The Ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. The Clean Air Action Plan is designed to develop mitigation measures and incentive programs necessary to reduce air emissions and health risks while allowing port development to continue.

New project approvals fall into two main categories: projects that expand the capacity of the ports or lease approvals/amendments. The Ports have several upcoming terminal redevelopment projects that could be approved and implemented in the next five years. There are significant opportunities to implement the measures defined by the Clean Air Action Plan to satisfy the twin goals of clean air and economic growth. The Ports also anticipate several new major leases and lease amendments in the next five years. In short, the Ports intend to serve as a catalyst for rapid change, recognizing the rights of all involved in, and affected by, Port operations.

1.2 South Coast Air Quality Background

The San Pedro Bay Ports are located in the South Coast Air Basin (SoCAB). This Basin has some of the worst air quality in the nation, which represents a major health concern for its residents. Much of this air quality problem is attributable to the fact that the SoCAB is the second largest urban area in the nation (with all its associated emissions sources) and to the existence of topographical and meteorological conditions that enhance the formation of air pollution. Currently, the SoCAB is designated by the EPA as being in nonattainment of the National Ambient Air Quality Standards (NAAQS) for ozone and for particulate matter less

than 2.5 microns ($PM_{2.5}$). The ozone nonattainment level is rated "severe-17," with an attainment deadline year of 2021. The $PM_{2.5}$ attainment deadline is 2015.

In addition, CARB has designated the exhaust from diesel-fueled engines as a toxic air contaminant, with diesel particulate matter (DPM) as a surrogate for total emissions. The EPA also lists diesel exhaust as a mobile source air toxic. According to CARB, about 70 percent of the potential cancer risk from toxic air contaminants in California can be attributed to DPM. Therefore, the concentration of DPM in communities has become a major public health concern and the focus of CARB and SCAQMD regulations.

In 2000, the SCAQMD released results from its second Multiple Air Toxics Exposure Study (MATES II), which raised concerns about the impact of emissions from ships, trucks and trains in the vicinity of the Ports and major transportation corridors. Since then, both Ports have had terminal development plans challenged and delayed due to concerns about the adequacy of environmental mitigation.

In order for the SoCAB to attain the NAAQS, and to protect public health, immediate action is necessary to significantly reduce emissions from all sectors, including "goods movement." Several port-related sources are subject to aggressive regulations yet, still fall short of the levels needed to accommodate growth while protecting public health. Recently, CARB undertook several actions targeted at reducing emissions from goods movement activities. These actions include:

- Ultra low sulfur diesel (ULSD) fuel requirements for on-road and off-road diesel engines fueled within the SoCAB
- Emissions standards for cargo handling equipment (CHE)
- Statewide Memorandum of Understanding between CARB and line haul railroads

In addition to the focus on DPM, oxides of nitrogen (NOx) and oxides of sulfur (SOx) greenhouse gases (such as carbon dioxide, methane, etc.) are an important consideration when evaluating emissions from mobile sources, since they potentially affect public health on a global level. While the immediate purpose of this Clean Air Action Plan is to address emissions that affect public health on a local basis, certain proposed measures will result in a decrease in greenhouse gas emissions.

1.3 Regulatory Measures Addressing Port-Related Activities

Almost all of the emissions at the ports come from five diesel fueled sources. In addition to ocean going vessels (OGVs), these are On-Road Heavy-Duty Vehicles (HDVs), Cargo Handling Equipment (CHE), Harbor Craft (HC) and Railroad Locomotives (RL). The responsibility for the emissions control of the majority of these sources falls under the

jurisdiction of local (SCAQMD), state (CARB) or federal (EPA) agencies. Below is a list of recently adopted regulatory measures that will reduce emissions from the Ports over the next five fiscal years and beyond. In formulating the San Pedro Bay Ports Clean Air Action Plan, the impacts of these measures were estimated and considered, to avoid duplication and to ensure both the effectiveness and cost efficiency of the Ports' proposed measures.

1.3.1 On-Road Heavy-Duty Vehicles

Emission Standards for New 2007+ On-Road Heavy-Duty Vehicles

In 2001, CARB adopted EPA's stringent emission standards for 2007+ HDV, which will ultimately result in 90% reductions in emissions of oxides of nitrogen (NOx) and particulate matter (PM). Per this regulation, HDV engine manufacturers will be meeting a PM standard of 0.01 g/bhp-hr starting in 2007, which is 90% lower than the 2004 PM standard of 0.1 g/bhp-hr. The NOx standard requires a phase-in of the 0.2 g/bhp-hr NOx standards between 2007 and 2010. By 2010, all engines have to meet the 0.2 g/bhp-hr NOx standard, which is over 90% lower than the 2004 NOx standard of 2.4 g/bhp-hr. It is expected that between 2007 and 2010, on average, manufacturers will be producing HDV engines meeting the PM standard of 0.01 g/bhp-hr and a NOx standard of 1.2 g/bhp-hr. This latter standard is referred the 2007 interim standard.

Heavy-Duty Vehicle On-Board Diagnostics (OBD) Requirement

In 2005, CARB adopted a comprehensive HDV OBD regulation, which ensures that the increasingly stringent HDV emissions standards being phased in are maintained during each vehicle's useful life. The OBD regulation requires manufacturers to install a system in HDVs to monitor virtually every emissions related component of the vehicle.

Ultra-Low Sulfur Diesel (ULSD) Fuel Requirement

In 2003, CARB adopted a regulation requiring that diesel fuel produced or offered for sale in California for use in any on-road or non-road vehicular diesel engine (with the exception of locomotive and marine diesel engines) contain no more than 15 parts per million (ppm) of sulfur (S) by weight, beginning June 2006 statewide. This ULSD fuel is needed in order for retrofit technologies, such as diesel particulate filters, to work successfully.

1.3.2 Ocean Going Vessels

Emissions Standard for Marine Propulsion Engines

The International Maritime Organization (IMO) established limits for NOx in Annex VI to the International Convention for the Prevention of Pollution from Ships in 1997. IMO limits apply to marine vessel engines over 130 kilowatts (kW) installed

on vessels built on or after 2000. Depending upon the engine speed in revolutions per minute (rpm), the NOx standards vary between 17.0 g/kW-hr (for < 130 rpm) to 9.8 g/kW-hr (for ≥2000 rpm). While a majority of countries have ratified the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI, it has yet to be fully ratified by the U.S. It has been approved by the U.S. Senate (7 April 2006), an important step toward ratification. Despite the formal status of Annex VI, it is believed that engines manufactured after 2000 will meet the standard due to the retroactive nature of the regulation (i.e., once fully in effect engines must comply, and the simplest way for that to occur is for them to be manufactured to comply).

Vessel Speed Reduction (VSR) Program

In May of 2001, a Memorandum of Understanding (MOU) between the POLA, POLB, EPA, CARB, SCAQMD, the Pacific Merchant Shipping Association (PMSA), and the Marine Exchange of Southern California was signed. This MOU calls for OGVs to voluntarily reduce speed to 12 knots at a distance of 20 nautical miles (nm) from Point Fermin. Reduction in speed demands less power on the main engine, which in turn reduces NOx emissions and fuel usage.

Low Sulfur Fuel for Marine Auxiliary Engines

In December of 2005, CARB adopted low sulfur fuel requirements for marine auxiliary engines within 24 nm of the California coastline. Starting in January of 2007, it requires use of marine diesel oil (MDO) or marine gas oil (MGO) with sulfur content of equal or less than 0.5% S by weight, followed by use of marine gas oil with sulfur content of equal or less than 0.1 % S in 2010. The use of low sulfur fuel will reduce emissions of NOx, DPM and sulfur oxides (SOx).

1.3.3 Cargo Handling Equipment

Emissions Standards for Non-Road Diesel Powered Equipment

The EPA's and CARB's Tier 1, Tier 2, Tier 3, and Tier 4 (interim Tier 4 and final) emissions standards for non-road diesel engines require compliance with progressively more stringent standards for hydrocarbon, carbon monoxide (CO), DPM, and NOx. Tier 4 standards for non-road diesel powered equipment complement the latest 2007+ on-road heavy-duty engine standards requiring 90 percent reduction in DPM and NOx when compared against the current level. To meet these standards, engine manufacturers will produce new engines with advanced emissions control technologies similar to those already expected for on-road heavy-duty diesel vehicles. These standards for new engines will be phased in starting with smaller engines in 2008 until all but the very largest diesel engines meet NOx and PM standards in 2015. Currently, the interim Tier 4 standard includes 90% reduction for PM and a 60% reduction in NOx.

Cargo Handling Equipment Regulation

In December of 2005 CARB adopted a regulation to reduce emissions from CHE such as yard tractors and forklifts starting in 2007. The regulation calls for the replacement or retrofit of existing engines with engines that use Best Available Control Technology (BACT). Beginning January1, 2007 the regulation will require that newly purchased, leased, or rented CHE be equipped with either a 2007 or later on-road engine, a Tier 4 off-road engine or the cleanest verified diesel PM emissions control system which reduces DPM by 90% and NOx by at least 70% for yard tractors. For non-yard tractors cargo handling equipment currently verified technologies reduces PM by 85%.

1.3.4 Harbor Craft

Emission Standards for Harbor Craft Engines

The EPA has established new engine standards for new "category 1 & 2" diesel engines – engines rated over 50 horsepower (hp) used for propulsion in most harbor craft. These standards are to be phased in between 2004 and 2007 and limit NOx, hydrocarbon, CO and DPM, but the emissions reductions achieved are modest in next five years. EPA expects 24% reduction in NOx and 12% reduction in DPM in 2030 when the harbor craft engine fleet is fully turned over to new these new engines.

Low Sulfur Fuel Requirement for Harbor Craft

In 2004, CARB adopted a low sulfur fuel requirement for harbor craft. Starting January 1, 2006 (in SoCAB) harbor craft are required to use on-road diesel fuel (i.e., ULSD), which has sulfur content limit of 15 ppm sulfur and lower aromatic content. Use of lower sulfur and aromatic fuel will result in NOx and DPM reduction benefits. In addition, use of low sulfur fuel will facilitate retrofitting of harbor craft with emissions control devices such as diesel particulate filters (DPFs) that have potential to reduce PM by 85%.

1.3.5 Railroad Locomotives

Emissions Standards for New and Remanufactured Locomotives and Locomotive Engines

In 1998, EPA adopted Tier 0 (1973-2001), Tier 1 (2002-2004), and Tier 2 (2005+) emissions standards applicable to newly manufactured and remanufactured railroad locomotives and locomotive engines. These standards require compliance with progressively more stringent standards for emissions of hydrocarbon, CO, NOx, and DPM. Although the most stringent standard, Tier 2, results in over 40% reduction in NOx and 60% reduction in DPM compared to Tier 0, full potential of these reductions will not be realized in the next five years because of the long life of diesel locomotive engines.

Low Sulfur Fuel Requirement for Intrastate Locomotives

In 2004, CARB adopted a low sulfur fuel requirement for intrastate locomotives. Intrastate locomotives are defined as those locomotives that operate at least 90 percent of time within borders of the state, based on hours of operation, miles traveled, or fuel consumption. Mostly applicable to switchers, starting 1 January 2006, statewide, intrastate locomotives are required to use CARB off-road diesel fuel which has sulfur content limit of 15 ppm S and lower aromatic content. Use of fuel with lower sulfur and lower aromatics will result in NOx and DPM reductions. In addition, use of low sulfur fuel will facilitate retrofitting of locomotives with emissions control devices such as DPFs that have potential to reduce DPM by 85 %.

Statewide 2005 Memorandum of Understanding

In order to accelerate the implementation of Tier 2 engines in SoCAB, CARB and EPA entered into an enforceable memorandum of understanding (MOU) in 1998 with two major freight railroads (Union Pacific (UP) and Burlington Northern Santa Fe (BNSF)) in California. This MOU requires UP and BNSF to concentrate introduction of the Tier 2 locomotives in the SoCAB which will achieve 65% reduction in NOx by 2010.

In 2005, CARB entered into another MOU with UP and BNSF whereby these two railroads have agreed to phase out non-essential idling and install idling reduction devices, identify and expeditiously repair locomotives that smoke excessively and maximize the use of 15 ppm S fuel.

In addition to these regulations, CARB is pursuing additional regulations that would reduce port-related emissions. These include equipment in the following categories:

- Port trucks (through a fleet rule and incentive program)
- Harbor craft
- Ship main engines (through fuel and engine emissions requirements)
- Ship auxiliary engines at dock (through cold ironing, engine controls, or other effective technologies)

CARB anticipates completing these rulemaking actions by the end of 2007. The recently adopted CARB regulations (listed in 1.3.1-1.3.5), anticipated CARB rulemakings, and the measures in the Clean Air Action Plan will provide a vital and complimentary combination to the overall effort to meet both State and SPBP air quality improvement goals.

It is important to highlight that the Clean Air Action Plan works in conjunction with and relies upon existing and anticipated federal, state, and local regulations. The Clean Air Action Plan will continue to incorporate new regulations in future updates. Working together, both regulatory and Port efforts can produce greater synergistic emissions reductions that are greater than those achieved on an individual basis. This combination will significantly reduce the health risks of the public and people working at the ports by significantly reducing emissions associated with port operations.

One non-regulatory program that is also helping to significantly reduce emissions from sources include those associated with ports, is the Carl Moyer Program. This program is a CARB administered grant program implemented in partnership with local air districts to fund the replacement of older, dirtier engines or to cover the incremental cost of purchasing cleaner-than-required engines and vehicles. Under this program, owners/operators of mobile emissions sources can apply for incremental funding to reduce emissions. The program is also being expanded to include a fleet modernization component. Emissions source categories at the ports that have been successful in obtaining Carl Moyer funding includes: heavy-duty vehicles, cargo handling equipment, harbor craft, and rail locomotives.

1.4 San Pedro Bay Ports Clean Air Action Plan Vision

The Ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. The Clean Air Action Plan is designed to develop mitigation measures and incentive programs necessary to reduce air emissions and health risks while allowing port development to continue.

The Ports are determined to accelerate ongoing efforts to reduce air pollution from all modes of goods movement through the San Pedro Bay Ports. The Clean Air Action Plan is not only built upon the Ports' previous air quality mitigation efforts, but also on the efforts of the regulatory agencies, business stakeholders and concerned residents. This plan incorporates their concepts and control measures while establishing a new vision for port-related goods movement.

The Ports are pleased to note that from preliminary emissions inventory estimates for 2005, current emission levels from cargo handling equipment are lower than 2001/2002 levels. But having noted this encouraging progress, both Ports recognize that there is still a significant amount of work to be done.

The Ports share the goal of reducing air pollution from port operations to acceptable regulatory health risk thresholds. The Ports take responsibility to implement the measures in this plan. The generally accepted health risk threshold for individual projects is a 10 in 1,000,000 additional cancer risk. It is recognized that the standardized modeling used to measure this risk is imperfect. Therefore, the Clean Air Action Plan is multi-faceted. The Clean Air Action Plan includes stringent San Pedro Bay-wide standards that achieve real emissions reductions; a nested set of implementation strategies; investment in the development and integration of new/cleaner technologies into port operations; and creating a comprehensive monitoring and tracking program that will document progress on all of these elements.

The Ports also expect that the Action Plan will be the basis of control measures incorporated into the State Implementation Plan through the SCAQMD's Air Quality Management Plan (AQMP). Due to the close coordination with SCAQMD and CARB, the Clean Air Action Plan will, it is hoped, represent the joint approach for reducing the "fair share" of emissions associated with port-related operations.

The Ports also acknowledge the reality that reducing pollution to near zero levels would require massive conversion to electric, fuel cell or hydrogen vehicles, which are not yet commercially available for all applications. However, there are low-emissions technologies commercially available that slash pollution up to 90% from the 2004 on-road heavy-duty exhaust emissions standards. The Ports also recognize that the extensive scope of emission reductions necessary to achieve the goals envisioned in this plan will require more than a 5-year period to fully implement. This highlights the need for the plan to be adopted in 2006, and for aggressive implementation to commence with strong commitments by both Ports.

1.5 San Pedro Bay Ports Clean Air Action Plan Background

This Clean Air Action Plan sets forth an array of approaches that can achieve the goals and implementation strategies that the Ports will use to reduce the public health risk from port operations.

The Clean Air Action Plan consists of the following eight elements:

- Standards and Goals
- Implementation Strategies
- Control Measures
- Technology Advancement Program
- Infrastructure & Operational Efficiency Improvements Initiative
- Estimated Emissions Reductions
- Estimated Budget Requirements

This document represents a staff-prepared draft overview of the plan that is a work in progress. Staff intends to take a final plan to the respective Boards of Harbor Commissioners in September 2006 with incorporation of suggestions from agencies, tenants, and the public. Presentations will also be made to the public and CARB and SCAQMD Boards during the summer prior to issuing a draft final plan. In the meantime, current emissions reduction programs will be continued and some of the new initiatives included in the plan will be initiated before September 2006.

The plan is based on the following principles:

(1) The Ports will work cooperatively to implement these strategies.
(2) The Clean Air Action Plan, although built upon past efforts, will be continually updated and improved.
(3) The Ports will be open to new technologies and other advancements to accelerate meeting the vision expressed above.
(4) The Ports will achieve an appropriate fair share of necessary pollutant emission reductions, which are cost effective and feasible.

Tenants, railroads, and the trucking industry will be expected to "sign-on" and participate in the Clean Air Action Plan beginning January 1, 2007. Before January 1, 2007, the Ports will work with tenants and the railroads to assist them in developing their own programs to meet the plan's standards. These groups will be asked for a written explanation as to how they intend to meet or surpass the goals of the plan. The Ports are committed to working with industry stakeholders to assure speedy action.

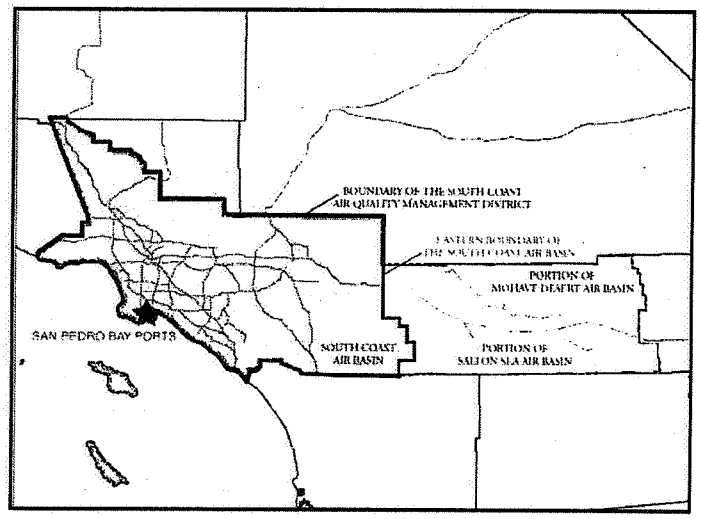
While many of the control measures are based in large part on the work of the No Net Increase Task Force, the Green Port Policy, and other initiatives, the Ports will remain open to innovative ideas that will achieve the same or better results.

The movement of goods by heavy-duty trucks from the Ports through local communities is an extraordinary challenge because it involves thousands of truck owner/operators who do not have the financial resources to acquire cleaner trucks on their own. The Ports are adopting a goal that will eliminate "dirty" trucks from the San Pedro Bay terminals within 5 years from adoption of this plan. The Ports will therefore work with all concerned parties to establish new relationships and business paradigms that will help secure the necessary funding to make this important transition. The Ports will also pursue "Green Container Transport" systems that can transport containers with "Green Power" to inland destinations so that, over time, the Ports can move toward a pollution-free transport system for goods movement.

The Clean Air Action Plan targets the port-related sources that were identified in the emissions inventories prepared by the Ports of Long Beach and Los Angeles. The

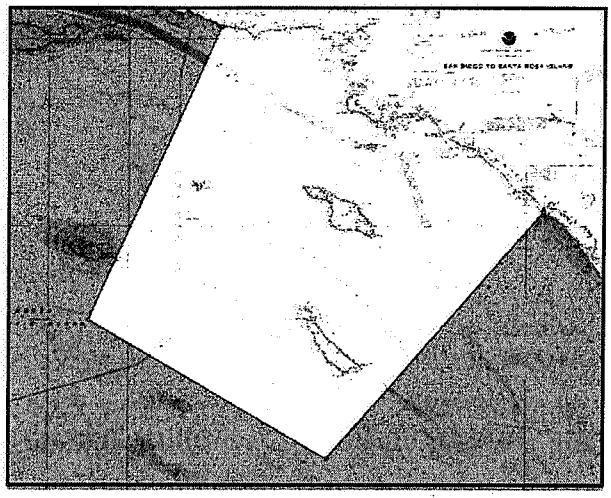
geographical boundaries of the emissions inventories include the SoCAB and its associated over-water boundary (and which is consistent with the boundaries established for the SCAQMD's Air Quality Management Plan). The landside boundary is presented in Figure 1.1 and the over-water boundary is presented in Figure 1.2. As in the emissions inventory, HDV operations are considered to be Port-related only within the SoCAB boundary and between the Ports and the first time the cargo is off-loaded from the truck (such as at a distribution center). Locomotive emissions are considered to be Port-related between the port terminals and the edge of the SoCAB landside boundary.

Figure 1.1: Emissions Inventory Landside Boundary



The emissions inventory over-water area is bounded in the north by the Ventura County line and to the south by the San Diego County line and extends perpendicularly out over water to the California Coastal Water designated coordinates. An outstanding issue to be resolved is the actual extent of the over-water boundary with regard to the SCAQMD's Air Quality Management Plan and the CARB's State Implementation Plan (SIP), which has a direct impact on how far out the OGV and HC measures extend. For directly emitted DPM, 24 nautical miles (nm) may be the extent at which it remains a health issue, while NOx and SOx are of regional concern within the over-water boundary and possibly beyond has a potential impact to the basin.

Figure 1.2: Emissions Inventory Over-Water Boundary



Both Ports are currently updating their 2005 emissions inventory by source category. Based on the baseline year emissions inventories for both Ports (Port of Los Angeles 2001, Port of Long Beach 2002), the contribution of emissions by the five port-related source categories are shown on the following charts:

Figure 1.3: Baseline Year DPM Emissions Contributions by Source Category

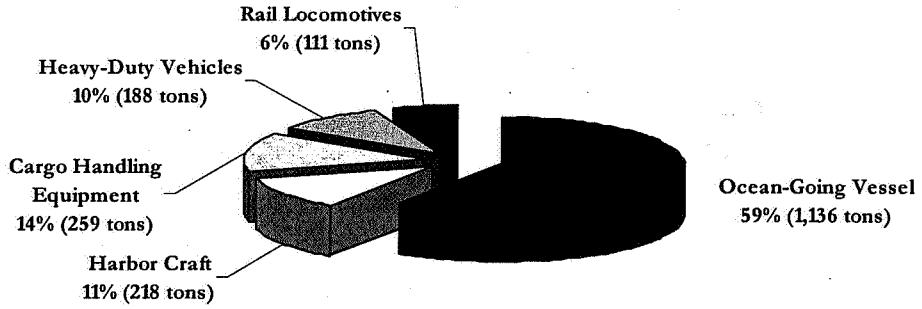


Figure 1.4: Baseline Year NOx Emissions Contributions by Source Category

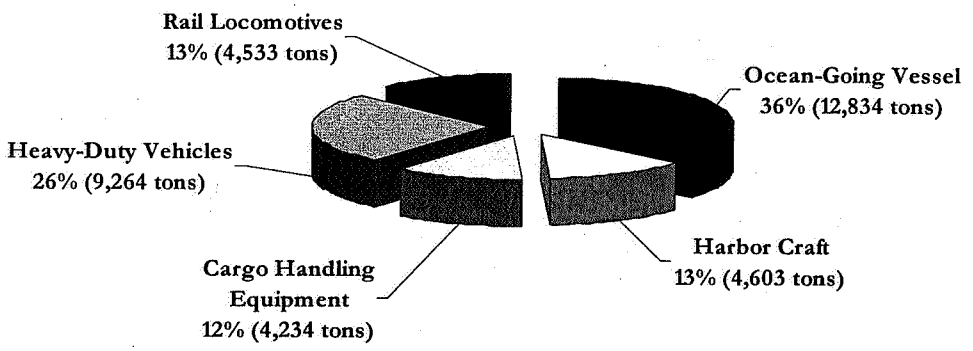
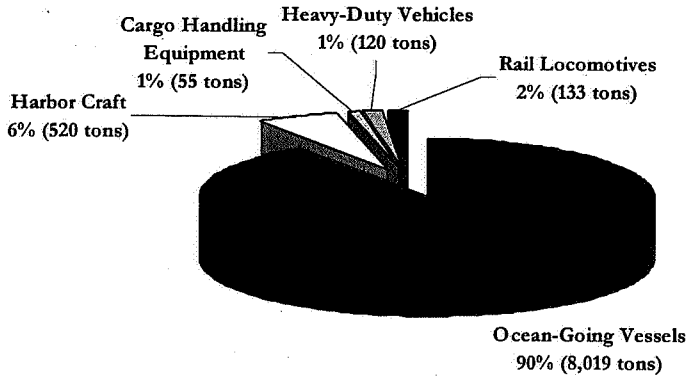


Figure 1.5: Baseline Year SOx Emissions Contributions by Source Category



1.6 Control Measure Development

Various measures have been evaluated, demonstrated, and integrated into each Port's existing Air Quality Program. Common control measures that both Ports participate in jointly include the VSR program and the Pacific Harbor Line (PHL) Fleet Modernization MOU. There are several strategies that both Ports have in common; however implementation approaches have differed, such as the yard tractor modernization programs, shore-power for ships[1], and others. The goal of the San Pedro Bay Ports Clean Air Action Plan is to bring together these and other control strategies and monitoring efforts into a single plan that will

[1] Referred to as alternative maritime power (AMP™) by the Port of Los Angeles and cold ironing by the Port of Long Beach.

avoid duplication of resources and still provides room for each Port to implement each measure independently, as needed.

For the Port of Los Angeles, control measures presented in this Action Plan have been brought forward through various efforts including the development of Near-Term Measures and the City of Los Angeles' No Net Increase (NNI) Task Force, among others. The most significant effort in the recent past is NNI. Section 4 discusses how the recommended 68 NNI Measures have been incorporated into this Action Plan. Measures on the regulatory track are the responsibility of federal, state, or local regulators and are, therefore, not carried forward in this Clean Air Action Plan. The non-regulatory NNI Measures incorporated into the control measures in this Action Plan for the next five fiscal years are identified, though a number of the NNI Measures have been modified for implementation. The specific incorporation of NNI measures into the Clean Air Action Plan is presented in Section 4, Table 4.2.

Air quality measures approved through the China Shipping (CS) Settlement Agreement have been incorporated as a separate element in the Clean Air Action Plan (see Section 4.5).

For the Port of Long Beach, strategies presented in this Action Plan have been brought forward based upon current programs developed through the previous Healthy Harbor Program, and the existing Green Port Policy, which was adopted by the Board of Harbor Commissioners in January 2005. The Green Port Policy established an overall environmental ethic for the Port of Long Beach, placing environmental protection of the air, soil, sediment, and water quality programs under a single umbrella and establishing them as a top priority. Under the POLB Green Port Policy, the Port's goal for the air quality component is to achieve measurable, long-term reductions in air pollutant emissions from Port operations. Specific strategies and programs have been developed and implemented in order to meet this goal.

In addition to these existing control measures, additional measures have been added along with new aspects of those previously developed. It is anticipated that as new technologies become available, they will be added to future versions of the Action Plan.

1.7 Clean Air Action Plan Development

The Port of Los Angeles, Port of Long Beach, SCAQMD, CARB, and EPA-Region IX have worked together to develop the scope and breadth of the San Pedro Bay Ports Clean Air Action Plan. The Ports and the agencies agree that this draft Action Plan should be released for public comment and to seek consensus regarding the contents of the final Action Plan.

Upon adoption, this Action Plan will offer several opportunities for continued collaboration with these agencies, including evaluations, demonstrations, funding, studies, emissions inventories, and lessons learned during implementation.

One of the most valuable aspects of this Clean Air Action Plan is that both Ports will combine resources and expertise to supplement the actions of federal, state, and local regulators as necessary to implement cleaner technologies for various source categories. The synergy of this group will also lead to additional options that can be implemented to reduce emissions and eliminate the associated Public Health Risk. This will be achieved through the Technology Advancement Program presented in Section 4.3.

1.8 Clean Air Action Plan Review and Adoption

Upon release of the Clean Air Action Plan, both Ports will jointly begin a public review period to take comments from neighboring residents and customers. The Ports will have a series of meetings with their customers to review the various aspects of the Clean Air Action Plan and solicit comments. The Ports will each host a tenant briefing and jointly host four public workshops to present the plan to the general public and to solicit comments. After revision based on stakeholders input, the intent is to seek Board approvals of the initial Clean Air Action Plan by September 1, 2006.

1.9 The Greater Challenge

As stated earlier, this Clean Air Action Plan only outlines control strategies, measures, and costs for the next five fiscal years. It is important to understand that a significant amount of work will still be needed beyond the next five years to ensure that the goals are met and maintained. Due to the enormity of the challenges ahead, the Ports simply cannot fund these initiatives on their own. Substantial additional funding must be secured. Efforts will need to be made at the legislative level to secure long-term funding, as there will be the need for continued incentives, coordination, evaluation, demonstration, implementation, and planning well beyond the five-year horizon. These challenges are why the Clean Air Action Plan needs to be reevaluated, adjusted, and updated annually.

For the continued reduction of public health risk associated with port-related sources, the regulatory agencies will need to continue to apply tighter emissions reduction requirements in the future to ensure that growth does not reverse the desired trend of continual emissions reductions.

Both Port's are supportive of greater regulatory agency participation, action, and regulation as this creates a fair and level playing field for both industry and Ports. As the San Pedro Bay Ports approve and implement the Clean Air Action Plan, it will clearly put them at a competitive disadvantage with (in regard to cargo that is destined outside of the SoCAB) other California, west coast, and international west coast ports. The Port's urge the CARB to make the Clean Air Action Plan a standard that all California ports must meet and further, they encourage EPA to make it a standard that all Ports in the country must meet.

The standards being set forth in this plan will require significant funding beyond what the Ports can provide. Port's funding will be focused on performing infrastructure improvements; assisting in the turnover of owner/operator- and fleet-owned trucks with alternative fueled/ clean diesel trucks; and investing in a Technology Advancement Program. The SCAQMD has committed to provide funding in 2006, and has further proposed to continue to fund the plan through the next five fiscal years. The estimated range of funding for the Clean Air Action Plan (for the various scenarios) is $194 million to $2.6 billion.

Even with the significant commitment of funding from both Ports and the SCAQMD, a sizeable infusion of additional funding will be required to execute the plan just to ensure turnover of the frequent-caller truck fleet (trucks that call at the Ports seven or more times per week).

The California Legislature recently passed a long-awaited infrastructure bond package that includes monies for port infrastructure and trade related air quality improvements. If approved by California voters this November, these funds could be used to supplement Port and SCAQMD funding. Both the regulatory agencies and the Ports will need to push for the required additional funding through legislative solutions and will need to educate the public regarding these issues.

1.10 San Pedro Bay Ports Clean Air Action Plan Report Organization

After this Introduction, the Clean Air Action Plan is organized into the following sections:

- Section 2: "San Pedro Bay Ports Clean Air Action Plan Goals" presents the goals associated with the Clean Air Action Plan over the next five fiscal years.

- Section 3: "Implementation Strategies" present the various strategies/options available to the Ports for implementation of the Clean Air Action Plan.

- Section 4: "Clean Air Action Plan Initiatives - Overview" presents the San Pedro Bay Ports Clean Air Action Plan recommended control measures that will be implemented in order to meeting the goals.

- Section 5: "Clean Air Action Plan Initiatives - Details" presents details of each of the initiatives proposed in the Action Plan that will need to be completed in order to realize successful implementation.

- Section 6: "Emissions Reductions" presents the emissions reductions that are estimated to result from the implementation of the measures discussed in the previous section.

- Section 7: "Budget Summary" presents and discusses the estimated capital and incentive costs associated with implementing the measures described in Section 5. Costs are presented in terms of fiscal year funding over the five-year Action Plan.

SECTION 2: SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN GOALS

The Clean Air Action Plan establishes the path by which the targeted control measures will be implemented in the short-term and provides for budget planning over a five fiscal year period. The Clean Air Action Plan will be reviewed each year in light of progress made during the previous year, and implementation strategies will be adjusted to ensure that the goals for the Action Plan are achieved. Additional measures may be specified in future Clean Air Action Plan updates to maintain progress towards a complete and timely achievement of Action Plan goals. Goals will be reviewed annually as part of the update cycle and new goals may be added.

2.1 Foundations

The following common foundations support the San Pedro Bay Ports Clean Air Action Plan.

- The San Pedro Bay Ports are committed to expeditiously and constantly reduce the public health risk associated with port-related mobile sources, and implement a program within five years that will achieve this goal.

- The San Pedro Bay Ports are committed to facilitate growth in trade while reducing air emissions.

- The San Pedro Bay Ports will focus on lease amendments and renewals and CEQA evaluations as mechanisms to establish provisions and requirements in leases consistent with meeting the Clean Air Action Plan goals.

- The San Pedro Bay Ports will affect tariff changes as needed to influence activity changes that will result in emissions reductions.

- The San Pedro Bay Ports are committed to monitor, document, and report on performance of their efforts under the Clean Air Action Plan and will update the plan on an annual basis.

2.2 Standards

The principles upon which this Action Plan is based set forth extremely ambitious goals for port-related goods movement. From the vision of reducing port-related health risk and the principles stated previously, it is the Ports' goal to establish standards at the following three levels:

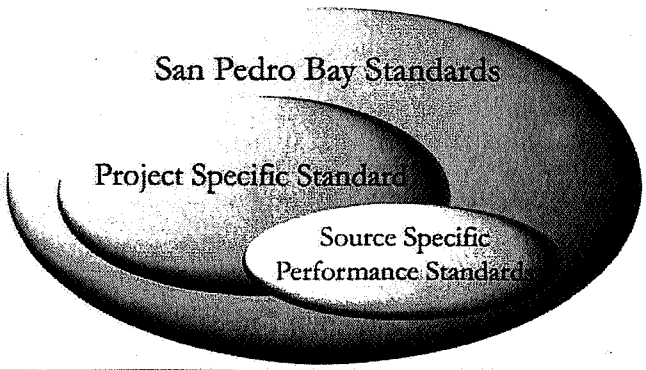
(1) **San Pedro Bay Standards**
- Reduce public health risk from toxic air contaminants associated with port-related mobile sources to acceptable levels.
- Prevent port-related violations of the state and federal ambient air quality standards at air quality monitoring stations at both ports.
- Reduce criteria pollutant emissions to the levels that will assure that port-related sources contribute their "fair share" to enable the South Coast Air Basin to attain state and federal ambient air quality standards.

(2) **Project Specific Standards –**
- Projects must meet the 10 in 1,000,000 excess cancer risk threshold, as determined by health risk assessments conducted during California Environmental Quality Act (CEQA) review and implemented through required CEQA mitigations associated with lease negotiations.
- Projects that exceed the AQMD CEQA significance thresholds for criteria pollutants must implement the maximum available controls and feasible mitigations for any emissions increases.

(3) **Source Specific Performance Standards** – A series of standards that will be met through Port lease requirements, tariffs, incentives, and market-based mechanisms as outlined below.

Compliance with the Project Specific Standards may require that an individual terminal go beyond the Source Specific Performance Standards or advance the date of compliance with those performance standards. The relationships between these three standards are illustrated below.

Figure 2.1: Relationships of Standards



The Source Specific Performance Standards are targeted at the five source categories of mobile equipment and vessels that are part of port-related goods movement. These source categories include: HDV, OGVs, CHE, HC, and RL.

Establishment of an appropriate San Pedro Bay Standard related to a health risk standard is the difficult task at this time, as none exists. Attainment of the NAAQS for the entire SoCAB is not appropriate as a San Pedro Bay Ports standard because they are national standards designated for broad areas and apply to concentrations resulting from all source categories' emissions, not just particular industries or source types (such as Port operations). In addition, developing plans to attain the NAAQS is solely the responsibility of the state as described in its SIP. However, setting the initial San Pedro Bay Standards to the concentrations in the NAAQS for port monitoring sites could be a good indication of the local impacts from port operations (its important to note that concentrations at monitoring stations will include not only the port sources but all sources in the vicinity of the monitors).

With regard to bay-wide toxic air contaminant risk goals, the Ports have started to explore a potential health risk standard with the SCAQMD and CARB. To date, neither agency has established a toxic air contaminant health risk standard specifically for DPM associated with port mobile source operations. The SCAQMD has adopted rules establishing acceptable health risk limits for toxics emitted by stationary facilities. Those rules set limits of 25 in a million cancer risk, with authorization for the SCAQMD Board to approve risks up to 100 in a million in two-year increments based upon lack of technology and other factors. Regulatory agencies have not identified any environmental regulatory limit on cancer risk that allows risks in excess of this range. At this time, the Clean Air Action Plan will set mass emission reduction goals (on a measure-specific basis) because it is known that mass emissions of DPM (the primary driver of toxic health risk associated with port operations) will need to be reduced significantly.

CARB and SCAQMD believe that there is no "safe" level of exposure to DPM. As part of its Goods Movement Plan, CARB established a goal of reducing DPM by 85% by 2020 with the near-term goal of establishing measures that achieve as much as possible within the first five years. Based upon the health risk assessment for the ports of Los Angeles and Long Beach recently prepared by CARB, health risks caused in some locations by port-related sources would likely need to be reduced by that amount and possibly more.

With regard to criteria pollutants, the CARB tied emission reduction goals in it's *Emission Reduction Plan for Ports and Goods Movement*[2] to preliminary estimates of the levels of reductions that will be needed to meet the Federal 8-hour ozone and PM 2.5 standards in the SoCAB. CARB set a goal to reduce NOx emissions levels 30% beyond current control levels

[2] http://www.arb.ca.gov/gmp/gmp.htm

by 2015, and 50% beyond current control levels by 2020. These goals are based on preliminary "carrying capacity" estimates that will be refined through modeling for the 2007 update to the regional Air Quality Management Plan (AQMP), which will be released in draft by SCAQMD in fall of this year. These goals will be revisited after a firm attainment target and attainment dates are established.

The AQMP will establish emission reductions from all source categories which are necessary to attain the PM 2.5 and 8-hour ozone standards. SCAQMD staff preliminarily estimates that it is likely that the region needs more than 30% reduction in NOx by 2015 to attain the PM2.5 standards, in addition to reductions of directly emitted particulates and sulfur oxides.

For the initial year of the Clean Air Action Plan, the San Pedro Bay Standard will be in compliance with NAAQS levels at port monitoring stations. During the first year, the Ports and the agencies will work together to set appropriate San Pedro Bay standards.

The Source Specific Performance Standards proposed by the Action Plan are:

HEAVY-DUTY VEHICLES/TRUCKS

- ✓ By the end of 2011, all trucks calling at the ports frequently or semi-frequently will meet or be cleaner than the EPA 2007 on-road PM emissions standards (0.01 g/bhp-hr for PM) and be the cleanest available NOx at the time of replacement or retrofit.

OCEAN-GOING VESSELS

- ✓ 100% compliance with the Vessel Speed Reduction Program [initially out to a distance of 20 nautical miles (nm) from Point Fermin, and expanded to 40 nm].
- ✓ The use of 0.2% or lower sulfur Marine Gas Oil (MGO) fuel in vessel auxiliary and main engines at berth and out to a distance of 20 nm from Point Fermin, and expanded to 40 nm, or equivalent reduction.
- ✓ The use of shore-power (or equivalent) for hotelling emissions implemented at all major container, selected liquid bulk, and cruise terminals in POLA within five years and at all container terminals and one crude oil terminal in POLB within five to ten years (the implementation time difference being due to the Port of Long Beach's more extensive infrastructure development schedule).
- ✓ The use of DPM and NOx control devices on auxiliary and main engines mandated on new vessel builds and existing frequent callers.

CARGO HANDLING EQUIPMENT

- ✓ Beginning 2007, all CHE purchases will meet one of the following performance standards:

- Cleanest available NOx alternative-fueled engine, meeting 0.01 g/bhp-hr PM, available at time of purchase, or
- Cleanest available NOx diesel-fueled engine, meeting 0.01 g/bhp-hr PM, available at time of purchase.

✓ By the end of 2011, all remaining CHE will meet the EPA Tier 4 engine standards.

HARBOR CRAFT

✓ By the second year of the plan, all Harbor Craft (HC) home-based at San Pedro Bay Ports will meet EPA Tier 2 for harbor craft or equivalent reductions.

✓ By the fifth year, all previously repowered HC home-based at San Pedro Bay Ports will be retrofitted with the most effective CARB verified NOx and/or PM emissions reduction technologies.

✓ When Tier 3 engines become available, within five years all HC home-based at San Pedro Bay Ports will be repowered with the new engines.

RAILROAD LOCOMOTIVES

✓ By 2008, all existing Pacific Harbor Lines switch engines in the Ports shall be replaced with Tier 2 engines equipped with 15-minute idling limit devices, retrofitted with either DOCs or DPFs, and shall use emulsified or other equivalently clean alternative diesel fuels as available.

✓ By 2011, all diesel-powered line-haul locomotives entering the San Pedro Bay Ports shall meet or be cleaner than EPA Tier 2 rail standards, with use of after-treatment controls and Ultra Low Sulfur Diesel (ULSD).

✓ Any new switch engine acquired after the initial Pacific Harbor Line replacement must meet EPA Tier 3 standards or equivalent to 3 grams NOx/bhp-hr and 0.023 g PM/bhp-hr.

✓ Any new rail yard developed at the San Pedro Bay Ports, or any rail yard significantly redesigned, shall be required to operate the cleanest locomotive technologies currently available (alternative fueled locomotives, hybrid, electric, multi-engine generator set, etc.), use yard equipment meeting the cargo handling equipment standards specified above, and will be serviced only by the cleanest commercially available heavy-duty trucks meeting or exceeding the EPA 2007 on-road emissions standards.

As stated above, Project Specific Standards require all new projects to meet or be below acceptable health risk standards (<10 in 1,000,000 excess cancer risk threshold) and for projects that exceed the AQMD CEQA significance thresholds for criteria pollutants must implement the maximum available controls and feasible mitigations for any emissions increases.

2.3 Monitor, Document, and Report on Performance

To track, monitor, and demonstrate the progress of the Clean Air Action Plan, both Ports will enhance existing monitoring programs to encompass the breadth of actions proposed in the Clean Air Action Plan. These include:

- Expand the Port-wide air monitoring network to improve continued monitoring of actual air pollution concentrations in and around the San Pedro Bay Ports.
- Update Port-wide air emissions inventories at least annually to track control measure compliance and emissions benefits.
- Using CARB's latest health risk assessment estimates, the Port of Los Angeles will develop Port-wide health risk assessments (individual and joint) in coordination with CARB and SCAQMD.
- Track Clean Air Action Plan progress, expenditures, reductions, etc. in comprehensive databases for each Port.
- Report on overall progress of the San Pedro Bay Ports Clean Air Action Plan to both Port's Boards annually and additionally as required.

For further details on monitoring and tracking on a per measure basis, see Section 5.

SECTION 3: IMPLEMENTATION STRATEGIES

Given that most of the control measures go beyond existing regulatory requirements (none are mandated as part of regular port operations), the Ports must take steps to implement the measures. Due to restrictions on legal authority, the number of implementation methods is limited for some source categories. Each method has advantages and limitations.

The primary implementation methods that both Ports agree upon are incorporation of control measures into lease requirements and utilization of appropriate mitigation measures, which may be identified as part of the California Environmental Quality Act (CEQA) evaluation process. The advantage of these methods is that the control measures will be tied to the lease or permit and, from a compliance standpoint, failure to meet the control measures would mean a violation of the lease or permit. The limitation of this strategy is that the timing of implementation port-wide will depend on the timing of lease renegotiations and/or new leases. To make up for this limitation, the ports will use, targeted incentive funding to "encourage" early emissions reduction measures and strategies such as fees and regulatory tariffs where possible.

This chapter provides a general overview of both of these implementation strategies as well as several others. Specific implementation strategies by control measure are provided in Section 4 and are detailed in the measure narratives that can be found in Section 5.

3.1 Overview of Implementation Strategies

The Ports have evaluated numerous implementation strategies for the proposed standards, extensively reviewed options, and evaluated several scenarios. Strategies evaluated to date are:

- Lease Requirements
- Tariff Changes
- CEQA Mitigations
- Incentives
- Voluntary Measures
- Credit Trading
- Capital Lease Backs
- Government-Backed Loan Guarantees for Trucks

Each of the above strategies would require a sound monitoring, recordkeeping, and reporting mechanism. Procedures and recordkeeping requirements need to be developed and set in place to monitor and review participation levels at a frequent interval to determine the effectiveness of the implemented strategy.

3.1.1 Lease Requirements

Facilities Required by Lease to Meet Emissions Reduction Requirements

This strategy offers the opportunity for control measures to be negotiated and required in a terminal's lease that would reduce emissions, increase performance on voluntary or incentive-based measures, or require customers to implement specific emissions reduction measures. This opportunity exists for renegotiated, amended, and new leases. Renegotiations and amendments to a lease could be triggered, for example, by a terminal improvement that requires an Environmental Impact Report (EIR) in accordance with CEQA.

One benefit of the lease strategy is that placing a requirement in a lease provides a legally binding mechanism for ensuring that the desired action is achieved and provides remedies for noncompliance (because noncompliance would constitute a breach of the lease terms). Another benefit is that, since leases are negotiated on a terminal-by-terminal basis, the mix of requirements can be tailored to terminal-specific considerations. For example, break bulk terminals might be less able to employ shore-power (cold ironing) than a container terminal having vessels that call repeatedly throughout the year, so a break bulk terminal's lease may contain an alternative emission reduction requirement. A limitation of this strategy is that all leases have different renewal dates and terms, so the implementation is phased over time as leases come due or are renegotiated. However, all terminals will indeed be considered for renewal so this is a strategy that will reach far beyond the initial five-year Action Plan.

3.1.2 Tariff Changes

Tariffs Changed to Influence Activity

A Port Tariff is the published set of rates, charges, rules and regulations for those doing business with a Port Authority. Each Port publishes its own tariff. A tariff is generally applicable to all tenants. However, individual operating leases may set requirements to a specific version of the tariff (i.e., later changes don't apply). Tariffs are legally enforceable similar like lease requirements and are applicable only within the port harbor district. All potential tariffs will need to go through legal evaluation prior to being enacted.

This strategy could be used to implement uniform rules affecting most or all Port users. A potential scenario for this strategy could be a tariff item that sets discounted rates to activities that provide an air quality benefit (like discounted dockage for vessel speed reduction). Alternatively, a tariff item might prohibit certain kinds of activities (such as a prohibition from dumping into harbor waters). In general, a tariff could allow more uniform application of resources to customers of a Port. However,

application of the tariff approach to implementation can only be used in selected instances and, as ordinances, must be developed following specific procedures.

3.1.3 CEQA Mitigations

New Projects or Changes to Existing Facilities Must Meet Health Risk Requirements

New development projects present a potential challenge to clean air and public health goals at the Ports. Port development projects often include increases in port-related diesel mobile sources and/or activity. New development projects present a vital opportunity with respect to the San Pedro Bay Ports emissions reduction efforts. All new significant development projects or modifications to existing facilities require a detailed CEQA and/or National Environmental Policy Act (NEPA) review prior to project approval. Along with these reviews comes an affirmative duty to mitigate significant environmental impacts.

Through the EIR process, air emissions and health risk levels will be assessed and applicable mitigations will be included in a project (on a project by project basis). These mitigations will be incorporated as provisions in any lease or permit for the project. Thus, this implementation strategy facilitates and complements the lease requirement strategy.

In addition, all CEQA air quality analyses will include a full analysis of construction emissions. Mitigation measures identified through the CEQA process will also provide a mechanism to require construction equipment controls in order to ensure emissions at or below the applicable standards.

This implementation strategy focuses on furthering the aims of the Clean Air Action Plan via mitigation measures which may be identified through the CEQA process. A limitation of this strategy is that its effectiveness depends on new projects moving forward through the CEQA process.

3.1.4 Incentives

Funding Targeted Toward Specific Sources to Accelerate Reductions

Incentive-based measures provide a business incentive for the participant to reduce emissions beyond what is currently required by regulation or lease requirements. Incentive funding is targeted at "buying" emissions reductions ahead of regulation milestones or lease renewals. Incentive funding can come from several sources including the Ports, local and state regulatory programs, federal agency programs and grants, or an additional use fee that generates money to be used to incentivise emissions reductions. An incentive based approach makes the adoption of the various strategies cost-neutral for the participant, or provides just enough incentive for a participant to enter the program.

Several of the emissions reduction measures implemented within the San Pedro Bay Ports to date have been incentive-based and have utilized Port and local/state funds. The advantages of this strategy are that it can accelerate implementation of control measures that will become lease requirements or proposed regulations, and it avoids regulatory authority control issues. The disadvantage is that there is not adequate funding to support all measures, either in the Ports' operating budgets or in regional, state, or federal grant programs.

Examples of successfully implemented incentive-based programs at the Ports include shore-power, yard tractor diesel oxidation catalyst (DOC) retrofits, harbor craft engine repowers, Gateway Cities Truck Modernization Program, and the air quality mitigation projects funded with China Shipping Settlement monies.

3.1.5 Voluntary Measures

Voluntarily Emission Reduction Actions Encouraged

Voluntary measures are non-compensated actions agreed to and undertaken by operators, and are used or implemented by the participants without legal obligation. There are already many examples of voluntary actions taken by operators that have resulted in a decrease in emissions, including procedural efficiency increases, purchase of new lower-emitting equipment, and use of low sulfur fuels in exempt equipment. This strategy is generally specific to measures that provide win-win situations for participants, which could include positive public relations press about the programs, regulatory agency or San Pedro Bay Ports recognition, environmental awards, etc. The existing VSR Program is an example of a successful voluntary program that has been implemented at the San Pedro Bay ports. As of March 2006, the San Pedro Bay VSR compliance rate was nearly 80% of vessels. Another notable example is the recent decision of Maersk Line to use low sulfur fuel in the engines of its vessels within 24 miles of California ports and while docked.

3.1.6 Market-Based Emission Reduction Program

Market Driven

An alternative market-driven strategy would reward participants for accepting emission reduction responsibility if they achieve emission reductions early or outperform program expectations. One example of such an approach is described in the Maritime Goods Movement Coalition proposal, which would establish near- and long-term emission performance standards to meet the region's air quality needs. Sources that commit to these standards would be able to generate valuable emission reduction credits for sale outside local impact zones and could obtain additional flexibility for implementing controls within their boundaries.

A market-driven approach can accelerate public health benefits by attracting additional investment in port areas. The program also can be designed to protect against any loss of local health benefits in high-risk areas by prohibiting a source from using emissions trading to avoid or defer controls (i.e., through the purchase and use of credits from other areas) until health-based targets are achieved. If a market driven strategy is used for any component of the Action Plan, it would be designed to reduce risk from high-risk areas by allowing source owners/operators in high risk areas to generate credits but not purchase credits.

By offering the potential of greater regulatory certainty (through an integrated program) and economic value, such a program could provide sources with a strong incentive to enter into an early binding commitment to reduce emissions. A potential additional program benefit is the encouragement of private financing for many activities that often depend solely on public financing, thus potentially lessening the ports' financial burden.

As with traditional regulatory programs, a market approach would require strict monitoring and reporting of emitting activity and would impose appropriate penalties for any non-compliance.

3.1.7 Capital Lease-Backs or Lease to Own

Reimbursable Programs

This strategy would allow a Port to cover initial capital costs for equipment associated with a measure for a participant and then lease back or lease-to-own the cleaner equipment purchased. This could facilitate a measure's implementation with participants that could not cover the cost of buying newer/cleaner equipment. The participating Port or funding entity would be repaid partially or completely over time by the lease payments. This strategy would allow for a more rapid implementation of a control measure that is capital intensive (such as SPBP-HDV1) and avoid delays (and potential tax implications for participants versus tax associated with receiving a grant) associated with participants securing the appropriate capital funding or credit. The advantage of this strategy is that it can accelerate a participant's move towards implementing a measure. The disadvantage would be the administrative and legal requirements of Port leases (i.e., indemnification requirements of the Ports). An example of this strategy would be the purchase of cleaner diesel or liquefied natural gas (LNG) fueled trucks for fleet managers or owner-operators that would then lease back the equipment or lease-to-own the truck. This type of program is currently envisioned as being potentially applicable only to HDV measures.

3.1.8 Government-Backed Loan Guarantees for Trucks

Loan Guarantees

A loan guarantee program is being considered by the Ports in an effort to find a solution for the significant tax burden recipients can have after receiving a replacement truck and the high interest rates available through traditional loan programs. The Ports would secure and provide the loans to the owner/operators in the program, which would then lease back the truck in 8 to 12 years. Port call frequency requirements would be set as a condition of the loan. Further evaluation and review of the strategy is currently underway by the Port of Long Beach.

3.2 Implementation

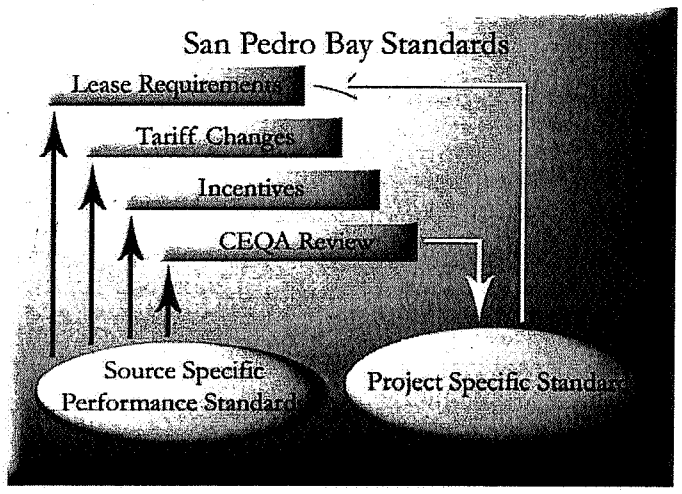
All control measures and implementation strategies/mechanisms are subject to further legal analysis by the City Attorneys of the respective ports.

The most effective combination of implementation strategies identified at this time is a mix of lease requirements, tariff changes, CEQA mitigations, and incentives. This combination provides redundancy in implementing the Source Specific Performance Standards should any one of the other specific strategies fail to be applied. Tariff changes offer an opportunity to affect a broader range of tenants but have potential implementation issues. Lease requirements may be able to go further than tariffs, but requirements can generally only be negotiated when the lease is reopened, such as when:

- ✓ A terminal change/modification triggers an EIR
- ✓ A new lease is sought
- ✓ An existing lease comes up for renewal

The following flow diagram illustrates how the Source Specific Performance Standards and the Project Specific Standard will be implemented by the various strategies, and how the performance and project standards are related.

Figure 3.1: Implementation Strategies and Standards Relationships



Lease requirements, being one of the primary mechanisms to implement the various control strategies, are generally dependent on when leases are reopened either through renewal, new leases, or modifications triggering a lease modification. Therefore, these lease-reopening dates are a key component in determining potential emissions reduction magnitudes from control measures. The following table presents the Port of Los Angeles' major leases, expiration dates, and currently anticipated upcoming Board action dates related to Environmental Impact Reports and/or lease actions.

Table 3.1: POLA Leases & Status

Land Use	Grantee	Term of Agreement	Date Expires	Anticipated Board Action
Container	POLA Container Terminal (berths 206-209)	vacant	vacant	within 5 years
Container	Eagle Marine Services, Ltd.	30 Years	12/31/2026	7/1/2011
Container	APM Terminals Pacific, Ltd	25 Years	7/31/2027	not in 5 yr period
Container	China Shipping Holding Company, Ltd.	25 Years	NEW	11/1/2006
Container	Evergreen Marine Corporation, LTD.	32 Years	12/31/2028	7/1/2007
Container	TraPac	15 Years	9/30/2002	6/1/2006
Container	Yang Ming Marine Transport Corporation, Ltd.	20 Years	10/10/2021	8/1/2007
Container	Yusen Terminals Inc.	25 Years	9/30/2016	8/1/2007
Passengers/Sup Com.	Pacific Cruise Ship Terminals, LLC	18 Months	6/30/2005	within 5 years
Automobile	Distribution & Auto Services, Inc.			n/a
General Cargo	Rio Doce Pasha Terminal, L.P. (berths 174-181)	15 Years	12/31/2000	11/1/2006
General Cargo	Stevedoring Services of America (berths 54-55)	10 Years	10/31/2009	12/1/2009
Dry Bulk	Hugo Neu-Proler Company	30 Years	8/30/2024	not in 5 yr period
Dry Bulk	Los Angeles Export Terminal Corporation	35 Years	8/30/2032	n/a
Liquid Bulk	Equilon (berths 167-169)	35 Years	2/11/2023	not in 5 yr period
Liquid Bulk	Exxon Mobil Corporation (berths 238-240)	25 Years	12/31/2015	not in 5 yr period
Liquid Bulk	Pacific Energy Marine Oil (pier 400)	TBD	NEW	12/1/2006
Liquid Bulk	ConocoPhillips (berths 148-151)		holdover	12/1/2007
Liquid Bulk	Ultramar (berth 164)	25 Years	1/1/2001	9/1/2006
Liquid Bulk	Vopak (berths 187-191)	38 Years	8/29/2023	not in 5 yr period
Liquid Bulk	Westway Terminal Company, Inc. (berths 70-71)	30 Years	3/23/2025	not in 5 yr period
Liquid Bulk	GATX Tank Storage (berths 118-119)	25 Years	4/13/2013	unknown
Liquid Bulk	Amerigas (berth 120)		holdover	12/1/2007
Liquid Bulk	Valero (berth 163)	20 Years	6/24/2014	not in 5 yr period

The following table presents the Port of Long Beach's major leases, expiration dates, and currently anticipated upcoming Board action dates.

Table 3.2: POLB Leases & Status

Land Use	Grantee	Term of Agreement	Date Expires	Anticipated Board Action
Container	PCT	20 Years	4/30/2022	not in 5 yr period
Container	SSAT - Pier C	20 Years	4/30/2022	5/15/2006
Container	SSAT Long Beach - Pier A	25 Years	10/21/2027	not in 5 yr period
Container	TTI	25 Years	8/11/2027	not in 5 yr period
Container	CUT	30 Years	6/30/2009	12/1/2007
Container	LBCT	25 Years	6/30/2011	12/1/2007
Container	Pier S	tbd	new lease	8/31/2007
Container	ITS	34 Years	8/31/2006	5/22/2006
Auto	Toyota	16 Years	12/31/2006	12/31/2006
Break Bulk	Cooper/T. Smith	20 Years	12/31/2008	12/31/2008
Break Bulk	Crescent Terminals	15 Years	6/30/2015	10/1/2006
Break Bulk	Fremont	40 Years	4/30/2036	not in 5 yr period
Break Bulk	Catalyst Paper (USA) Inc.	3 Years	8/31/2008	8/31/2008
Break Bulk	Pacific Coast Recycling	25 Years	11/13/2019	not in 5 yr period
Break Bulk	Weyerhaeuser	36 Years	1/31/2011	1/31/2011
Dry Bulk	BP West Coast Products	40 Years	12/31/2009	12/31/2009
Dry Bulk	CEMEX Pacific Coast Cement	40 Years	8/31/2021	not in 5 yr period
Dry Bulk	Koch Carbon	40 Years	12/31/2027	not in 5 yr period
Dry Bulk	Marsulex	20 Years	5/31/2005	12/31/2006
Dry Bulk	MMC (Mitsubishi)	33 Years	6/13/2022	not in 5 yr period
Dry Bulk	Metropolitan Stevedore	35 Years	3/31/2016	not in 5 yr period
Dry Bulk	Morton	15 Years	7/31/2005	12/31/2006
Dry Bulk	NGC	60 Years	11/30/2024	not in 5 yr period
Dry Bulk	G-P Gypsum	n/a (private)	n/a (private)	n/a (private)
Dry Bulk	Oxbow (East)	20 Years	11/3/2019	not in 5 yr period
Dry Bulk	Oxbow (Pad 14)	31 Years	6/30/2021	not in 5 yr period
Dry Bulk	Oxbow (South)	32 Years	6/30/2021	not in 5 yr period
Dry Bulk	Oxbow (West)	41 Years	12/31/2027	not in 5 yr period
Liquid Bulk	BP/ARCO	40 Years	5/30/2023	8/31/2007
Liquid Bulk	ATSC	20 Years	12/31/2014	not in 5 yr period
Liquid Bulk	BP Terminal 3	n/a (private)	n/a (private)	n/a (private)
Liquid Bulk	World Oil	n/a (private)	n/a (private)	n/a (private)
Liquid Bulk	Baker Commodities	n/a (private)	n/a (private)	n/a (private)
Liquid Bulk	Chemoil	36 Years	6/30/2010	10/31/2007
Liquid Bulk	Equilon (Shell)	40 Years	10/31/2006	12/31/2006
Liquid Bulk	Petro-Diamon	20 Years	9/30/2022	not in 5 yr period
Liquid Bulk	VOPAK	n/a (private)	n/a (private)	n/a (private)

SECTION 4: CLEAN AIR ACTION PLAN INITATIVES - OVERVIEW

This section presents an overview of the Clean Air Action Plan, which consists of six primary elements:

1. Source category control measures for existing operations
2. Standards for new leases and lease renewals negotiations
3. Requirements for construction equipment
4. Comprehensive Technology Advancement Program initiative
5. Infrastructure and operational efficiency improvements initiative
6. Clean Air Action Plan tracking and monitoring

For the Port of Los Angeles there is an additional element associated with the China Shipping Settlement.

4.1 Source Specific Control Measures

Specific source category control measures were developed from both existing Port air programs and the work completed by the City of Los Angeles' (NNI) study and the Port of Long Beach's Green Port Policy. Table 4.1 illustrates how both Ports are considering initial implementation strategies, at this time, for the various measures proposed in the Clean Air Action Plan. These initial implementation strategies are thought by the Ports to be ready for use to initiate the control measures. Depending on the performance of these initial strategies, they will be adjusted, removed, enhanced, or other addition strategies will be utilized in order to maximize timely emissions reductions. In addition, the Ports are looking to what extent strategies like tariff changes can be effectively utilized to expedite emissions reductions.

Table 4.1: Control Measures & Initial Implementation Strategies

SPBP Measure Number	Control Measure	Initial Implementation Strategies	
		Port of Los Angeles	Port of Long Beach
SPBP-HDV1	Performance Standards for On-Road HDV	Incentives/Lease Req SCAQMD Funding	Incentives/Lease Req SCAQMD Funding
SPBP-HDV2	Alternate Fuel Infrastructure for On-Road HDV	Incentives SCAQMD Funding	Incentives SCAQMD Funding
SPBP-OGV1	OGV Vessel Speed Reduction	Tariff (Incentives) Lease Requirements	Tariff (Incentives) Lease Requirements
SPBP-OGV2	OGV Reduction of At-Berth OGV Emissions	Capital/Incentives Lease Requirements	Capital Lease Requirements
SPBP-OGV3	OGV Auxiliary Engine Fuel Improvement Standards	Lease Requirements	Lease Requirements
SPBP-OGV4	OGV Main Engine Fuel Improvement Standards	Lease Requirements	Lease Requirements
SPBP-OGV5	OGV Main and Auxiliary Engine Emissions Improvements	Lease Requirements Incentives	Lease Requirements Incentives
SPBP-CHE1	Performance Standards for CHE	Lease Requirements	Lease Requirements
SPBP-HC1	Performance Standards for Harbor Craft	Incentives	Incentives
SPBP-RL1	Rail Switch Engine Modernization	PHL MOU Agreement Lease Requirements	PHL MOU Agreement Lease Requirements
SPBP-RL2	Operational Controls for Line Haul Railroads	MOU/Lease Req CEQA Mitigations	MOU/Lease Req CEQA Mitigations
SPBP-RL3	Clean Rail Yard Standards	MOU/Lease Req CEQA Mitigations	MOU/Lease Req CEQA Mitigations
	Construction Standards	CEQA Mitigations	CEQA Mitigations
	Technology Advancement Program	Incentives	Incentives
	Infrastructure & Operational Efficiency Improvements Initiative	Incentives	Incentives
	POLA China Shipping Settlement	Settlement Agreement	N/A

It should be noted that control measures SPBP-OGV1, OGV-3, and OGV-4 will be evaluated to determine solutions to various logistical issues to ensure effective measure implementation. These issues include: updating the existing radar range capabilities to 40 nautical miles (nm), working with the Marine Exchange and United States Coast Guard to resolve issues associated with vessels outside the Coast Guard's administrative area, work with the Marine Exchange to track additional fuel compliance data elements for monitoring and

reporting, determine effects of changing VSR zone on areas inside California waters, but beyond 40 nm from Point Fermin, work to get work gang assignments moved to 40 nm, and to evaluate fuel availability and ship tankage issues associated with operating on cleaner fuels. The evaluations and upgrades to the radar system will be completed before the end of 2007.

4.1.1 Control Measures for Heavy-Duty Vehicles

- **SPBP-HDV1** – Performance Standards for On-road HDV. The control measure is focused on maximizing the reductions from frequent (7 or more calls per week) and semi-frequent (3.5 to less than 7 calls per week) caller trucks that service both Ports. This control measure sets forth the following "clean truck" definitions:

  - ✓ All frequent caller trucks, and semi-frequent caller container trucks model year (MY) 1992 and older, calling at the San Pedro Bay Ports will meet or be cleaner than the EPA 2007 on-road emissions standard (0.01 g/bhp-hr for PM) and the cleanest available NOx at time of replacement.
  - ✓ Semi-frequent caller container trucks MY1993-2003 will be equipped with the maximum CARB verified emissions reduction technologies installed.

  The measure then sets target dates by which trucks meeting the above definitions will be either replaced or retrofitted. In order to accommodate this massive transformation of the existing truck fleet, Port, SCAQMD, and other public funding will be required. The program also sets forth suggested strategies to maximize the use and emissions reductions of "clean trucks" calling at both ports.

- **SPBP-HDV2** – Alternative Fuel Infrastructure for HDVs. Construct LNG or compressed natural gas (CNG) refueling station preferably on jointly owned property, after resolution of logistical issues and site considerations. Funding to build at the recommended locations would come primarily from Port incentive funds (for on-port and near-port infrastructure), SCAQMD alternative fuel funds (for on-port, near-port, and basin-wide infrastructure), and potentially from grants from state and federal regulators or others.

4.1.2 Control Measures for Ocean-Going Vessels

- **SPBP-OGV1** – Vessel Speed Reduction (VSR). Currently a voluntary program under which ships are slowed within the SoCAB over-water boundary out to 20 nm from Point Fermin, reducing NOx emissions. The program will be evaluated to determine solutions to various logistical issues to ensure effective measure implementation. These issues include: updating the existing radar range

capabilities to 40 nm, working with the Marine Exchange and United States Coast Guard to resolve issues associated with vessels outside the Coast Guard's administrative area, determine effects of changing VSR zone on areas inside California waters, but beyond 40 nm from Point Fermin, work to get work gang assignments moved to 40 nm, and other operational issues. The evaluation and upgrades to the radar system will be completed before the end of 2007. The associated costs would be shared between the San Pedro Bay Ports.

- **SPBP-OGV2** – Reduction of At-Berth OGV Emissions. Under this initiative, each Port will develop the infrastructure required to eventually provide shore-power capabilities to all container and cruise ship berths. On a case-by-case basis, other vessel types like specially outfitted tankers or refer terminals will be evaluated for the application of shore-power.

  In addition, this initiative includes the demonstration and implementation of other shore-side technologies that can be used on vessels unequipped for connecting to shore-power that would provide emissions benefits equivalent to shore-power.

- **SPBP-OGV3** - Auxiliary Engine Fuel Improvement Program. As proposed, this measure would accelerate the phase in of 0.2% S (MGO) fuel in auxiliary engines between 2006 and 2009, with initial implementation driven by lease requirements and potentially tariffs. This requirement would impact vessels calling at San Pedro Bay Ports, within the SoCAB over-water boundary out 20 nm from Point Fermin. As stated above, the program will be evaluated for expansion to 40 nm from Point Fermin.

- **SPBP-OGV4** – Main Engine Fuel Improvement Standards. As proposed, this measure would require OGV owners/operators to make a fuel switch to MGO fuels with sulfur content no greater than 0.2% S in their main engines. Similar to SPBP-OGV3, this measure would also be implemented through lease requirements and potentially tariffs. Initially, similar to SPBP-OGV3 the program would extend out 20 nm from Point Fermin and would be evaluated for expansion to 40 nm from Point Fermin.

- **SPBP-OGV5** – Main and Auxiliary Engine Emissions Improvements. This measure focuses on reducing DPM, NOx, and SOx emissions from OGV main engines and auxiliary engines. OGV engine standards have not kept pace with other engine standards such as HDVs and CHE. IMO's MARPOL Annex VI is a very weak standard. This measure is coupled with the Technology Advancement Program by incorporating successfully demonstrated technologies

or technologies that have sufficient data that it can be agreed upon by regulatory agencies and the Ports as to what emissions reductions levels can be for a given technology.

4.1.3 Control Measures for Cargo-Handling Equipment

- **SPBP-CHE1** – Performance Standards for CHE. A program designed to promote or require the replacement of existing 2003 and newer CHE with equipment compliant with either EPA 2007 on-road or Tier 4 non-road emission standards, or retrofit with the highest-level CARB verified emissions reduction technologies. The current state regulation is focused on equipment 2002 and older in 2007 – 2013 and 2003 – 2006 engines in 2010 – 2016. This measure accelerates the modernization of the cargo handling fleet beyond the CARB current requirements.

4.1.4 Control Measures for Harbor Craft

- **SPBP-HC1** – Rail Switch Engine Modernization. This measure continues the various engine replacement programs led by both Ports, CARB/SCAQMD, and others. The focus will be on harbor craft that have not already been repowered/retrofitted (including construction related harbor craft like dredges and support vessels). When candidate vessels are identified, the Ports will assist/require the owner/operator to repower or retrofit propulsion and auxiliary engines. For non-construction related candidates, Port staff will assist the owners in applying for Carl Moyer Program incentive funding for the cleanest available engine that meets the emissions and cost effectiveness requirements. This measure is fuel neutral. Potential vessel candidates will be identified through the annual emissions inventory process, and the program will be implemented through lease requirements. It should be noted, that several tugs operating at the Port of Long Beach are home-ported on private property (not Port property) and therefore will not be affected by this measure.

4.1.5 Control Measures for Railroad Locomotives

- **SPBP-RL1.** – Pacific Harbor Line Modernization. A voluntary program initiated by the Ports of Los Angeles and Long Beach in conjunction with PHL to modernize switcher locomotives used in Port service to meet Tier 2 locomotive engine standards and initiate the use of fuel emulsion in those engines. The program also includes evaluation of alternative-powered switch engines including LNG and hybrid locomotives. In addition, a locomotive DOC and DPF will be evaluated and based on a successful demonstration; DOC or DPF will be applied

to all Tier 2 switcher locomotives. Finally, this measure restricts future purchases to the cleanest locomotives available.

- **SPBP-RL2** – Operational Controls for Line-Haul Locomotives - This measure calls for the line-haul railroads to maximize the use of Tier 2 locomotives, installation of verified DOCs or DPFs, installation and use of 15-minute idling restrictors, and use of ULSD fuels for rail movements associated with movement of goods to and from the San Pedro Bay Ports. The long-term goal is to expedite the introduction of line-haul engines that are 90% cleaner then the Tier 2 engine standards for PM and NOx.

- **SPBP-RL3** – Clean Rail Yard Standards - Rail facilities include many emission-producing activities, including the operation of switching and line-haul locomotives, idling of switching and line-haul locomotives, loading and unloading of railcars by CHE, and HDVs servicing the yards. New rail facilities, or modifications to existing rail facilities, will incorporate the cleanest locomotive technologies. A list of these technologies will be provided for project proponents to consider in developing new facilities, and choices will be formalized in lease requirements.

4.1.6 Integration of Non-Regulatory NNI Measures

Many of the measures proposed in the Clean Air Action Plan advance the requirements and implementation of upcoming regulations, as did several of the NNI measures. Non-regulatory NNI Measures have been incorporated into the Clean Air Action Plan control measures. Regulatory NNI Measures are part of the on-going regulatory programs implemented by the federal, state, and local agencies and are the responsibility of those agencies. Table 4-2 details how each San Pedro Bay Ports Clean Air Action Plan measure relates to the non-regulatory NNI control measures.

Table 4.2: Integration of NNI Measures

SPBP Measure #	New Control Measure/Program Name	Non Regulatory NNI Measures
SPBP-HDV1	Performance Standards for On-Road HDV	HDV3, HDV10 HDV12,
SPBP-HDV2	Alternate Fuel Infrastructure for On-Road	HDV-4
SPBP-OGV1	OGV Vessel Speed Reduction	OGV2, OGV15
SPBP-OGV2	OGV Reduction of At-Berth OGV Emissions	OGV3, OGV16
SPBP-OGV3	OGV Auxiliary Engine Fuel Improvement Standards	OGV4, OGV11
SPBP-OGV4	OGV Main Engine Fuel Improvement Standards	OGV9, OGV12
SPBP-OGV5	OGV Main and Auxiliary Engine Emissions Improvements	OGV 7
SPBP-CHE1	Performance Standards for CHE	CHE2, CHE3, CHE4, CHE5, CHE7, CHE8
SPBP-HC1	Performance Standards for Existing Harbor Craft	HC9, HC10
SPBP-RL1	Rail Switch Engine Modernization	R5, R6
SPBP-RL2	Operational Controls for Line Haul Railroads	R10, R11
	Technology Advancement Program	HDV13, HDV14, HDV18, HDV19, OGV7, OGV13, OGV14, HC3, HC7, R7, R9, R12
	POLA China Shipping Settlement	CHE6, HC5

Notes:
OGV 6 – This is already being done by shipping companies and will be documented in the upcoming 2005 emissions inventory update.
HC11 – "AMP™ Staging Areas" is being modified such that all customers that own/operate tugs will be required to AMP™ while they are at their homeport (the area being leased). This provision was not included in HC measures. Through preliminary analysis, staging areas (locations with the Ports where tugs would wait on shore-power between jobs rather than return to their homeports) are infeasible with current security requirements and wharf availability.

4.2 Construction Activity

Construction activity emissions will be assessed through the CEQA evaluation process and control strategies that may be required to meet CEQA mitigation requirements will be incorporated in bid packages for the actual construction work.

Construction equipment includes marine sources (primarily dredges, tugs, crew boats, pile-drivers) and land (excavators, cranes, etc.) sources. Land- and marine-based construction equipment will be required to meet the control strategies that may be required as mitigations in the CEQA document.

The Ports, SCAQMD, and CARB will be developing a list of Best Management Practices (BMP) associated with construction activities by the end of 2007. These BMPs will be incorporated in construction contracts.

4.3 Technology Advancement Program

Another significant initiative of the Clean Air Action Plan is the Technology Advancement Program, which will evaluate, demonstrate, and incorporate new strategies into the suite of control measures that will ultimately result in significant reductions of DPM, NOx, and other criteria pollutants. This initiative builds on the success and synergies of the San Pedro Bay Ports, CARB, SCAQMD, EPA, tenants, and other stakeholders working together to find joint solutions. Several successful projects have occurred over the years between these entities, and this program would help to build on those early successes. A coordination committee will be established consisting of funding partners that includes both Ports, SCAQMD, CARB, and the EPA. Other stakeholders may become involved in relation to specific projects, as approved by the coordination committee. There are fundamental areas in which the program will focus its initial work:

- Source Category Reductions
- "Green Container Transport" Solutions
  - ✓ Heavy-duty hybrid trucks
  - ✓ Shuttle systems including magnetic levitation, linear induction motors, etc.
  - ✓ Others as identified and developed
- Emissions Inventory Improvements

The program will be primarily funded by both Ports and the participating agencies. Projects will be developed and implemented under each of the areas listed above. Successful demonstration projects will then be incorporated into the next annual update of the Clean Air Action Plan as control measures or additional emissions reduction strategies.

4.4 Infrastructure & Operational Efficiency Improvements Initiative

This initiative identifies projects at the San Pedro Bay Ports that improve infrastructure and operational efficiencies that have an added air quality benefit. The initiative includes, but is not limited to:

- Focus on on-dock vs. near-dock rail infrastructure
- Grade separations
- Optical character recognition (OCR) gates at terminals
- Terminal cargo handling/configuration efficiency improvements
- Radio Frequency Identification (RFID)
- Virtual Container Yards

The emissions reduced by these projects would be quantified and reported in emissions inventory updates.

4.5 Port of Los Angeles – China Shipping Settlement

Unique to POLA are the emission reductions associated with the China Shipping Settlement. In February 2003, the Port joined environmental and Harbor-area community groups in a settlement agreement that includes a series of environmental programs designed to improve the area's air quality and quality of life. As part of this settlement, the Port has committed over $20 million over five years to pay for air quality mitigation projects that reduce Port operation emissions that affect the communities of Wilmington and San Pedro. This program is known as the Port Air Quality Mitigation Incentive Program (PAQMIP). In accordance with the settlement agreement, the PAQMIP expends funds for projects and improvements that reduce emissions from Port operations that affect the communities of Wilmington and San Pedro. All emission reductions resulting from funded projects are retired by the Port of Los Angeles for the benefit of the environment, meaning that the reductions cannot be used as offsets or sold as credits.

The PAQMIP is in its third year[3], with the most recent Request for Proposals (RFP) planned for issuance in June/July 2006. The primary purpose of this program is to provide financial incentives to assist in the implementation of projects that will accomplish two objectives: (1) reduction of emissions associated with Port operations in the communities of San Pedro and Wilmington, and (2) research and development of specific technologies that can be applied in the San Pedro Bay Port area to achieve the first objective.

4.6 Clean Air Action Plan Tracking and Monitoring

The Ports will track, monitor, and demonstrate the progress of the Clean Air Action Plan. In addition, both Ports will enhance existing monitoring programs to encompass the breadth of actions proposed in the Clean Air Action Plan. These enhancements include:

[3] 3rd time an RFP is issued to solicit projects.

- Expanding the Bay-wide ambient air quality monitoring network to monitor actual air pollution concentrations in and around the San Pedro Bay Ports.
- Updating the Bay-wide air emissions inventories annually to track control measure compliance and emissions benefits.
- Tracking Clean Air Action Plan progress, expenditures, reductions, etc., in a comprehensive database for each Port.
- Using agency approved protocols, the Port of Los Angeles will develop a port-wide health risk assessment in coordination with the air agencies.

Monitoring and tracking of the plan will initially take place either monthly or quarterly (depending on the control measure/program). Results will be briefed to each Port's Board and a detailed annual overall progress reporting of the San Pedro Bay Ports Clean Air Action Plan will also be reported to the Boards and published. The metrics that are tracked and reported will be reviewed annually and adjusted, added to, or removed as needed for greater clarity and accuracy.

SECTION 5: CLEAN AIR ACTION PLAN INITIATIVES - DETAILS

This section presents the Clean Air Action Plan initiatives and control measures that the Port of Los Angeles and the Port of Long Beach will implement as part of the larger SPBP Clean Air Action Plan. These initiatives consist of:

5.1 Heavy-duty vehicles (trucks) control measures
5.2 Ocean-going vessels control measures
5.3 Cargo handling equipment control measures
5.4 Harbor craft control measures
5.5 Railroad locomotive control measures
5.6 Standards for new leases and lease renewals
5.7 Requirements for construction equipment
5.8 Comprehensive Technology Advancement Program initiative
5.9 Infrastructure and operational efficiency improvements
5.10 The Port of Los Angeles' China Shipping Settlement

Again it is important to note that this plan is a "living document" and that the control measures developed for the first San Pedro Bay Ports Clean Air Action Plan will most likely change. New strategies will be added as more options to reduce emissions become available. Some strategies will be more successful than others, while some strategies may be dropped due to lack of reductions or authority to implement. The plan will be updated annually to maintain consistency with the Clean Air Action Plan's foundations, to maximize the reduction of public health risk, and to meet or exceed the goals presented in Section 2.

5.1 Heavy-Duty Vehicles (Trucks) Control Measures

HDVs represent one of the two primary source categories where emissions reduction efforts are focused in the San Pedro Bay Ports Clean Air Action Plan. This is due to their significant contribution of pollutant emissions, their proximity and health risk impact to surrounding communities, and the diffuse nature of ownership and control of the emission sources (many, if not most, trucks are owned and operated by individuals rather than by a centralized company). This source category is addressed through a combination of measures that include truck replacements, control device retrofits for trucks that will not be replaced, and a research and development initiative to help identify and demonstrate cleaner engines types and modes of transportation that can be used in the movement of containerized cargo.

5.1.1 Control Measure Number SPBP-HDV1
Measure Title: *Performance Standards for On-Road Heavy-Duty Vehicles*

Financial incentives will be provided to expedite the fleet transformation to "clean trucks" by replacing and retrofitting all frequent and semi-frequent container caller trucks servicing both ports by the end of 2011. This will maximize the associated emissions reductions and greatly reduce health risk concerns from trucks. The measure would be implemented through lease requirements, tariff changes, and/or incentives.

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Increasing throughout five year period (see Tables 5.3 & 5.4)*
Tonnage Reduced:	*Increasing throughout five year period (see Tables 5.3 - 5.5)*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: Lease Requirements, Tariffs, & Incentives

Background

On-road heavy-duty diesel vehicle (truck) travel is an integral part of Port operations moving containers from the port into the SoCAB and beyond. Almost all of these trucks are rated with a gross vehicle weight (GVW) greater than 33,000 pounds. It is not known exactly how many unique trucks service both Ports. During the baseline emissions inventory process for both the Port of Los Angeles (2001 baseline) and the Port of Long Beach (2002 baseline) approximately 7,200 license plates of trucks visiting the ports were analyzed. This analysis determined that the average age of the port specific fleet was 12.9 years (MY 1990) compared to the 2001 statewide fleet age of 12.2 years (MY 1991) in the state of California's emissions inventory model EMFAC2002. From the baseline emissions inventory data set, it was found that MY 1958 to 2002 trucks serviced the ports.

Currently, both Ports are in the midst of updating their emissions inventory of port-related sources for 2005. As a part of this EI update, extensive truck visit/license plate information has been collected from seven terminals (three from POLA and four from POLB). To date, over one million (1,003,024) optical character recognition (OCR) truck visit data records have been received from the seven terminals and represent a time range of 45 to 208 days. From this preliminary data set, there were 35,291 unique California registered trucks identified, which had an average MY age of 1994. The trucks range in age from 1941 to 2006. Efforts are still under way to try to fill in the remaining container terminals data and collect the entire 2005 record of truck calls for both Ports. For now however, these data represent the best data set available to analyze the trucks servicing the San Pedro Bay Ports.

Out of the entire data set, there is a smaller data set covering five of the terminals over the same 37-day period. From this data set, it was found that nearly 2,000 unique frequent

caller trucks visited the ports seven days per week or more (these trucks averaged ~12 calls per week), and accounted for ~50% of all truck calls. In addition, 3,000 semi-frequent trucks visited the ports from every other day to seven days per week representing 30% of all truck calls. Data analyses of this subset indicated that a total 15,700 unique California registered trucks made 256,000 trips over the 37-days duration. Further, gate count surveys of each of the container terminals at both of the San Pedro Ports indicated a total of 8.2 million annual gate counts.

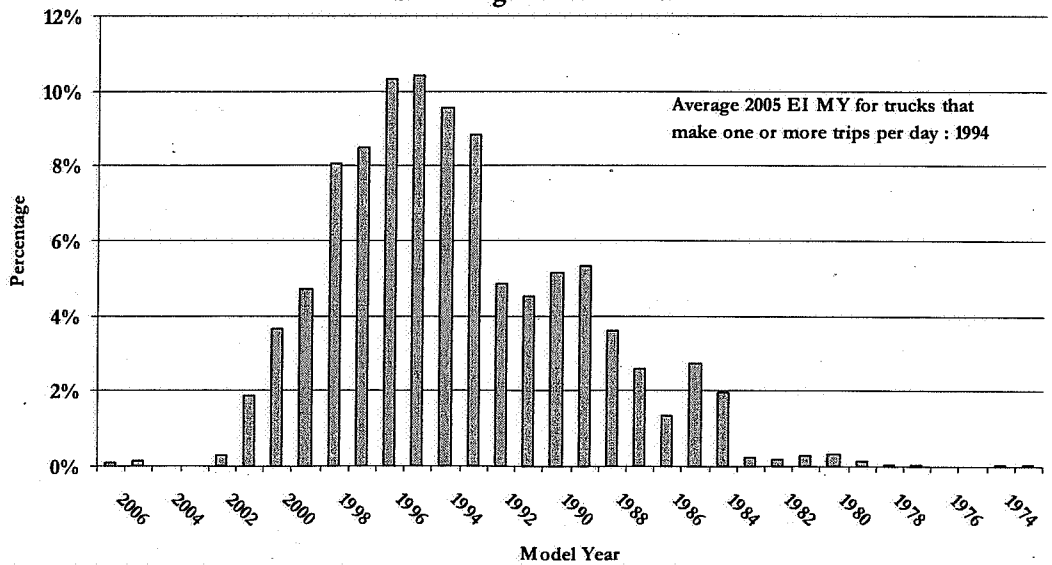
Utilizing the estimate of 8.2 million annual gate moves and the activity characteristics of trucks that service the ports (described above), the fleet characteristics of trucks for all terminals and for an entire year for both of the San Pedro Bay Ports were estimated in the following manner:

- ~41,000 individual trucks that service both ports.
- ~7,000 individual frequent caller trucks make ~50% of all calls.
- ~9,800 semi-frequent caller trucks make ~30% of all calls.
- ~16,800 individual frequent and semi-frequent trucks account for ~80% of all calls.

Changing any of these assumptions could have a significant impact on the end result and therefore as better information is gathered, the number of trucks by category will be updated.

The following figure presents the model year distribution of all 15,700 trucks.

Figure 5.1: Model Year Truck Distribution of 2005 EI Update for 15,711 Unique Trucks Servicing POLA & POLB



Another potential source of information regarding truck population is the PierPass program, which has been designed to lessen near-port on-road congestion by extending terminal gate hours. Specific information on trucks is being gathered during gate transactions to assist with administration of this program. This information, when available, will be incorporated into the analysis.

The challenge of expediting emissions reductions from this source category is the numbers of owner/operator and fleet operators that service both ports. Complicating the issue are the costs associated with new trucks and financial ability of the owners/operators to acquire new trucks quickly.

Measure Description

This measure focuses on achieving significant emissions reductions related to improvements to the ~16,800 individual frequent and semi-frequent caller trucks. The Ports envision tackling this measure using several approaches: incentives to replace trucks, lease requirements to require the use of "clean trucks," or other mechanisms such as a green lane program, a medallion program, tariff changes, etc. Two initial approaches include significant incentives to owner/operators to encourage accelerated turnover/retrofits, and on the terminal side to maximize the use of "clean trucks" through lease requirements and/or other mechanisms. It is important to note that the latter approach has not yet been developed. The Ports will develop, through discussions with SCAQMD, tenants, and other stakeholders, the details of how such an approach would be implemented.

"Clean trucks" are defined by this measure, as trucks meeting one of the following definitions:

- Frequent and semi-frequent caller[4] container trucks currently MY1992 and older that have been replaced or upgraded such that they meet or are cleaner than the EPA 2007 on-road emissions standard (this category represents ~7,000 trucks).
- Semi-frequent caller trucks MY 1993-2006 that have been equipped with the most effective CARB verified emissions reduction technologies (this category represents ~9,800 trucks).
- Trucks that have been replaced in the last four years through the Gateway Cities truck replacement program (this category represents ~300 trucks).

For the first approach, the Ports and SCAQMD would provide incentives for the replacement and retrofit of frequent and semi-frequent trucks such that the goals of the measure are met, however additional funding on a massive scale will be needed (further discussed in below in the Financial Costs section). Three sets of funding scenarios were developed: scenarios based on Port and SCAQMD funding only (Budget Scenarios 1

[4] San Pedro Bay Ports frequent caller trucks call on average 7 or more times per week at; semi-frequent caller trucks call on average 3.5 to less than 7 times per week.

through 5), scenarios including unlimited and capped public bond funding (Budget Scenarios 6 through 11), and a scenario that evaluated the complete replacement of the 16,800 frequent and semi-frequent caller trucks (Scenario 12). Detailed information on all budget scenarios is presented in Appendix A.

There were several scenarios developed and evaluated by the Ports for addressing port-related HDV emissions. The scenarios initially evaluate cleaner diesel, alternative fuel, and retrofit options for the short-term. Electric, hybrid, and several other "Green Container Transport" options will be evaluated in the Technology Advancement Program and as these technologies are successfully demonstrated, they will be phased into the scenarios. Therefore, the proposed scenarios for HDV emissions reductions will be reviewed and can be modified to integrate these new cleaner options in future updates of the Clean Air Action Plan.

For all scenarios, alternative fueled and cleaner diesel trucks meet the proposed standards. The cost breakdown for incentive cost assumptions per unit replaced is:

1.	Replacement Incentive[5] for new LNG truck	$185,00[6]
2.	Automated Vehicle Locator (AVL) installation	$1,300
3.	Administration costs	$2,200
	Total Incentive Costs	$179,500/truck

Automated Vehicle Locator units will be installed on all trucks being replaced and will provide the Ports with better total miles traveled and times calling at the terminals of the San Pedro Bay Ports.

Similarly, the cost breakdown for the incentive cost for cleaner diesel truck replacements meeting the proposed standards were developed is:

1.	Replacement Incentive[7] for new cleaner diesel truck	$126,000
2.	Automated Vehicle Locator (AVL) installation	$1,300
3.	Administration costs	$2,200
	Total Incentive Costs	$129,500/truck

The cost breakdown for retrofits for MY 1993 through 1997 including a DPF and lean NOx catalyst (CARB verified to 85% PM & 25% NOx reductions) and an engine control chip "flash" or resetting (CARB verified to 25% NOx reduction) is:

[5] Replacement Incentive is for the full purchase price of a new LNG truck, cost estimate based on April 18, 2006 meeting between Wesport, Port of Los Angeles, Port of Long Beach, and Starcrest.

[6] Carl Moyer limits incentive funding up to 80% and a maximum project cost effectiveness of $14,300 per ton of emissions reduced; the additional 20% will be paid by both Ports in order to increase participation in the program.

[7] Replacement Incentive is for the full purchase price of a new cleaner diesel truck; cost estimate based on April 5, 2006 meeting between Gateway Cities, Port of Los Angeles, Port of Long Beach, and Starcrest.

1.	DPF+Lean NOx Catalyst w/installation	$15,500
2.	Chip re-flash	$200
3.	Owner/operator incentive	$500
	Total Incentive Costs	$16,200/truck

It should be noted that the Carl Moyer Program guidelines allow for funds up to 80% of capital costs for a truck replacement with the condition that the maximum funding meet a cost effectiveness of $14,300/ton reduced (DPM, NOx, and volatile organic compounds (VOCs)). The cost assumptions used for this measure assumes 100% funding for replacements because of the need to turn over the large number of trucks described in the various budget scenarios. The Port's will provide the additional 20% to make up the entire cost of the replacement.

The first five scenarios evaluated several combinations of alternative fuel, cleaner diesel, and retrofits. These scenarios also assumed that only the Ports and SCAQMD monies were used to reduce HDV emissions. They focused only on frequent caller trucks and did not provide reductions for all ~7,000 trucks due to funding limitations. The resulting estimated annual reductions at the end of the fifth year of implementation ranged from ~80 to ~250 per year (tpy) of DPM and ~480 to ~830 tpy NOx (budget scenario details are provided in Appendix A). These scenarios did not include any public/bond funds and after looking at the initial results, it was deemed that these reductions did not go far enough to meet the goals of the Clean Air Action Plan.

Seven additional scenarios were developed assuming different bond funding levels and targeted the ~16,800 frequent and semi-frequent caller trucks (~80% of all truck calls to the ports). Scenarios 6 through 8 assume that the bond funding is approved by the voters in November 2006 and that unlimited funds were available. Budget scenarios 9 through 11 assumed that $800 million were available for San Pedro Bay Ports. The final scenario assumes that all 16,800 frequent and semi-frequent trucks are replaced and was used to determine the upper end of emissions reduced and costs. Emissions reductions for these scenarios are presented in Table 5.1 below.

The scenarios were designed for comparison purposes. The budgets have been committed to by each Port, however the actual breakdown on the percentage of funding going to alternative fuel/cleaner diesel/retrofits will be ultimately decided by each Port's Board.

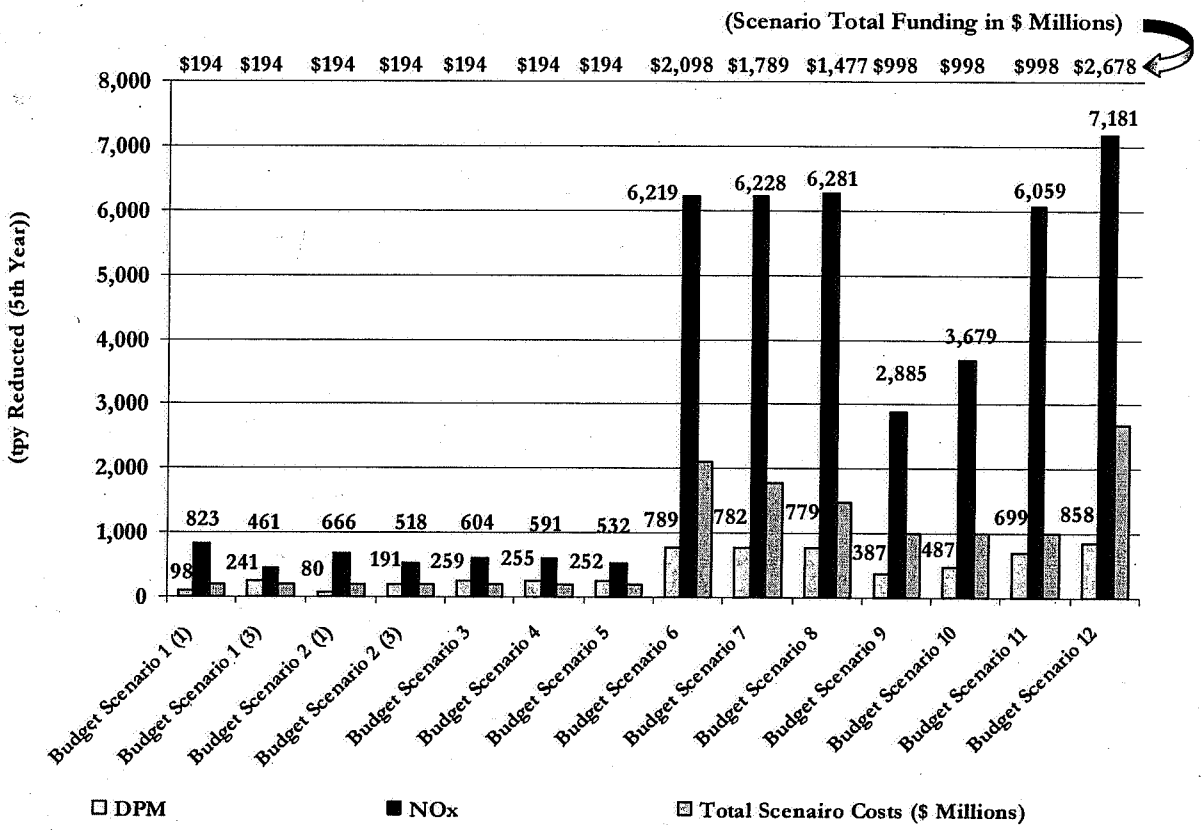
The following table provides the annual emissions reductions by the end of the fifth year of the plan and total scenario costs.

Table 5.1: Summary Results of Budget Scenarios

	Reductions (5th Year) DPM (tpy)	NOx (tpy)	Total Scenairo Costs (US$)
Budget Scenario 1 (1)	98	823	$194,000,000
Budget Scenario 1 (3)	241	461	$194,000,000
Budget Scenario 2 (1)	80	666	$194,000,000
Budget Scenario 2 (3)	191	518	$194,000,000
Budget Scenario 3	259	604	$194,000,000
Budget Scenario 4	255	591	$194,000,000
Budget Scenario 5	252	532	$194,000,000
Budget Scenario 6	789	6,219	$2,097,600,000
Budget Scenario 7	782	6,228	$1,789,300,000
Budget Scenario 8	779	6,281	$1,476,500,000
Budget Scenario 9	387	2,885	$998,000,000
Budget Scenario 10	487	3,679	$998,000,000
Budget Scenario 11	699	6,059	$998,000,000
Budget Scenario 12	858	7,181	$2,678,400,000

Figure 5.2 presents the summary results for annual DPM and NOx emissions reductions in the fifth year of the plan and the total costs associated with each scenario.

Figure 5.2: Summary Results for Budget Scenarios



It should be noted that bond money is on the November 2006 ballot and that strong support should be provided by the Ports, SCAQMD, and other agencies to assist in the passage of the ballot measure.

The budget scenario currently under consideration is Budget Scenario 7, which is based on a 50/50 mix between alternative fueled and cleaner diesel truck replacements, as well as retrofits. The following replacements and retrofits are proposed for this specific scenario:

- 10,622 frequent and semi-frequent trucks replaced
  - ✓ 3,500 frequent caller trucks replaced w/alternative fueled trucks meeting the frequent "clean truck" standards
  - ✓ 3,500 frequent caller trucks replaced w/cleaner diesel trucks meeting the frequent "clean truck" standards
  - ✓ 1,811 semi-frequent caller trucks replaced w/alternative fueled trucks meeting the semi-frequent pre-MY1993 "clean truck" standards

- ✓ 1,811 semi-frequent caller trucks replaced w/cleaner diesel trucks meeting the semi-frequent pre-MY1993 "clean truck" standards

➢ 9,800 semi-frequent trucks retrofitted
- ✓ 5,112 MY1993-1997 semi-frequent caller trucks retrofitted (w/ DPFs, lean NOx catalyst, and chip re-flash) meeting the semi-frequent MY1993-1997 "clean truck" standards
- ✓ 844 MY1998-2003 semi-frequent caller trucks retrofitted (w/ DPFs and lean NOx catalyst) meeting the semi-frequent MY1998-2003 "clean truck" standards

The total Budget Scenario 7 annual emissions reductions (after taking into account current regulations) are estimated at over 780 tpy (2.1 tpd[8]) DPM and over 6,200 tpy (17.1 tpd) NOx from port-related HDVs at a cost of just over $1.7 billion dollars. This scenario was selected because of its equal mix of cleaner diesel, retrofit, and alternative fuels. By changing to any of the other scenarios, changes the costs and the estimated emissions reductions by fiscal year and total emissions reductions. It should be noted that this budget estimate does not include a $12 to $17 million Technology Advancement Program funded through the Ports, SCAQMD, and other regulatory agencies.

The details of Budget Scenario 7 are presented in the following tables. Details on all scenarios are provided in Appendix A.

[8] tpd- ton per day; tpd = tons per year / 365 days per year

Table 5.2: Budget Scenario 7 Truck Replacements & Retrofits Assumptions

7,000	**Frequent Trucks (preliminary 2005 EI data)**	**9,800**	**Semi-Frequent Trucks (preliminary 2005 EI data)**
3,500	Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,500	Frequent Caller Trucks CD Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
1,811	Semi-Freq Caller Trucks Alt Fuel Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
1,811	Semi-Freq Caller Trucks CD Replaced		
10,622	**Total Trucks Replaced**		

Table 5.3: Budget Scenario 7 Cleaner Diesel Replacements/Retrofits Details

SBP-HDV1 HDV Incentives (Cleaner Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	$22,000,000	$218,600,000	$205,100,000	$169,200,000	$169,200,000	$784,100,000	
CD Option 1 - Clean Diesel Trucks MY2007+							
50% CD Funding				$129,500 /truck ($126k O/Op, $1.3k AVL, $2.2k admin)			$126K based on ARB's Ports Truck Report, pg B-16
Number of total trucks/year	**85**	**1,306**	**1,306**	**1,306**	**1,306**	**5,311**	
Baseline DPM in tpy	6	92	178	264	350	**888**	
Total DPM Emis Red tpy	5	90	174	259	344	**873**	
Baseline NOx in tpy	54	884	1,714	2,544	3,373	**8,568**	
Total NOx Emis Red tpy	37	613	1,188	1,969	2,750	**6,557**	
50% CD Funding				$16,200 /truck ($14.5k Cleaire $200 Chip Reflash, $1,000 Installation, $500 Incentive)			
# of Cleaire + Chip Units/year	**679**	**2,217**	**2,217**	**0**	**0**	**5,112**	
Baseline DPM in tpy	13	54	96	96	96	**355**	
Total DPM Emis Red tpy	11	46	82	82	82	**302**	
Baseline NOx in tpy	214	913	1,612	1,612	1,612	**5,963**	
Total NOx Emis Red tpy	94	399	705	705	705	**2,609**	
# of Cleaire	**0**	**844**	**0**	**0**	**0**	**844**	
Total DPM Emis Red tpy	0	7	7	7	7	**30**	
Total NOx Emis Red tpy	0	45	45	45	45	**182**	

Table 5.4: Budget Scenario 7 Alternative Fuel Replacements Details

Alt Fuel Option 1 - Purchase of New LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$22,000,000	$244,800,000	$244,800,000	$244,800,000	$244,800,000	$1,001,200,000	
	Number of total trucks/year	117	1,299	1,299	1,299	1,299	5,311	
	Baseline DPM in tpy	7.7	93.2	178.7	264.3	349.8	894	
	Total DPM Emis Red tpy	7.7	93.2	178.7	264.3	349.8	894	
	Baseline NOx in tpy	74	899	1724	2549	3373	8,619	
	Total NOx Emis Red tpy	52	721	1390	2059	2728	6,949	

Note: $2,200 admin charge is based on current Gateway Cities estimates, which includes all administrative costs associated with truck replacements, outreach efforts with truck drivers and dealers, and other associated accounting costs. This cost is expected to be less per unit in this larger program and any remaining funds in each fiscal year will be moved back into the purchase/retrofit program.

For the alternative fuel replacement trucks, the Ports and SCAQMD would initiate a demonstration or pilot project in the first fiscal year of 123 LNG trucks to evaluate and demonstrate their use as a long-term replacement of diesel trucks. The demonstration would be focused on frequent caller trucks from both fleets and owner/operators. In addition, under SPBP-HDV2, the Ports would develop alternative fuel station infrastructure in or near the Ports necessary to make sure LNG fuel is available. During the second year (FY 2007/2008) of this program, fleet-owned trucks would be primarily sought as replacement candidates with LNG. From the third year of this program forward (FY 2008/2009 and later), interested independent owner-operators of trucks will also be sought through an RFP process to replace their older trucks with LNG powered trucks. Within this group, the Ports will first target the captive trucks that travel mainly near the ports, so that they have convenient alternative fuel infrastructure available to them (as discussed in SPBP-HDV2).

Three of the significant hurdles to be overcome in implementing this path of the program are the acceptability of alternatively fueled trucks by operators in terms of drivability, maintenance, and availability of fuel. For these reasons, trucks belonging to medium to large captive fleets will be especially important, although the focus will not be restricted to just fleets. As proposed, participating fleets will be able to provide drivers of LNG trucks a replacement vehicle in the event that their LNG truck requires maintenance in order to avoid delays due to a lack of repair facilities. Another challenge facing alternative fuels is that for the same amount of funding, generally one can "buy" more reductions of DPM with conventional fuels than with the costs associated with alternative fuels and their required infrastructure. The San Pedro Bay Ports, however, are moving forward with the short-term goal of significant emission reductions from control or replacement of diesel engines while laying the foundation to transition to even cleaner engines and methods to move cargo.

There are several concepts being considered to maximize the use of "clean trucks," one being the establishment of "green truck lanes" at entrance gates that would only accept "clean trucks" meeting the measure's definitions. Over the five-year period, more lanes would be converted to green truck lanes. The "green lane" concept could be implemented using various approaches such as:

- Favor "clean trucks" (those trucks meeting the proposed standard) in a modified Pier Pass program by letting only those trucks use the green lanes
- Move all truck visits to a modified reservation program, thus controlling the number of visits by trucks not meeting the proposed standard
- Other options including a medallion program to identify clean trucks, etc.

Annual tracking of truck activity would be done through OCR records or radio frequency identification (RFID) tag records. Trucks that fall into the frequent or semi-frequent caller category would be identified and then targeted for truck replacement or installation of DPFs that also reduce NOx as well as chip re-flashing.

There are seven fundamental elements of this control measure:

1. Based on the OCR data being collected for the 2005 EI update (which is currently ongoing), the Ports will identify the oldest, highest emitting trucks that make frequent visits to their terminals. Once identified, the Ports will direct their resources toward replacing those trucks with lower emitting ones. The Ports will also identify the trucks owned by fleets and independent owner operators that visit the Ports. In addition, the Ports will evaluate the OCR data to develop clean visit frequency standards for the terminals, and negotiate the standards through lease terms.

2. The current Gateway Cities truck modernization program will be refocused (or a new program developed) to allow only the purchase of new cleaner diesel and alternative fueled trucks, as well as retrofits that meet the proposed frequent and semi-frequent standards proposed.

3. The Ports, SCAQMD, CARB, and EPA need to focus efforts to inform the public of the importance of bond funding to the emissions associated with port-related trucks and the necessity for the bond initiative to be approved by the voters.

4. The Ports will build a fueling station on or near Port property (possibly on Terminal Island) for alternative fuel trucks, and ensure that LNG/CNG repair and maintenance facilities are readily available either through fleet operators or at the refueling locations. Details of this element of the program are discussed under measure SPBP-HDV2.

5. The Ports will work with SCAQMD, CARB, EPA, and industry to evaluate and demonstrate new engine technologies for the movement of containers such as electric, hybrid, fuel cell, and other clean modes of transportation for use in the SoCAB. This effort will be part of the Technology Advancement Program (Section 5.8).

6. The overall HDV program will be reevaluated on an annual basis to ensure that both short- and long-term goals are being met or exceeded. In addition, successfully demonstrated new technologies identified through the Technology Advancement Program will be assessed for integration into the plan.

7. Develop mechanisms that maximize the use of "clean trucks" at San Pedro Bay Ports.

Implementation Plan

As stated above, the Ports will evaluate the full set of 2005 data collected as part of the 2005 emissions inventory update in order to develop applicable clean truck frequency standards for terminals.

As an incentive based measure the committed funding to the Gateway Cities program should last through mid-2006 at current program subscription rates. If the program can be adequately modified, additional incentive funding will be committed to continue subsidizing new truck purchases, with the modification being the change in focus to the proposed "clean truck" standards and to meeting the fleet turnover numbers presented in Tables 5.2 through 5.4.

For the first fiscal year, a LNG truck pilot project will be initiated that will include at least 123 trucks. Fleet owner/operators would most likely be selected to participate in the program but the pilot would not be limited to fleets only. The purpose of the pilot would be to demonstrate the viability of alternative fuel trucks servicing the ports and to identify any potential gaps in fueling infrastructure and certified maintenance facilities. To facilitate this effort, the Ports and SCAQMD are developing a RFP for release shortly after the Clean Air Action Plan is approved.

After the completion of the LNG on-road pilot project and the establishment of a LNG refueling station (at or near the San Pedro Bay Ports (SPBP-HDV2)), the Gateway Cities program will be modified (or a separate complimentary program may be initiated) to retire older existing trucks that are replaced by natural gas, or cleaner diesel trucks, or equipped with retrofits/re-flashing. It is envisioned that Gateway Cities would be used for targeting independent owner/operators and the Ports would work directly with fleets' owners/operators. It may be more advantageous and effective that the LNG program initially concentrate on captive vehicle fleet owners and those fleet owned trucks that centrally fuel their vehicles as a fueling infrastructure may pose a significant obstacle to implementation. Both Port's incentive funding would be combined with alternative fuel funding from the SCAQMD and CARB (as shown below in the Financial Costs section) to expedite the move to cleaner trucks. In addition, owners/operators would be able to take advantage of the alternative fuel tax incentives provided in the recently signed Federal Energy Bill.

Air Quality Benefits

The estimated reductions in DPM, NOx, and SOx associated with this measure are presented in Table 5.5 below.

Table 5.5: Estimated Emissions Reductions for SPBP-HDV1 by Fiscal Year

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	24	236	442	612	782	2,095
Total NOx Reduction (tpy)	192	1,833	3,428	4,922	6,417	16,792
Total SOx Reduction (tpy)	0.1	0.7	1.3	1.9	2.5	6

Detailed information for all budget scenarios evaluated is provided in Appendix A.

Financial Costs

The financial costs associated with the 12 budget scenarios evaluated assume the following general funding streams from Ports, regulatory agencies, and bond funding.

- Budget Scenarios 1 through 5:
  - ✓ Each Port would contribute at least $16 million per year (w/$1 million from each Port in the first fiscal year going to SPBP-HDV2)
  - ✓ SCAQMD's commitment to fund $12 million in the first fiscal year and then at least $6 million per year for the next four years

- Budget Scenarios 6 through 8 (detailed budget assumptions provided in Table 5.6):
  - ✓ Each Port would contribute at least $16 million per year (w/an additional $1 million from each Port in the first fiscal year going to SPBP-HDV2)
  - ✓ SCAQMD's commitment to fund $12 million in the first fiscal year and then at least $6 million per year for the next four years
  - ✓ Bond/CMAQ[9]/other funding ranging from a total $745 million to $1.7 billion starting the second fiscal year through the end of the fifth

- Budget Scenarios 9 through 11
  - ✓ Each Port would contribute at least $16 million per year (w/an additional $1 million from each Port in the first fiscal year going to SPBP-HDV2)
  - ✓ SCAQMD's commitment to fund $12 million in the first fiscal year and then at least $6 million per year for the next four years
  - ✓ Bond/CMAQ/other funding held at a total of $800 million starting the second fiscal year through the end of the fifth

- Budget Scenario 12
  - ✓ Each Port would contribute at least $16 million per year (w/an additional $1 million from each Port in the first fiscal year going to SPBP-HDV2)
  - ✓ SCAQMD's commitment to fund $12 million in the first fiscal year and then at least $6 million per year for the next four years

[9] Congestion Mitigation and Air Quality Funding (CMAQ) Improvement Program, funded and administered by the Federal Highway Administration; http://www.fhwa.dot.gov/environment/cmaqpgs/

✓ Bond/CMAQ/other funding held at a total of $2.7 billion starting the second fiscal year through the end of the fifth

The specific funding details of Budget Scenario 7 are presented in Table 5.6.

Table 5.6: Costs for SPBP-HDV1 by Port, by Path, by Fiscal Year

SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
	Clean Diesel - POLA	$8,000,000	$8,000,000	$9,000,000	$9,000,000	$9,000,000	**$43,000,000**
	Clean Diesel - POLB	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**
	Clean Diesel - Bond/Other Funding	$0	$202,600,000	$188,100,000	$152,200,000	$152,200,000	**$695,100,000**
		$22,000,000	**$218,600,000**	**$205,100,000**	**$169,200,000**	**$169,200,000**	**$784,100,000**
	HDV Incentives (Alt Fuels)						
	LNG - POLA	$8,000,000	$8,000,000	$9,000,000	$9,000,000	$9,000,000	**$43,000,000**
	LNG - POLB	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**
	LNG - Bond/Other Funding	$0	$222,800,000	$221,800,000	$221,800,000	$221,800,000	**$888,200,000**
		$22,000,000	**$244,800,000**	**$244,800,000**	**$244,800,000**	**$244,800,000**	**$1,001,200,000**
	Measure FY Totals	**$44,000,000**	**$463,400,000**	**$449,900,000**	**$414,000,000**	**$414,000,000**	**$1,785,300,000**

The numbers and types of truck replacements and retrofits were provided earlier in Table 5.2 through 5.4. Additional detailed information on the cost estimates is provided in Appendix A.

Beyond the cost of truck or retrofit incentives, additional funding will be needed for administrative costs associated with operating the program, public outreach, tracking, monitoring, and reporting. There are also costs that are not covered by the current incentive program that would be borne by participating truckers. These costs include income taxes due on the subsidy portion of the new truck's purchase price, and increased insurance rates charged for newer, more valuable trucks. These costs have posed problems in the past as they have priced some truckers out of participation. Mechanisms will be evaluated and included in the program to cover some or all of these costs for low-income truckers that would otherwise be willing to participate in the program. In addition, the Ports will explore legislative options to exempt port drayage truckers from these tax obligations.

The SCAQMD has set aside $6 million for the San Pedro Bay Ports this year to facilitate the conversion of diesel-powered trucks to the use of LNG. An additional $6 million has been set aside for emissions reductions at the Ports. These monies will be used to co-fund the program. In addition, both Ports will evaluate other grant opportunities that could be used to supplement and expand the program.

It is also important to note that substantial financial incentives for the purchase of alternatively fueled vehicles and equipment have been included in the nation's energy policy. Tax credits of up to 40% of the differential cost of alternatively fueled equipment are available to the purchaser or vendor as well as a 30-cent per gallon fuel tax credit.

Milestones

In order to implement the program's diesel path, the Ports' staff will undertake the following activities:

1. Based on the completed 2005 license plate data, Port staff will evaluate the number of unique trucks servicing both Ports, evaluate the model years of trucks versus visit frequency, and determine the number of frequent and semi-frequent caller trucks. In addition, the Ports will develop the monitoring, recording keeping, and reporting requirements that will be needed to track the measure's performance and implementation.

   Schedule: The analysis of the truck fleet and development of a clean truck visit frequency standard will occur upon completion of the 2005 data set and its review. It is expected that by December 2006, the standards, clean truck definitions, monitoring, record keeping, and reporting requirements will be developed. The Ports are investigating standards to be included in terminal lease negotiations, as lease negotiation opportunities arise.

2. Port staff will either modify the Gateway Cities program or develop a port-specific subsidy program that ensures all truck replacement and retrofit purchases meet the frequent and semi-frequent standards proposed in this measure. This would affect only new transactions; all existing transactions would be grandfathered to the original program. In addition, the cost per replacement vehicle would be evaluated to see if there is an increase in per truck cost prior to Board consideration of the Clean Air Action Plan.

   Port staff has already started discussions with the contractor managing the Gateway Cities program. First, the success rate of the current program will be evaluated against the original plan. Improvement based on the contractor's experience with the existing program will be discussed and incorporated in the modified program if deemed feasible. If the Port staff evaluation results in a recommendation to develop a new program, the RFP method will be considered to implement this measure. Details of the RFP are listed under "RFP Details" section shown below.

Schedule: If modification to current Gateway Cities program is chosen as the preferred path, the proposed changes would be incorporated into the program immediately after the Board approves this control measure. If the RFP method is chosen, the RFP will be released shortly following approval of this Action Plan by each Port's Board of Harbor Commissioners.

3. Port staff is currently developing an RFP in coordination with SCAQMD for development of a program to implement cleaner diesel trucks and the introduction of alternative fuels (LNG or CNG, i.e., the alternative fuels path) as available options to cleaner diesel trucks, which meet or are cleaner than the 2007+ EPA standard.

   RFP Details: Details to be associated with the RFP to accomplish both the cleaner diesel path and the alternative fuel path are:

   - Ports will identify and confirm the amount and various sources of funds to allow potential bidders to propose the most effective way to implement this program.
   - Based on terminal lease renewal status, the Ports will provide an estimate of the number of trucks and time frame during which trucks will be required to be replaced under lease agreements.
   - Ports will develop guidelines for the type of trucks to be replaced. Based on their emissions characteristics and operation, bidders will be asked to identify trucks based on age, operation and ownership that are good candidates for the diesel path, the alternative fuel path, or either path.
   - Bidders will be asked to propose strategies to implement the diesel and alternative fuel paths. Examples of some of the strategies are incentives, lease through fleet operators and truck purchases.
   - Bidders will be asked to outline the status of the federal tax credits available to implement the alternative fuel path and a strategy to utilize the maximum benefit of the federal tax credit such that the cost to Ports to implement this strategy is minimized.
   - Bidders will be asked to propose how they plan to contact various truck fleet operators and independent truck owners for the replacement of their trucks.
   - Bidders will be asked to demonstrate their understanding of the total cost to the truck owner, and provide a typical breakdown between incentives, tax credits, owner responsibility, etc. This is required to demonstrate a thorough understanding of the real-world financial terms for program participants.

   Schedule: RFP will be released within ___ days after Board approval of the control measure

4. Evaluate implementation options (centrally controlled independent owner/operator, independent lease-back owner, Port-owned lease-back, government bonds, etc.).

   Schedule: Evaluation will be completed within __ days after Board approval of the control measure.

5. Port staff will continue to identify other potential funding sources such as grant programs at the federal, state, and local levels, as well as market-based incentive opportunities. The findings will be included in a fact sheet that will be updated as new funding sources are identified.

   Schedule: The first fact sheet will be completed within __ days after the control measure is approved.

6. The selected bidder will update applications, program information/public outreach, presentation materials, program fact sheets and benefits, etc., to reflect changes in the Gateway Cities program from this control measure. If an entirely new program is adopted, then this new program will be the subject of this effort. In addition, the selected vendor will work with SCAQMD to incorporate their co-funding requirements, applications, etc.

   Schedule: Within __ days after Board approval of the control measure.

7. The selected bidder will begin an outreach initiative for the updated replacement and retrofit program for truck owners/operators, truck dealers, and trucking associations.

   Schedule: Start public outreach __ days after the control measure is approved by the Board.

8. The benefits of this program will be quantified and reflected in the annual updates to the Port's HDV emissions inventories.

   Schedule: Annually

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-HDV1 Performance Standards for On road Heavy-Duty Vehicles	Environmental (both Ports)	Number of trucks/retrofits purchased Participants Costs associated with the program Purchased truck activity Location of activity Number of visits to ports Replaced truck specifications AVL data Advertising/outreach mechanisms Any applicant/participant issues needing attention to improve participation in the program	Quarterly

5.1.2 Control Measure Number SPBP-HDV2

Measure Title: ***Alternative Fuel Infrastructure for Heavy-Duty Diesel Vehicles***

In support of the significant investment in SPBP-HDV1 for alternative fueled trucks, this measure provides for the development of a refueling and central maintenance facility, jointly owned by both Ports, and located on Terminal Island.

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*FY2006/2007 through FY 2007/2008 (see Table 5.7)*
Tonnage Reduced:	*Not applicable; supports reductions in SPBP-HDV1*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: **Incentives**

Measure Description

Next to the differential in purchase and maintenance costs, the decision to convert from traditionally diesel-powered trucks to a cleaner alternative like CNG or LNG hinges upon the existence of available fueling infrastructure. Engine manufacturers may limit production of natural gas powered trucks if the fueling infrastructure is not in place and energy companies may limit the establishment of CNG or LNG fueling infrastructure if sufficient demand is lacking. The objective of this measure is to alleviate some of these constraints by the Ports jointly building an alternative fuel station and centralized maintenance facility on Terminal Island. Both Ports would work together with SCAQMD and CARB to utilize the agency's expertise on alternative fuel vehicles and infrastructure requirements. To maximize the utilization of the fueling station it will be

available for public use. Site and station design, operation and fuel supply for the facility would be contracted through a RFP process.

Implementation Plan

There are three key elements associated with the implementation of this control measure:

1. Final selection of the Terminal Island location that will be co-owned by both Ports. Both Ports will share in the costs associated with the land and the building/operation of the station and maintenance facility.

2. Release RFPs for the design, construction, supply, and operation of the appropriately sized station and maintenance facility.

3. Develop and implement an outreach program to publicize operating hours, location, services provided, and other pertinent information related to the fueling station to encourage its use.

Air Quality Benefits

There are no emission reductions directly related to the performance of this control measure; however this measure is critical to the successful implementation of SPBP-HDV1, which itself results in significant emission reductions.

Financial Costs

The financial cost to both Ports is presented in Table 5.7 below.

Table 5.7: Costs for SPBP-HDV2 by Port by Fiscal Year

SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
	POLA	$1,000,000	$1,000,000	$0	$0	$0	**$2,000,000**
	POLB	$1,000,000	$1,000,000	$0	$0	$0	**$2,000,000**
	SCAQMD	tbd	tbd	$0	$0	$0	**$0**
	Bond Funding	$0	$0	$0	$0	$0	**$0**
	Measure FY Totals	**$2,000,000**	**$2,000,000**	**$0**	**$0**	**$0**	**$4,000,000**

Milestones

1. Staff will develop separate or combined specification(s) and RFP(s) for the construction of the facilities, operation/fuel supply for/of fueling station, and management/operation of the maintenance facility. The RFPs will be coordinated with each Port's Executive Director.

Schedule: Site selection would be completed within __ days after the control measure is jointly approved. The scope of the design RFP will be coordinated with each Port's Executive Director and be released for bid within __ days after the control measure is jointly approved.

2. The Ports will select the design firm from the RFP process.

   Schedule: Completed __ days after the release of the RFP.

3. The design for the fueling facility will be approved by both Ports.

   Schedule: Completed __ days after the selection of the design firm.

4. Both Ports will select the construction contractor, fuel station operator/fuel supplier, and maintenance facility manager/operator.

   Schedule: Completed within __ days after the release RFPs.

5. Port Staff will develop a fact sheet and work with their Public Relations staff and Communications departments to disseminate information to the public to encourage the use of the facility.

   Schedule: Completed within __ days after the joint approval of this measure.

6. Fueling station and maintenance facility will be completed and operational.

   Schedule: Within __ days after the joint approval of this measure.

As an alternative to the process of separate RFPs for design, construction, and operation, proposals would be sought for combinations of these functions to determine whether cost savings could be achieved through a single contractor performing two or more of these functions.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-HDV2 Alternative Fuels Infrastructure for HDVs	Environmental/ Engineering (both Ports)	Fueling station Construction contracts Fueling station supply contracts Number of fueling pumps online Fuel throughput by station Amount of infrastructure funding Amount of fuel purchased Location of central maintenance facility Contract for construction Amount of construction funding Contract for operation Amount of operational Funding Central maintenance facility online Activity of facility Fuel Supplied Number of trucks using the facility	Quarterly

5.2 Ocean-Going Vessels Control Measures

OGVs represent the second major source category where emissions reduction efforts are focused in the San Pedro Bay Ports Clean Air Action Plan. This is because of their significant contribution of emissions and their proximity and health risk impact to surrounding communities while at berth. This source category is addressed through a combination of measures that include operational controls, shore-power, cleaner fuels, and a research and development initiative to help identify and demonstrate new technologies to reduce at berth emissions. This final component will be implemented through the Technology Advancement Program.

As stated in Section 4.1, control measures SPBP-OGV1, OGV-3, and OGV-4 will be evaluated to determine solutions to various logistical issues to ensure effective measure implementation. These issues include: updating the existing radar range capabilities to 40 nautical miles (nm), working with the Marine Exchange and United States Coast Guard to resolve issues associated with vessels outside the Coast Guard's administrative area, work with the Marine Exchange to track additional fuel compliance data elements for monitoring and reporting, determine effects of changing VSR zone on areas inside California waters, but beyond 40 nm from Point Fermin, work to get work gang assignments moved to 40 nm, and to evaluate fuel availability and ship tankage issues associated with operating on cleaner fuels. The evaluations and upgrades to the radar system will be completed before the end of 2007.

5.2.1 Control Measure Number SPBP-OGV1
Measure Title: *OGV Vessel Speed Reduction (VSR)*

This measure sets an OGV Transit Standard that 100% of OGVs will comply with the VSR program 20 nm from Point Fermin and expansion to 40 nm from Point Fermin

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Throughout five year period (see Table 5.8)*
Tonnage Reduced:	*Increasing throughout five year period (see Table 5.8)*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: Lease Requirements & Tariff Reduction Incentives

Measure Description

The objective of the VSR program is to reduce NOx emissions from OGVs by slowing their speeds as they approach or depart the Port. NOx emissions are directly correlated to the engine load and, generally speaking, load and NOx emissions decrease as engine load/vessel speed decreases. A voluntary VSR program currently exists under which vessels slow to 12 knots when they are within 20nm of Point Fermin. This measure establishes a wider VSR zone with an over-water boundary of 40nm from Point Fermin.

Since its establishment in 2001, the compliance rate[10] of the VSR program program-to-date has averaged 44%. Overall compliance in 2004 was up to 50%, and the average for the first six months of 2005 was 71%. This increase can be at least partially credited to the practice of assignment of gangs at the 20-mile boundary, reducing the incentive for ships to move quickly through the speed reduction zone.

The Port of Long Beach's VSR dockage rebate/incentive program currently has increased VSR compliance rate to 78% with a short-term goal to move compliance to 90% of calls by late 2006 (100% of all calls to be compliant by mid 2007). The incentive program has committed funding through FY2006/2007 at a maximum of $2.2 million dollars. The Port of Los Angeles is evaluating a similar program.

Parallel to this strategy, lease requirements will be established and include compliance rates with the VSR program. Lease requirements will replace the incentive program.

As stated in Section 5.2 above, there are several technical and logistical issues that need to be resolved prior to the expansion of the program to 40 nm.

[10] Compliance rate is based on compliance of vessels operated by participating shipping lines, not of all vessels.

It is recommend that the radar installation improvements be conducted not only for VSR compliance but to also provide actual ship speeds through the heavily dominant northern route which will ensure accuracy in estimating emissions through the inventory process.

There are eight key elements to this control measure:

1. Work with the Marine Exchange and United States Coast Guard to resolve issues associated with vessels outside the Coast Guard's administrative area.

2. Renew and revise the MOU between the Ports of Los Angeles and Long Beach, the Marine Exchange, United States Coast Guard, and other affected parties, to procure and install hardware and software needed to track vessel speeds out to 40 nm.

3. The Ports will increase emissions reduction benefits over and above the current program by extending the VSR zone to 40nm.

4. Work to move work gang assignments out to 40 nm from Point Fermin.

5. Evaluate effects of changing VSR zone on areas inside California waters, but beyond 40 nm from Point Fermin.

6. Assure compliance with the VSR program through tariff reduction incentives and included in lease requirements for renewed lease agreements as well as encouraging the continued/increased voluntary participation of those whose leases are not up for review.

7. Conduct source testing to verify the effect of the VSR program on DPM and NOx emissions under the Technology Advancement Program.

Implementation Approach

Staff of both Ports will confer with representatives of the Marine Exchange, and U.S. Coast Guard to discuss how best to upgrade the existing radar system in order to track and report the speed of vessels in the expanded VSR zone. This cost would ultimately be shared by both San Pedro Bay Ports through an MOU with the appropriate entities.

As new leases are negotiated or existing leases come up for renewal, compliance with the VSR program will be stated condition during negotiations.

Slowing down OGV main engines may result in the reduction of pollutants other than NOx, however anecdotal information suggest that emissions of particulate matter may actually increase as a result of VSR. Testing should be performed to verify and quantify

the benefits of this programmatic approach. Testing for this purpose would be conducted under SPBP-OGV5.

Air Quality Benefits

The estimated reductions in DPM, NOx, and SOx associated with this measure are presented in the following table.

Table 5.8: Estimated Emissions Reductions for SPBP-OGV1 by Fiscal Year

	FY 2006/2007 (tpy)	FY 2007/2008 (tpy)	FY 2008/2009 (tpy)	FY 2009/2010 (tpy)	FY 2010/2011 (tpy)	Total (tons)
VSR participation (20 nm)						
DPM Reduction	0	0	0	0	0	**0**
NOx Reduction	1,721	1,721	1,721	1,721	1,721	**8,604**
SOx Reduction	0	0	0	0	0	**0**
Expanded VSR (40 nm) participation Lease Based						
DPM Reduction	0	0	0	0	0	**0**
NOx Reduction	0	786	1,571	1,571	1,571	**5,500**
SOx Reduction	0	0	0	0	0	**0**
Total SPBP-OGV1 Emission Reductions[1]						
Total DPM Reductions	**0**	**0**	**0**	**0**	**0**	**0**
Total NOx Reductions	**1,721**	**2,507**	**3,292**	**3,292**	**3,292**	**14,104**
TotalSOx Reductions	**0**	**0**	**0**	**0**	**0**	**0**

[1] Reductions are taken after ARB's adopted Auxiliary Engine regulation is implemented

Technical note on calculation of the air quality benefit

The 2001 Port-wide Baseline Air Emissions Inventory for the Port of Los Angeles calculated pre-VSR ocean-going vessels transit emissions in the fairway zone (outside of the precautionary zone) using the assumption that all ships transited at cruise or service speed as reported in the Lloyd's Register of Ships. This was a high-end assumption because not all ships transit at cruise speed. However, the only actual speed data reflecting pre-VSR conditions was a data set of vessel arrival and departure speeds for vessels visiting the Ports of Los Angeles and Long Beach in the two months immediately preceding initiation of the VSR program in May of 2001. These average pre-VSR speeds are generally lower than Lloyd's cruise or service speeds.

During the preparation of the EI, it was thought that the two-month data set might not adequately reflect pre-VSR conditions, so faster cruise or service speeds from Lloyd's were used to model transiting emissions. The use of the EI

methodology results in higher pre-VSR baseline transiting emissions in the fairway zone.

From May 2001 to present, the VSR program emission reductions are calculated assuming and incorporating the two-month data set of actual pre-VSR speeds (broken down by vessel class) to represent the pre-VSR transiting conditions. For calculation purposes, the methodology assigns the average pre-VSR speed for a vessel class to all vessels in that class. In order to calculate the emission reductions from the VSR program, the difference is calculated between the average pre-VSR baseline speed (by vessel class) and the actual speed recorded by the Marine Exchange radar.

The result is that the VSR emission reductions presented above are significantly higher than what has been reported for the VSR in the past. However, it is important to note that these elevated reductions are most likely not indicative of the actual reductions under the VSR control measure. The actual reductions are presumed to be somewhat lower than the estimates presented above but greater than the estimates reported to date under the VSR program. This issue will be further addressed and refined in the 2005 update to the inventories for both Ports. In addition, a mechanism will be developed for including the reductions achieved by vessels that reduce their speed to something greater than 12 knots, but less than the speed they would travel in unconstrained circumstances (i.e., "partial compliance").

It is also important to note that a reduction in vessel speed may necessitate an increase in auxiliary engine use due to longer transit times. This increase will be mitigated due to the requirements of CARB's auxiliary engine rule. These offsetting emissions, and the impact of CARB's regulation have been accounted for and have been reflected in the emissions benefit calculations.

Financial Costs

The projected funding costs for the measure include port incentive funding for the needed upgrades to the Marine Exchange radar system, administrative costs associated with the control measure, and the incentive funding offered by the Port of Long Beach.

Table 5.9: Costs for SPBP-OGV1 by Port by Fiscal Year

SPBP-OGV1	Vessel Speed Reduction	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
	POLA	$2,550,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000	**$11,350,000**
	POLB	$2,550,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000	**$11,350,000**
	SCAQMD	$0	$0	$0	$0	$0	**$0**
	ARB	$0	$0	$0	$0	$0	**$0**
	Measure FY Totals	**$5,100,000**	**$4,400,000**	**$4,400,000**	**$4,400,000**	**$4,400,000**	**$22,700,000**

Milestones

1. Port staff from both Ports will concurrently meet with the Marine Exchange and the US Coast Guard to draft a procurement plan for the purchase of hardware and software necessary to track vessel speeds out to 40nm from Point Fermin.

   Schedule: Within __ days after the control measure is approved.

2. Port Staff will work with the Marine Exchange and United States Coast Guard to resolve issues associated with vessels outside the Coast Guard's administrative area.

   Schedule: Within __ days after control measure is approved.

3. Renew and revise the MOU between the Ports of Los Angeles and Long Beach, the Marine Exchange, United States Coast Guard, and other affected parties, to procure and install hardware and software needed to track vessel speeds out to 40nm or the result of Element 1 above.

   Schedule: Within __ days after control measure is approved.

4. Port Staff will work with the Marine Exchange to track additional fuel compliance data elements for monitoring and reporting.

   Schedule: Within __ days after control measure is approved.

5. Move gang work assignments to 40 nm from Point Fermin.

   Schedule: Within __ days after control measure is approved.

6. Port staff from both Ports will meet and confer with the Marine Exchange, the EPA, CARB, SCAQMD and PMSA to revise and renew the VSR Memorandum of Understanding.

   Schedule: Within __ days after the control measure is approved.

7. Upon successful installation of the necessary radar upgrades, the Marine Exchange will provide monthly reports relaying vessel specific speed data. Port staff will use this information to keep their customers informed of their compliance rates.

   Schedule: To be determined.

8. Port staff will draft language for requiring participation in, and compliance with the VSR program to be included in all new or renewed leases.

   Schedule: Within ___ days after the control measure is approved.

9. Port staff will prepare a presentation and/or fact sheet outlining the air quality benefits of the VSR program and the changes to the VSR zone and new lease requirements as proposed in this measure for distribution to customers, community members and other interested parties.
   Schedule: Within ___ days after the control measure is approved.

10. The benefits of the expanded VSR program will be quantified and reflected in the periodic updates to the Port's emissions inventories and reported annually to the Executive Director and the Board of Harbor Commissioners for each Port.

    Schedule: Every year after the control measure is approved.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-OGV1 VSR	Environmental (both Ports)	Ship participation	Monthly
		Marine exchange speed data	
		Lease renewals	Ongoing

5.2.2 Control Measure Number SPBP-OGV2
Initial Measure Title: ***Reduction of At-Berth OGV Emissions***

The use of shore-power for hotelling emissions initially implemented at all major container and cruise terminals at the Port of Los Angeles within five years and all container terminals and one crude terminal at the Port of Long Beach within five to ten years. Demonstration and application of alternative emissions reduction technologies for non-shore-power ships.

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Increasing Throughout five year period (see Table 5.10- 5.14)*
Tonnage Reduced:	*Increasing throughout five year period (see Table 5.15)*
Key Milestone Dates:	*See Milestone Section*

Implementation Strategies: **Lease Requirements, Incentives, Tariff Changes, & Capital Funding**

Measure Description

This measure focuses on reducing dwelling (hotelling) emissions from OGVs while at berth. The measure focuses on two primary approaches for reducing at-berth emissions: (1) shore-power (transferring the electrical generation needs for OGVs while at berth from onboard diesel-electric generators to the cleaner shore-side power grid, which generates power through regulated/controlled stationary sources) and (2) hotelling emissions reduction requirements through alternative technologies, for ships that do not fit the shore-power model. The shore-power approach is generally best suited for vessels that make multiple calls per year, require a significant demand while at berth (function of dwelling load and time at berth), and vessels that will continue to call at the same terminal for multiple years. The most common ship types that are good candidates for shore-power are large string-service containerships, cruise ships, reefer ships, and specially designed crude tankers that have diesel-electric powered pumps. Shore-power requires extensive infrastructure improvements onboard vessels that would use the system, as well as on the terminal side for supplying the appropriate level of conditioned electrical power supply. The onboard infrastructure costs are dependant on the candidate vessel's current configuration, conduit space, and electrical panel space.

Alternative hotelling emissions reduction technologies will be applied to vessels that do not fit the shore-power model and include:

- Exhaust gas scrubbing technologies that capture vessel stack emissions while at berth and "scrubs" exhaust streams either on-shore or on a barge.
- Shore-powered dockside electrical pumps for tankers, which reduce onboard pumping loads (generally these pumps are driven by steam power).
- Developing emissions reduction technologies (such as sea water scrubbers, selective catalytic reduction, etc.).

Some of these technologies can potentially achieve the equivalent emissions reductions of shore-power while others have the potential for significant reductions (though not at the same level of shore-power) of hotelling emissions.

Both ports currently have separate and distinct programs; however, they share a common ultimate goal of moving all container berths, cruise ship operations, and other frequent visitors calling in the San Pedro Bay to shore-power, and to move other vessel types towards alternative hotelling emissions reduction technologies. The Port of Long Beach's program is referred to as shore-side power or cold ironing, while the Port of Los Angeles' program for shore-power is called Alternative Maritime Power (AMP™). With regard to shore-power, the ports are in significantly different positions from an infrastructure standpoint. Generally, the Port of Los Angeles has the main electrical trunk lines in place from which to "step-down" and condition power for ships. The Port of Long Beach, on the other hand, needs to bring trunk lines down from Interstate 405 into the Port to

supply the appropriate power, which will require significant infrastructure improvements and thus delay implementation timelines compared with the Port of Los Angeles.

Finally, the Port of Los Angeles will be focusing on developing shore-power infrastructure for all cruise berths and requiring its use by all visiting cruise ships. The cruise operations at the Port of Long Beach are managed and leased by another department at the City of Long Beach and therefore not directly under the control of the Port. The Port is currently looking at mechanisms to require shore-power for cruise ships.

Implementation Plan

The implementation of this measure consists of the two paths: use of shore-power and alternative hotelling emissions reduction technologies for non-shore-power candidate vessels/terminals. The Ports will consider the effectiveness of tariff changes with respect to accelerating the installation of needed infrastructure. Shore-power implementation will be different for each port due to the existing infrastructure differences cited above. Lease requirements will state that shore power infrastructure will be used.

Port of Los Angeles AMP™ Implementation

Over the next five years the Port of Los Angeles will conduct a massive infrastructure improvement program to equip a number of berths at container and cruise terminals with AMP™ infrastructure. The proposed scenario focuses terminal infrastructure improvements based on upcoming lease negotiations or EIR dates and will be implemented primarily by lease requirements to use AMP once the infrastructure is in place and operational. The schedules presented within the measure are preliminary schedules developed with the Port's Engineering Department and are based on a series of assumptions of when projects will be cleared through the CEQA process.

The Port of Los Angeles has eight major container terminals and one cruise terminal (with three berths that can accommodate two large cruise ships). Over the next five years, the Port of Los Angeles will conduct a massive infrastructure improvement program to make AMP™ available at a number of berths at container, selected liquid bulk terminals, cruise terminals, and dredge plug-in locations. The following draft table presents the berths at the Port of Los Angeles that are currently planned to be improved and operational by the end of the fifth year of the Clean Air Action Plan. The following table presents the berths at the Port of Los Angeles that will be improved and operational by the end of the fifth year of the Clean Air Action Plan.

Table 5.10: POLA AMP™ Infrastructure by Berth Over Next Five Fiscal Years

Site	Number of Berths	Date Operational
B90-93 (Cruise Terminal)	2 Berths (2 Vessels)	Jan 2008
B100-102 (CS)	1 Completed, 1 To Go	Jan 2009
B121-131 (WBCT)	2 Berths	Jul 2010
B136-147 (TraPac)	2 Berths	Jul 2009
B175-181(Pasha)	1 Berth	Jan 2011
B206-209 (LTT)	1 Berth	Jan 2011
B212-218 (YTI)	1 Berth	Dec 2006
B224-236 (Evergreen)	1 Berth	Jan 2008
Pier 300 (APL)	1 Berth	Jan 2011
Pier 400 (APM)	1 Berth	Jan 2011
Pier 400 (Liquid Bulk)	1 Berth	Jan 2009
Total AMP'd Berths	**15 Berths**	

Note: LTT – Long Term Tenant

A preliminary aggressive lease requirement-based rollout scenario was developed in conjunction with POLA Engineering for the AMP™ program. Under this scenario, the POLA would have AMP™ capabilities at 15 berths (2 cruise and 13 container) for a cost of $44 million. The resulting scenario would translate into the following number of AMP™ ship calls presented in Table 5.11 and detailed assumptions are presented in Appendix A.

Table 5.11: POLA Estimated AMP'd Ship Calls by Fiscal Year

Site	FY2006/07	FY2007/08	FY2008/09	FY2009/10	FY2010/11
B90-93 (Cruise Terminal)	0	0	100	200	200
Pier 300 (APL)	0	0	0	0	72
Pier 400 (APM)	0	0	0	0	10
B224-236 (Evergreen)	0	0	11	36	52
B212-218 (YTI)	4	11	0	36	52
B206-209	0	0	0	0	0
B175-181(Pasha)	0	0	0	0	0
B136-147 (TraPac)	0	0	0	40	106
B121-131 (WBCT)	0	0	0	0	36
B100-102 (CS)	54	54	54	92	131
Pier 400 (Liquid Bulk)	0	0	0	6	12
B195-199	0	0	0	0	0
TOTAL	**58**	**65**	**165**	**410**	**671**

One container terminal, China Shipping, is currently AMP™ equipped, an agreement has been reached with the Yusen Terminal operators to install AMP™ infrastructure, and design of AMP™ infrastructure improvements for Berths 206-209 are already underway. In addition, focused incentive funding of $810,000 for each participant's first vessel converted to AMP™ will be made available to the cruise lines Norwegian Cruise Lines, Princess, Royal Caribbean Cruise Lines, and to the container terminals American Presidents Line (APL), Maersk, Evergreen, and Nippon Yusen Kaisha (NYK). It is important to note that state and local air quality officials may be considering regulations making the use of AMP™ mandatory in the SoCAB. Upon adoption of such a regulation, the ports would terminate any future incentive programs and ensure that Port policies do not conflict with air quality regulations.

This aggressive rollout of AMP™ will require significant terminal infrastructure improvements for both container and cruise terminals. These improvements include the design of the terminal improvements, power step-down and conditioning equipment, terminal trenching, proper ship grounding designs, engineering plans and specifications, bid packages, contracting, etc. The extremely aggressive AMP™ rollout program presented above is based on the following key assumptions/limitations:

- All EIRs remain on schedule.
- Customer vessels will be ready to use AMP™ shortly after berth infrastructure is completed and operational.
- With the exception of Evergreen, no other temporary AMP™ installations will be constructed. Evergreen is the exception because they already have AMP™ capable vessels.
- Berth 206-209 AMP™ calls will be determined upon lease negations.
- Engineering can complete AMP™ installations as assumed in the schedule.
- Weekly service calling at each berth using AMP™.
- There will be enough AMP equipped vessels to reach 50% of all vessel calls at vessel calls at a AMP™-ready berth.
- By the third year, will be enough APM equipped vessels to reach 70% of all vessel calls at an AMP™-ready berth.
- Initially 40% then 80% of all Princess Cruise Line calls will be AMP™-ready.

Additional assumptions are provided in Appendix A.

Port of Long Beach Shore-Power Implementation

Over the next five years, the Port of Long Beach currently plans to have crude oil Berth T121 and six container berths operational with shore-power. In addition, the Port will be undergoing a massive electrical infrastructure improvement

program to bring main trunk lines down from Interstate 405, and complete infrastructure improvements for the remaining container terminals, electric dredge plug-ins, and additional infrastructure for electrification of certain types of yard equipment. The following table presents the berths at the Port of Long Beach that will be improved and operational by the end of the fifth year. Again the POLB is limited by the lack of sufficient power infrastructure and therefore these analyses need to be completed prior to negotiation with Edison.

Background: The Port of Long Beach Harbor Commission adopted a Green Port Policy in January 2005 that will guide all port operations and future development to achieve significant air quality improvements. Key elements of the Green Port Policy that are being enacted over time are the Port's commitment to implement shore-power; the encouragement of terminal operators to electrify yard equipment; and the conversion to electric dredging for all Port deepening projects. To undertake the large-scale improvements to the electrical system required to support these goals, the Port established an Electrical Infrastructure Program with primary responsibility to manage the strategic planning, development and improvement of the Port's electrical infrastructure. In addition to air quality improvements, the Program also has a goal to reduce the cost of electrical power for Port tenants as an incentive to further air quality improvements by simplifying the existing electrical distribution system and by upgrading the source voltage.

Priorities: Manage the strategic planning, development, and improvement of the Port's electrical infrastructure.

Goals:

- Satisfy future electrical demand due to cold ironing, yard electrification and terminal development.
- Preserve competitiveness.
- Position the Port to take advantage of future electrical service opportunities.

The following tables present the berths that are expected to be improved and operational with shore-power and the expected number of calls.

Table 5.12: POLB Shore-Power Infrastructure by Berth Over Next Five Fiscal Years

Site	Number of Berths	Date Operational
Pier C (Matson)	1 Berth	Jan 2011
Piers D, E, F (Middle Harbor)	1 Berth	Sept 2011
Pier G (ITS)	2 Berths	Jan 2011
Pier S	2 Berths	Sept 2011
Pier T, berth T121 (BP)	1 Berth	4th qtr 2007
Total Shore Power Berths	**7 Berths**	

Table 5.13: POLB Estimated Shore-Powered Ship Calls by Fiscal Year

Site	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
Pier G (ITS K-Line - Two berths)	0	0	0	0	100
Pier C (Matson - One berth)	0	0	0	0	52
Piers D, E, F (Middle Harbor)	0	0	0	0	17
Pier S (Two berths)	0	0	0	0	33
Total container calls	**0**	**0**	**0**	**0**	**202**

The Port of Long Beach has committed to providing cold-ironing infrastructure at all container and one crude oil terminal within the next five to ten years. However, the Port does not anticipate the opportunity, through facility redevelopment or master lease renewal, in the next five years to incorporate cold-ironing infrastructure at the facilities identified below, including Pier H where the City of Long Beach serves as the landlord. The Port is committed to expeditiously work with the leaseholders and City of Long Beach, and if necessary take other actions, to install cold-ironing infrastructure as soon as possible. The potential additional locations are listed below.

Table 5.14: POLB Potential Additional Shore-Power Berths

Site	Number of Berths	Date Operational
Pier A	1 Berth	2011
Pier H (Carnival)	1 Berth	2011
Pier J	1 Berth	2011
Navy Mole (Sea-Launch)	2 Berths	2011
Pier T (TTI)	1 Berth	2011
Total Shore Power Berths	**6 Berths**	

Port of Long Beach Program Elements

1. *Electrical Master Plan*

- Scope of Work
  - ✓ Evaluation of the Port's current and future electrical needs
  - ✓ Evaluation and catalogue of alternative power sources and/or pricing structures
  - ✓ Identification of possible regulatory rules that could enhance Green Port Policy goals
  - ✓ Evaluation of electrical facility ownership, transmission and distribution options
- Schedule and Cost
  - ✓ The final report is scheduled to be released in August 2006.
  - ✓ The total cost for management, preparation, and review of the electrical master plan is approximately $900,000.

2. *Cold Ironing Program Preparation*

- Electrical Infrastructure EIR
  - ✓ Preparation of Port wide cold ironing infrastructure document covering electrical system enhancements required to upgrade electrical systems and install necessary infrastructure to provide power to cold ironing systems at all cargo terminal berths. Planning and data gathering for the future environmental document is currently underway.
- Sizing of Cold Ironing System
  - ✓ Standardization of infrastructure design is underway and addresses container, liquid bulk and break-bulk facility needs.

3. *Electrical Infrastructure Improvement Projects – Status and Schedule*

- Dredge Connection Point to serve west portion of Harbor District
  - ✓ The Green Port Policy requires dredge equipment to be electrically powered when working in the harbor district. To accomplish this, an electrical power source to support electrification of hydraulic dredge equipment is required (clamshell dredge equipment has a lower voltage requirement and does not require a stand-alone connection point). Construction of a 15MVA connection point for dredge equipment will be built at Pier T. The work is anticipated to be complete in mid 2007.
- Pier T Berth T121 Liquid Bulk Terminal
  - ✓ The Port of Long Beach is providing cold ironing infrastructure at the BP West Coast Products terminal, Berth T121. Shipside improvements will be carried out by BP.
  - ✓ Construction of the offshore structural improvements will begin in late May 2006 and completion of the onshore electrical work is forecasted in July 2007. The estimated cost for the infrastructure improvements being undertaken by the Port of Long Beach is $13.5 million. The tenant's

vessel retrofit program will be complete by mid 2007 when it is anticipated cold ironing of BP vessels at Berth T121 will begin.

- Pier C Container Terminal
  - ✓ A recently approved lease amendment for the SSA Terminals at Pier C requires cold ironing of the two container ship berths. The Port will be responsible for improvement of the terminal electrical capacity and infrastructure, the shipping line responsible for retrofit of the vessel fleet. Environmental documentation to support necessary infrastructure improvements will be required. It is anticipated cold ironing at Pier C could begin in 2011.
- Pier G Container Terminal
  - ✓ A recently approved lease amendment for the (International Transportation Service (ITS) container terminal at Pier G requires cold ironing of the container ship berths. The Port will construct a new ship berth and retrofit an existing berth for cold ironing; certified environmental documents have been received for this work. Construction will take place in phases and will include upgrade of the terminal's electrical capacity to accommodate cold ironing. Certain construction elements could be underway by early 2007 with cold ironing of vessels at two Pier G berths anticipated to begin in 2009.
- Pier E Middle Harbor
  - ✓ Preparation of the environmental documents is currently underway for the Pier E and Pier F Middle Harbor development program. Once documents are approved and the phased construction is complete the new container terminal complex will accommodate cold ironing at five ship berths. Depending on the timing for approval of the environmental documents and receipt of develop permits, it is anticipated that one cold-ironed berth will be complete in 2011. As new berths are constructed at the terminal, they will be equipped with cold ironing infrastructure. Berth construction is expected to be completed by 2018, at which time all berths will be equipped for cold ironing.
- Pier S Container Terminal
  - ✓ Preparation of the environmental documents will begin soon for the Pier S container terminal. Once documents are approved and the phased construction is complete the new container terminal complex will accommodate cold ironing at three container vessel berths. Depending on the timing for approval of the environmental documents and receipt of develop permits, the terminal accommodates cold ironing at three berths beginning in 2011.
- Terminals where Cold ironing will be Provided
  - ✓ Pier A Container Terminal
  - ✓ Pier J Container Terminal

- ✓ Pier T Container Terminal
- ✓ Sea Launch on the Navy Mole
- ✓ City of Long Beach Cruise Terminal

Alternative Hotelling Emissions Reduction Technologies Implementation

This path focuses on alternative emissions reduction technology strategies for hotelling emissions from vessels that are not good candidates for shore-power. Currently there are no verified emissions reductions technologies for direct use on ship auxiliary emissions other than shore-power. The proposed joint Technology Advancement Program will be responsible for identification and demonstration of potential applicable emissions reduction technologies that could be implemented under this portion of the measure.

Even though there are no directly applicable verified emissions reduction technologies, there are measures that can be implemented to reduce the loads required during dwelling for some ships, such as traditional bulk liquid tankers. One such option is the use of shore side electrical pumps for discharging the vessel. These shore-side pumps can assist in reducing the load required by the ship's steam driven pumps such that they are only required to run at a load that moves the liquid over the "rail" or side of the ship, the rest of the liquid pipeline transport is powered by electrically powered on-shore pumps.

In addition, the Port of Long Beach is conducting a demonstration project to evaluate a exhaust stack scrubbing technology that could potentially have similar emissions reductions as shore-power.

Air Quality Benefits

The estimated reductions in DPM, NOx, and SOx associated with this measure are presented in the following table.

Table 5.15: Estimated Shore-power Emissions Reductions for SPBP-OGV2 by Fiscal Year

	FY 2006/2007 (tpy)	FY 2007/2008 (tpy)	FY 2008/2009 (tpy)	FY 2009/2010 (tpy)	FY 2010/2011 (tpy)	Total (tons)
Total # of container calls affected	**58**	**54**	**76**	**204**	**811**	**1,203**
DPM Reduction	3	2	3	8	30	45
NOx Reduction	92	84	118	318	1,251	1,863
SOx Reduction	43	36	51	136	568	834
Total # of cruise ships calls affected	**0**	**0**	**100**	**200**	**200**	**500**
DPM Reduction	0	0	2	3	3	8
NOx Reduction	0	0	91	181	181	453
SOx Reduction	0	0	25	50	50	126
Total # of liquid bulk ships calls affected	**3**	**12**	**12**	**18**	**24**	**69**
DPM Reduction	0	1	1	1	1	3
NOx Reduction	5	18	18	28	37	106
SOx Reduction	3	9	9	14	18	53
Total SPBP-OGV2 Reduction						
TOTAL Measure DPM Reductions	3	3	5	12	34	56
TOTAL Measure NOx Reductions	96	102	227	527	1,470	2,423
TOTAL Measure SOx Reductions	46	45	85	200	636	1,012

At this time, emissions associated with alternative hotelling emissions reduction technologies cannot be estimated and will be updated after successful demonstration of such technologies.

Financial Costs

The financial costs associated with this measure are presented below for each port for the shore-power path only. The initial costs associated with the targeted dwelling emissions reduction requirements are included in the Technology Advancement Program (presented later in this section). The costs presented in this section represent the costs to each port for the implementation of this measure.

Port of Los Angeles AMP™ Costs

The costs associated with the AMP™ program are:

- Capital costs associated with terminal infrastructure improvements.
- Incentive costs for shipboard AMP™ retrofits. These incentives would be paid back incrementally until a total power usage through AMP™ reaches 6.4 million kW-hrs for cruise ships and 3.5 million kW-hrs for container ships. This is a one-time requirement for reimbursement and the usage can be from any AMP™ equipped ship calling the berth.
- Limited incentives for fuel cost neutrality at China Shipping (part of the China Shipping settlement) and NYK, which has a one-year agreement for the retrofitted vessel.

China Shipping settlement funds are already established and set-aside and therefore are not included in the summary table below as these costs will not impact the upcoming FY budgets.

Port of Long Beach Shore-Power Order of Magnitude Costs

The costs associated with the shore-power program are:

- Capital costs associated with the terminal infrastructure improvements at T121.
- Engineering planning/evaluation of bringing required trunk lines down to the terminals.
- Permitting and construction management.
- Coordination with the Port's electrical service provider.

The following table presents order of magnitude estimated costs to provide electrical infrastructure and service capacity enhancements to accommodate use of electric powered dredge equipment within the harbor district and cold ironing up to14 berths by the end of 2011.

Table 5.16: Port of Long Beach Electrical Infrastructure Order of Magnitude Estimated Costs

Terminal	Number of Berths New Build/Retrofit	Service Upgrade	Conduit Length (ft)	No of Outlets	Transformer & Switch Gear	Order of Magnitude Cost
	Unit Costs	$2,500,000	$400	$500,000	$900,000	
Berth T121, BP	One Berth Retrofit	-	-	-	-	$13,500,000
Pier C	Two Berths Retrofit	1	5,000	10	1	$10,400,000
Pier G	One Berth - New Build One Berth - Retrofit	0	15,000	10	2	$12,800,000
Pier E	One Berth New Build	0	5,000	5	1	$5,400,000
Pier S	Three Berths New Build	0	12,000	15	3	$15,000,000
Over the Next Five Years the Port Will Work with Tenants (the City for Cruise Terminal) to Encourage Early Implementation of Cold Ironing a						
Pier A	One Berth Retrofit	1	10,000	5	1	$9,900,000
Pier J	One Berth Retrofit	1	10,000	5	1	$9,900,000
Pier T	One Berth Retrofit	0	5,000	5	1	$5,400,000
Sea Launch	Two Berths Retrofit	0.5	2,500	2	2	$5,150,000
Cruise Terminal	One Berth Retrofit	1	5,000	2	1	$6,400,000
					Subtotal	**$93,850,000**
					Hinson Line Extension (Service Capacity Enhancement)	$15,000,000
					Total Order of Magnitude Estimated Costs - Initial Berths	**$108,850,000**

Total Combined Costs for Shore-Power

The total cost of the measure, by Port, is presented in the following table. It should be noted that the AMP™ infrastructure costs shown in the table will largely be recovered over time by the lease terms.

Table 5.17: Costs for SPBP-OGV2 by Port by Fiscal Year

SPBP-OGV2	POLA AMP Costs	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
	AMP™ Infrastructure	$5,500,000	$16,000,000	$12,500,000	$6,000,000	$4,000,000	**$44,000,000**
	Shipboard AMP Incentives	$810,000	$4,050,000	$0	$0	$0	**$4,860,000**
	Cost Neutrality Incentives	$226,800	$0	$0	$0	$0	**$226,800**
		$6,536,800	**$20,050,000**	**$12,500,000**	**$6,000,000**	**$4,000,000**	**$49,086,800**
	POLB Cold-Ironing Costs						
	BP T121 Infrastructure	$13,500,000	$0	$0	$0	$0	**$13,500,000**
	Line Extention & Container Berths	$0	$15,000,000	$14,600,000	$14,500,000	$14,500,000	**$58,600,000**
		$13,500,000	**$15,000,000**	**$14,600,000**	**$14,500,000**	**$14,500,000**	**$72,100,000**
	Measure FY Totals	**$20,036,800**	**$35,050,000**	**$27,100,000**	**$20,500,000**	**$18,500,000**	**$121,186,800**

Milestones

1. As leases are opened through the EIR process or for renegotiation, or as new leases are negotiated, the Ports will include provisions for use of shore-power infrastructure.

   Schedule: As lease are opened.

2. Shore-side infrastructure in place and operational as presented above.

   Schedule: As shown above.

3. The benefits of this program will be quantified and reflected in the periodic updates to the Port's emissions inventories.

   Schedule: Annually after the control measure is approved.

4. Port of Long Beach will work with SCAQMD and ARB to help them better understand the steps and challenges associated with cold ironing.

   Schedule: As shown above.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
CAP-OGV2 AMP	Environmental/ Engineering (both Ports)	Number of terminals w/shore-power Terminal infrastructure funding Number of berths w/shore-power Number of ships retrofitted Number of shore-power calls/berth Ship retrofit funding Number of retrofitted ship calls Energy consumption per visit Cost of energy consumed Ship power load per visit Hours per visit Hours shore-powered per visit Auxiliary engine specifications Auxiliary engine fuel consumption rate	Monthly

5.2.3 Control Measure Number SPBP-OGV3

Measure Title: ***OGV Auxiliary Engine Fuel Standards***

Auxiliary engine fuel standard of 0.2% sulfur distillate/MGO or equivalent reduction.

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Increasing throughout five year period (see Table 5.18)*
Tonnage Reduced:	*Varies throughout five year period (see Table 5.18)*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: Lease Requirements & Tariff Changes

Measure Description

This measure is designed to require the use of lower sulfur distillate fuels in the auxiliary engines of OGVs within 20 nm of Point Fermin and while at berth. Many of the OGVs that currently frequent the Port burn heavy fuel oil (HFO), (most commonly Intermediate Fuel Oil (IFO) 380), that has a sulfur content ranging from 1.0 to 4.5%. A substantial reduction in DPM can be achieved if these vessels were instead required to use distillate fuels that have a sulfur content of 0.2% S or less. The Ports are focusing this measure and SPBP-OGV4 (Main Engine Fuel Standards) to target fuel quality with the goal of synchronizing both the auxiliary and main engine fuels. In SPBP-OGV4, main engine fuel is targeted at distillate fuels of 0.2% sulfur or less, which is consistent with the

recent public announcement by Maersk Line[11]. The Ports believe that synchronizing the auxiliary and main engine fuel standards will reduce tankage, logistical, and operational hurtles for the carriers. Over the next two years the Ports will review the standards set in both of these measures to determine when to move to a common fuel standard of 0.1%, based upon an assessment of fuel availability.

The CARB's auxiliary engine regulation adopted in December of 2005 requires any OGV operating an OGV within 24 nm of the California coastline to utilize MGO or MDO with a sulfur content no greater than 0.5% in their auxiliary engines beginning January 1 2007, or use alternative emission control systems that result in equivalent emissions reductions to the use of the lower sulfur fuel. Beginning January 1, 2010, owners and operators of OGVs will be required by the State to use MGO with a sulfur content no greater than 0.1% in their auxiliary engines, or use equally effective alternative emission control systems.

This measure in combination with SPBP-OGV4 goes beyond the CARB regulation for 2006 through 2010, by requiring 0.2% S MGO instead of requiring 0.5% S MDO or MGO. It targets OGV auxiliary engine emissions for vessels bound for, or exiting, the Ports. However, in 2010, the CARB regulation requires 0.1% S fuels.

The benefits of this measure and SPBP-OGV2 are overlapping with the CARB rules in that they, at least in part, seek to reduce emissions from the same source. It is also important to note that while the CARB auxiliary engine rule waives the low sulfur fuel requirement for vessels utilizing shore-power during hotelling, if included as a Port lease requirement, the use of the lower sulfur fuel would still be required even for shore-powered vessels. The potential impact of this provision in CARB's rule has not been reflected in the emission reduction estimates.

The fundamental elements of this control measure are:

1. The Port will undergo updated assessment to assure adequate availability of low sulfur distillate fuels necessary for compliance with this measure.[12]

2. The Port will secure benefits over and above CARB's program by requiring the accelerated introduction of 0.2% sulfur distillate fuel use in auxiliary engines between 2006 and 2010.

3. Compliance monitoring, record keeping, and reporting.

[11] "Maersk Line announces fuel switch for vessels calling California," Press Release, Mary Ann Kotlarich, Maersk Inc., May 26, 2006

[12] Update: Starcrest Consulting Group, LLC, *Evaluation of Low Sulfur Marine Fuel Availability – Pacific Rim*, July 2005. Prepared for the Port of Los Angeles.

Implementation Plan

This measure would be implemented through lease requirements, tariff changes, or CEQA mitigation. The standard would be initially applicable for transits (out to 20 nm from Point Fermin) and during hotelling. The Ports will evaluate the potential effectiveness of a tariff to expedite emissions benefits from this measure.

It should be noted that the NNI report assumes that the change to cleaner fuels would be on a broad-based deep penetration assumption with no details on how that would actually be implemented. This assumption is significantly different than the implementable lease-based approach assumed in the Clean Air Action Plan.

As stated above in Section 5.2, there are several technical issues associated with this measure that will be worked out by the end of 2007.

Air Quality Benefits

The estimated reductions in DPM, NOx, and SOx associated with this measure are presented in the following table.

Table 5.18: Estimated Emissions Reductions for SPBP-OGV3 by Fiscal Year

	FY 2006/2007 (tpy)	FY 2007/2008 (tpy)	FY 2008/2009 (tpy)	FY 2009/2010 (tpy)	FY 2010/2011 (tpy)	Total (tons)
Lease Based Implementation Schedule						
[1]Total SPBP-OGV3 Reduction						
0.2% MGO fuel needed, metric tons	2,662	7,466	11,355	13,071	13,871	48,426
DPM Reduction	**1**	**4**	**7**	**6**	**4**	**21**
NOx Reduction	**0**	**5**	**15**	**16**	**17**	**53**
SOx Reduction	**116**	**138**	**214**	**133**	**29**	**630**

[1] Reductions are taken after ARB's adopted Auxiliary Engine regulation is implemented

Note: This measure will be superseded by CARB regulation beginning FY 2009/2010. Although the emission reductions will persist, these benefits will no longer be attributable to this measure and accounted for as Regulatory Reductions. The emission reductions shown in the table were estimated assuming a reduction from MGO with a sulfur content of <0.5% to a 0.1% sulfur distillate. The figures in the table also include the impact of the CARB measure.

Financial Costs

There are no identified port-related costs associated with the measure as stated above.

Milestones

1. Port staff will meet and confer with fuel suppliers to make them aware of the requirements of this measure and discuss the possibility of harmonizing with the European Union's in-port auxiliary fuel regulations. This would set the fuel sulfur content at 0.1%. Port staff and fuel suppliers will also derive an estimate of fuel demand to ensure the availability of adequate quantities of 0.1% and 0.2% MDO/MGO necessary to supply those vessels visiting the Ports of Los Angeles and Long Beach.

   Schedule: __ days after the control measure is approved.

2. Port staff will draft language to be included in all new and renewed leases outlining the requirements of this measure.

   Schedule: __ days after the control measure is approved.

3. Complete evaluation of moving measure boundary to 40 nm as stated above in Section 5.2.

   Schedule: __ days after the control measure is approved.

4. Port staff will develop a system whereby customers and fuel suppliers periodically provide bunker information that will be used to track compliance with the program.

   Schedule: __ days after the control measure is approved.

5. Port staff will prepare a presentation and/or fact sheet outlining the air quality benefits of the program and new lease requirements as proposed in this measure for distribution to customers, community members and other interested parties.

   Schedule: __ days after the control measure is approved.

6. The benefits of this program will be quantified and reflected in the periodic updates to the Port's emissions inventories.

   Schedule: Annually after the control measure is approved.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-OGV3 Auxiliary Fuel Improvement	Environmental Staff (both Ports)	Participants Number of ships using IFO Sulfur content of IFO fuels IFO bunker purchase locations Quantity of IFO consumed Number of ships using MDO Sulfur content of MDO Fuels MDO bunker purchase locations Quantity of MDO burned Quantity of MDO incentivise Programmatic funding for MDO Number of ships using MGO Sulfur content of MGO MGO bunker purchase locations Quantity of MGO burned Quantity of MGO incentivised Programmatic funding for MGO Ship fueling configurations Number of ships mono fueled Number of ships dual-fueled Number of ships switching fuels Number of ships w/shaft gen. Number of fuel Samples taken Meetings w/shipping lines Meetings w/engine manufacturers	Quarterly

5.2.4 Control Measure Number SPBP-OGV4
Measure Title: *OGV Main Engine Fuel Standards*

Main engine fuel standard of <0.2% MGO during arrival and departures at San Pedro Bay Ports.

Initiation Year: *FY2006/2007*
Implementation Schedule: *Increasing throughout five year period (see Table 5.19)*
Tonnage Reduced: *Increasing throughout five year period (see Table 5.19)*
Key Milestone Dates: *See Milestone Section*

Initial Implementation Strategies: **Lease Requirements & Tariff Changes**

Measure Description

This program is designed to promote, encourage, and require the use of lower sulfur fuels in the main propulsion engines of OGVs within 20 nm of Point Fermin through 2007 and extended to 40 nm from Point Fermin when technical/logistical issues have been resolved (by end of 2007); as opposed to the current practice of using fuels that have substantially higher sulfur content. Significant reductions in emissions of NOx, SOx, and DPM can be achieved through the consumption of these "cleaner" fuels. Maersk Line recently announced that it would be operating main engines into and out of the Port of Los Angeles using 0.2% sulfur fuels.

Similar to the auxiliary engine fuel improvement program (SPBP-OGV3) this measure will target the emissions from the main engines all vessels bound for or exiting San Pedro Bay Ports while operating within the VSR zone. During approach or departure, these vessels would be required to switch from the use of IFO to lighter/lower sulfur MGO fuels with 0.2% or less sulfur content.

These are the fundamental elements of the program:

1. The availability of adequate quantities of 0.2% sulfur distillate fuels necessary for compliance with this measure will be assessed by both Port staffs.

2. The Port will secure benefits by requiring the accelerated use of <0.2% S MGO fuel use in main engines over the next five fiscal years. This standard will be re-evaluated during the next five years to determine if fuels with further reductions in sulfur content are sufficiently available.

3. Compliance with the program will be assured through tariff changes, lease requirements included in new or amended lease agreements, and incentives to shipping lines.

As stated above in Section 5.2, there are several technical issues associated with this measure that will be worked out by the end of 2007.

Implementation Plan

As proposed, this measure would be initially implemented through lease requirements. Other implementation strategies will be evaluated to accelerate usage across all shipping lines. This will be critical as the cleaner MGO fuels cost significantly more than the heavier/dirtier IFOs, which could place carriers at a significant cost disadvantage. The Ports will complete the implementation evaluation before January 2007. The Ports will consider the effectiveness of tariff changes with respect to accelerating the installation of needed infrastructure.

It should be noted that the NNI report assumes that the change to cleaner fuels would be on a broad-based deep penetration assumption with no details on how that would actually be implemented. This assumption is significantly different than the implementable lease-based approach assumed in the Clean Air Action Plan.

Air Quality Benefits

The estimated reductions in DPM, NOx, and SOx associated with this measure are presented in the following table. Technical assumptions and details are provided in Appendix A.

Table 5.19: Estimated Emissions Reductions for SPBP-OGV4 by Fiscal Year

	2006/2007 (tpy)	2007/2008 (tpy)	2008/2009 (tpy)	2009/2010 (tpy)	2010/2011 (tpy)	Total (tons)
[1]Total SPBP-OGV4 Reduction						
TOTAL Measure DPM Reductions	36	133	257	284	295	1,004
TOTAL Measure NOx Reductions	44	168	328	364	379	1,283
TOTAL Measure SOx Reductions	236	903	1,768	1,970	2,056	6,934

[1] Reductions are taken after ARB's adopted Auxiliary Engine regulation is implemented

Financial Costs

With the decision not to subsidize the higher-cost, lower-S fuels, the cost to the ports for this measure is limited to the costs associated with verifying and administering the requirements.

Milestones

1. Port staff will meet and confer with fuel suppliers to make them aware of the requirements of this measure and ensure the availability of adequate quantities of 0.1% and 0.2% S MDO/MGO fuel necessary to supply those vessels visiting San Pedro Bay Ports.

   Schedule: Within __ days after the control measure is approved.

2. Port staff will meet and confer with the Pacific Rim Partnership in an effort to harmonize fueling requirements among the various ports.

   Schedule: Within __ days after the control measure is approved.

3. Complete evaluation of moving measure boundary to 40 nm as stated above in Section 5.2.

   Schedule: __ days after the control measure is approved.

4. Port staff will draft language to be included in all new and renewed leases outlining the requirements of this measure.

   Schedule: Within __ days after the control measure is approved.

5. Port staff will develop a system whereby customers and fuel suppliers periodically provide bunker information that will be used to track compliance with the program.

   Schedule: Within __ days after the control measure is approved.

6. Port staff will prepare a presentation and/or fact sheet outlining the air quality benefits of the program and new lease requirements along with incentives as proposed in this measure for distribution to customers, community members and other interested parties.

   Schedule: Within __ days after the control measure is approved.

7. The benefits of this program will be quantified and reflected in the periodic updates to the Ports' emissions inventories.

   Schedule: Annually after the control measure is approved.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
CAP-OGV4 Main Engine Fuel Improvement	Environmental (Both Ports)	Number of ships using IFO Sulfur content of IFO fuels IFO bunker purchase locations Quantity of IFO consumed Number of ships using MGO Sulfur content of MGO MGO Bunker purchase locations Quantity of MGO burned Quantity of MGO incentivised Programmatic funding for MGO Ship fueling configurations Number of ships mono fueled Number of ships dual-fueled Number of ships switching fuels Engine manufacturer & model Number of fuel Samples taken Meetings w/shipping lines	Quarterly

5.2.5 Control Measure Number SPBP-OGV5
Measure Title: *OGV Main & Auxiliary Engine Emissions Improvements*

This measure provides for main and auxiliary engine emissions reductions that are validated through the Technology Advancement Program. The goal of this measure is to reduce DPM, NOx, and SOx emissions by 90%. The first engine emissions reduction technology for this measure will be the use of MAN B&W slide valves for main engines.

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Increasing throughout five year period (see Table 5.20)*
Tonnage Reduced:	*Increasing throughout five year period (see Table 5.20)*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: Technology Advancement Program, Lease Requirements, Tariff Changes, & Incentives

Measure Description

This measure focuses on reducing DPM, NOx, and SOx emissions from main engines and auxiliary engines. OGV engine standards have not kept pace with other engine standards such as HDVs and CHE. IMO's MARPOL Annex VI is a very weak standard, which took a significant amount of time to ratify. There are discussions to reopen Annex VI and strengthen the standard as well as add a PM standard, though this process will not be completed fast enough to meet the San Pedro Bay Port's goals.

This measure is coupled with the Technology Advancement Program in that some of the technologies that can be utilized to reduce OGV engine emissions have not been assessed to determine the emissions control efficiencies except for repowering (which can only be done on some auxiliary engines) or electrification (again only on auxiliary engines). Therefore, as additional technologies are identified, demonstrated, and the agencies agree to associate reduction levels, they will be folded into this control measure and applied to the sources through a mix of implementation strategies. The ultimate goal is to achieve 90% or greater emissions reductions (DPM, NOx, and SOx) relative to the current Annex VI standard.

The technologies and challenges with the implementation of potential emissions reduction strategies can significantly differ between the two engine types (main and auxiliary). For example, ships are built around main engines while auxiliary engines are with ships. Large direct drive engines are generally two stroke, slow speed, and massive. Auxiliary engines can range from small to large medium speed engines. The following two subsections further describe characteristics and potential technologies that can/could be applied.

Main Engines

Main engines generally come in four configurations: direct drive, geared drive, diesel-electric, and steam. Direct drive is when the engine's drive shaft is directly connected to the propeller. These engines are massive two-stroke engines. In geared drive, the engine's drive shaft is connected to reduction gears that are then connected to the propeller. Generally, the drive shaft can be decoupled from the gears and then coupled back as needed. Diesel-electric configurations are a series of large auxiliary engines (generally medium speed) that turn generators that provide both the propulsion and auxiliary power loads. On some ships instead of several large auxiliary engines, jet turbines are installed to generate electricity. Finally, steam main engines are becoming obsolete but there still are a few ships that use boilers/steam power to provide mechanical power to the propeller.

The first technology that will be coming out of the Technology Advancement Program will be slide valves from engine manufacturer MAN B&W. This technology is relatively easy to install, not overly expensive, and provides good NOx and PM reductions. It is expected that emissions reduction levels will be agreed upon by the Steering Committee of the Technology Advancement Program by the end of 2006. Another technology that is going to be demonstrated shortly will be an exhaust gas scrubber that will be mounted to a barge or at the terminal to capture and scrubbed. Additional technologies are provided in the Technology Advancement Program (Section 5.8).

Auxiliary Engines

Auxiliary engines have a wide range of sizes and are generally medium speed diesel engines. Auxiliary engines turn generators that provide electricity to meet the ship's power demand for all non-propeller electrical functions. For diesel-electric ships however, the auxiliaries power even the propulsion engines. Large cruise ships are becoming more and more diesel-electric. A ship's power demand comes from various sources such as navigation system, computers, heating/ventilating/air conditioning, kitchen appliances, lighting, radio/ communications gear, bow thrusters, auxiliary engine blowers, refrigeration, etc. Cruise ships have extensive power requirements for all the passenger facilities onboard.

Selective Catalytic Reduction (SCR) technology is being demonstrated on a containership auxiliary engine that calls at the Port of Los Angeles. Another promising technology is in-line fuel emulsion, where water and the fuel are emulsified just before the fuel enters the engine.

Both Ports believe that existing vessels can become significantly cleaner ships, with respect to air quality, if at a minimum the following five elements are incorporated into the vessel's operations:

1. Use of cleaner 0.2% MGO fuels in both main and auxiliary engines.
2. Compliance with VSR (SPBP-OGV1) on arrivals and departures.
3. Main engines retrofitted with slide valves and other applicable engine rebuild emissions reduction technologies.
4. Auxiliary engine(s) used during transiting are retrofitted with SCR, exhaust gas recirculation, in-line fuel emulsification, etc.
5. During hotelling, ships would have either shore-power capabilities, SCR + a DPM reduction technology, or exhaust gas scrubber(s).

Because of growth in trade and very weak international standards for vessel fuels and emissions, ships will become the dominant source of port-related emissions unless new vessels utilize the full array of technically feasible and cost-effective control technologies required of other source categories. New vessels destined for California service should be built with these technologies. As new orders for ships are placed, the Ports believe its essential that the following elements be incorporated into the vessel's design and construction:

1. Design in extra fuel storage tanks and appropriate piping to run both main and auxiliary engines on a separate/cleaner fuel.
2. Work with your engine manufacturer to incorporate all their emissions reduction technologies/options (slide valves, common rail, exhaust gas recirculation, etc.) that can be included when ordering main and auxiliary engines.
3. Incorporate SCR or an equally effective combination of engine controls. If SCR systems are not commercially available at the time of engine construction, design in space and access for main and auxiliary engines to facilitate installation of SCR or other retrofit devices that maybe installed at a late(r) date.
4. Incorporate shaft generators/micro turbines/heat recovery devices to take advantage of main engine power and exhaust heat.
5. Design in space for in-line emulsification and appropriate storage tankage and piping.
6. Design in access space, conduits, cable reels, cable winches, locker space, etc. for shore-power equipment.
7. Order low-NOx burners for auxiliary boilers.
8. Design in space, access, hatches for sails, nuclear reactors, or solar arrays.

Implementation Plan

The order in which emissions reduction technologies move to this control measure is as follows:

New technology → Technology Advancement Program → SPBP-OGV5

Once a technology has successfully passed through the Technology Advancement Program, then it will be integrated into this measure and implemented through the following strategies: lease requirements, tariff changes, CEQA mitigations, or limited incentives.

Air Quality Benefits

Emissions reductions associated with this measure assume slide valves will clear the Technology Advancement Program in 2006. At this time it is not known what emissions reduction magnitude they will achieve but preliminary data suggest on the order of 30% reduction in NOx and 25% DPM. Following these assumptions, implementation is assumed to be through lease requirements and CEQA mitigations. The estimated emissions reductions for this measure are presented in the following table.

Table 5.20: Estimated Emissions Reductions for SPBP-OGV5 by Fiscal Year

	2006/2007 (tpy)	2007/2008 (tpy)	2008/2009 (tpy)	2009/2010 (tpy)	2010/2011 (tpy)	Total (tons)
SPBP-OGV 5 - Slide Valve Retrofit-Main Engine						
TOTAL Measure DPM Reductions	**28**	**69**	**100**	**111**	**115**	**424**
TOTAL Measure NOx Reductions	**266**	**673**	**983**	**1,092**	**1,138**	**4,151**
TOTAL Measure SOx Reductions	**0**	**0**	**0**	**0**	**0**	**0**

Financial Costs

At this time, it is anticipated that all the related Port costs associated with this measure would be funded through the Technology Advancement Program.

Milestones

1. Port Staff, regulatory agency staff, and engine manufacturers agree or verify emissions reduction levels for DPM and NOx for MAN B&W slide valves based on available test data.

   Schedule: Emissions reduction values for DPM and NOx agreed upon by end of 2006.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
CAP-OGV5 Main Engine Emissions Improvements	Environmental (POLA only)	Number of ships retrofitted with slide valves	Quarterly

5.3 Cargo Handling Equipment Control Measures

5.3.1 Control Measure Number: SPBP-CHE1
Measure Title: *Performance Standards for CHE*

This measure calls for the following CHE improvements:

- ✓ *All purchases of yard tractors, side picks, top picks, rubber tired gantries, forklifts, reach stackers, and straddle carriers will be equivalent or cleaner than either the EPA 2007 on-road or Tier 4 off-road standards.*
- ✓ *By 2010, all yard tractors will be equivalent or cleaner than the EPA 2007 on-road or Tier 4 off-road standards.*
- ✓ *By 2012, all top picks, rubber tired gantries, forklifts, reach stackers, and straddle carriers will be equivalent or cleaner than the EPA 2007 on-road or Tier 4 off-road standards.*
- ✓ *An emissions standard for all other CHE equivalent to the applicable EPA Tier 4 off-road standard, by 2014. Until replaced by a Tier 4 engine, such equipment shall be equipped with the highest level of CARB certified emissions control retrofit.*

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Increasing throughout five year period (see Table 5.21)*
Tonnage Reduced:	*Increasing throughout five year period (see Table 5.21)*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: Lease Requirements & Tariff Changes

Measure Description

This program is designed to achieve the maximum possible emission reductions from cargo handling equipment operating at the port within next five years. This program accelerates the CARB CHE rule requirements. The proposed standards are listed above. It will require the replacement of existing 2003 and newer yard tractors with equipment compliant with 2007 or newer on-road heavy-duty engine emission standards or the 2011 non-road standards. These standards achieve a 90% reduction in PM and NOx compared to previous model years. Starting in 2007, all on-road engines are required to meet a 0.01 g/hp-hr standard for PM and a 2.0 to 0.2 g/hp-hr standard for NOx. The NOx standard for yard tractors has a phase in requirement with 100% implementation at 0.2 g/bhp-hr

NOx in 2010. In addition, 2003 and newer non-yard tractor cargo handling equipment is required to be either retrofitted or replaced, within next five years, with best available control technology (BACT) that has been verified by CARB or EPA.

CARB recently adopted a regulation that requires the replacement or retrofit of existing engines with ones that use BACT and requires, beginning 1 January 2007, that newly purchased, leased or rented CHE meet low PM and NOx limits. CARB's regulation is focused on equipment 2002 and older in 2007–2013 timeframe and 2003–2006 engines and equipment in 2010-2016 timeframe. This control measure further accelerates the CHE modernization concentrating mainly on 2003 and newer equipment that is not covered by the CARB regulation within the 2006/2007 and 2010/2011 fiscal year span.

CHE other than yard tractors would meet or beat the most stringent applicable standard for the engine type and class as listed above in the CHE improvements summary.

Implementation Plan

The performance standards will be phased in through lease requirements with Ports requiring that terminals meet the standards listed above as part of new or amended lease negotiations or when leases are reviewed through the EIR process. The Port of Los Angeles will also further evaluate the potential use of tariff changes.

Milestones

1. Port staff will develop (for lease negotiations) guidelines outlining the acceptable emissions standards for CHE. The guidelines will also provide specifics on the types of equipment affected, time line and various options such as diesel, LNG and other alternative fuels.

   Schedule: These guidelines will be reviewed and updated on an annual basis. The original set of guidelines will be presented to the Executive Director within ___ days after the control measure is approved or within ___ days after each update.

2. Port staff in cooperation with SCAQMD staff will develop and annually update a technical fact sheet detailing the status of various emissions control technologies or alternative fueled CHE. This fact sheet will contain details such as verification status of various emissions control devices, availability of low emitting equipment, results of successful demonstration of alternatively fueled equipment or new technology aimed at reducing emissions and the names/contact info of vendors or engine manufacturers who offer these products. The fact sheet will be made available on Port websites as well as to customers at the time of lease negotiation.

   Schedule: Within ___ days after the control measure is approved and annually thereafter.

3. Port staff in cooperation with SCAQMD staff will develop and annually update, a fiscal fact sheet that will provide availability of funds through various sources such as SCAQMD, CARB grants, and EPA. The fact sheet will be made available on port websites as well as to customers at the time of lease negotiation.

   Schedule: Within ___ days after the control measure is approved and annually thereafter.

4. After the measure is approved, Port staff and SCAQMD will hold a joint outreach meeting for customers to present the funding incentives, funding levels, process, federal tax credits, schedule, and status of technology as outlined in the technical and fiscal fact sheets mentioned above. This will also be an opportunity for Port staff to gather questions and concerns that the customers might have so that they can be addressed prior to lease negotiations.

   Schedule: Within ___ days after the control measure is approved.

5. Port staff will develop a status sheet to be updated by the customer showing how they plan to meet the performance standards under this program. This sheet will have the original number of equipment, which is currently being provided by each customer to the Port for emissions inventory update purposes. At the time of lease renewal, the customer will update this sheet to include, the number of equipment replaced or retrofitted, model year of retrofitted or replaced equipment, the engine manufacturer and the status of emission control devices installed and emissions certification status. This sheet will be used by Port staff to verify that the goals of this program are being met.

   Schedule: Within ___ days after the control measure is approved.

6. Port staff will annually report to each respective Executive Director the number of pieces of equipment affected by this program, the emissions reductions achieved and the level of funding used.

7. The CHE emissions inventory will be updated annually to incorporate changes that result from the enforcement of this program.

Air Quality Benefits

The estimated reductions in DPM, NOx, and SOx associated with this measure are presented in the following table.

Table 5.21: Estimated Emissions Reductions for SPBP-CHE1 by Fiscal Year

	2006/2007 (tpy)	2007/2008 (tpy)	2008/2009 (tpy)	2009/2010 (tpy)	2010/2011 (tpy)	Total (tons)
[1]Total SPBP-CHE 1 Reduction						
TOTAL Measure DPM Reductions	4	6	9	9	11	40
TOTAL Measure NOx Reductions	127	195	290	336	376	1,323
TOTAL Measure SOx Reductions	0	0	0	0	0	0

[1] Reductions are taken after ARB's adopted CHE regulation is implemented

The reduction estimates are calculated from 2005 CHE emissions adjusted for the cargo handling equipment regulation adopted by the CARB in December of 2005. The 2005 EI currently underway calculated emissions based on population and activity data collected by interviewing terminal operators. The same methodology was used for 2001 baseline emissions calculations. No growth was assumed for future years.

Financial Costs

Since this measure will be implemented as a lease requirement, there will be no direct costs to either Port. The cost of complying with this requirement could be significant for shipping lines, but that cost cannot be estimated at this time.

Elements to Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-CHE1 Performance Standards for CHE	Environmental (both Ports)	Leases and CEQA schedules Number & type of equipment included in lease Performance standards for types of equipment Equipment Activity Levels (part of EI process) Emission Reductions from measure Availability of Fed/State/Local Funds Status of Emissions Control Technologies	Quarterly

5.4 Harbor Craft Control Measures

5.4.1 Control Measure Number SPBP-HC1
Measure Title: *Performance Standards for Harbor Craft*

This measure sets the following three goals for harbor craft home fleeted at either the Port of Los Angeles or the Port of Long Beach:

- ✓ *By the second year of the Action Plan, all HC home-ported at San Pedro Bay Ports will meet EPA Tier 2 standards for harbor craft or equivalent reductions.*
- ✓ *By the fifth year, all previously repowered HC home-based at San Pedro Bay Ports will be retrofitted with the most effective CARB verified NOx and/or PM emissions reduction technologies.*
- ✓ *When Tier 3 engines become available, within five years all HC home-based at San Pedro Bay Ports will be repowered with the new engines.*

Similar to SPBP-OGV5, this measure also defines "clean harbor craft" for both existing vessels and new builds.

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Implemented through lease requirements & emissions inventory updates*
Tonnage Reduced:	*Unquantifiable at this time. Quantifiable after the 2005 emissions inventory update.*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: Voluntary, Incentives, & Port of Los Angeles' China Shipping Settlement Funds

Measure Description

Over 150 harbor craft have already been repowered since 2001 with the help of the SCAQMD (under the Carl Moyer Program) and through the Port of Los Angeles' China Shipping Funds. There are approximately 150-200 fishing related vessels that have not been repowered although their numbers are expected to decline sharply as new fishing regulations come online shortly. This control measure focuses on harbor craft that are home-ported at either Port and could potentially be repowered with cleaner engines or retrofitted with verified/verifiable emissions control devices. This would occur either through lease renewals/renegotiations or through application to either the Carl Moyer Program or to the China Shipping Settlement PAQMIP.

Under this program, older propulsion and auxiliary harbor craft engines will be identified through the emissions inventory process as potential candidates for significantly cleaner repower or retrofit. Similar to SPBP-OGV5, this measure would work in tandem with the Advanced Technology Program in that retrofits for harbor craft are not currently verified by CARB and therefore technologies that successfully emerge from the program would be integrated into this measure.

Repowers and retrofits will also be required during lease renegotiation for harbor craft.

There are four fundamental elements to this control measure:

1. Through the emissions inventory update process, identify the candidate propulsion and auxiliary harbor craft engines for repower or retrofit.

2. Identify available SCAQMD, PAQMIP, Carl Moyer Program, and other available funds and criteria.

3. Assist owner/operator in applying for grant funding.

4. Develop harbor craft specific guidelines for "clean harbor craft," for both existing vessels and new builds. These guidelines will be updated as successful emissions reduction technologies are demonstrated through the Technology Advancement Program or when new Tier 3 engines are available.

Implementation Approach

In order to successfully implement element 1, harbor craft emissions inventory need to be updated to identify the population of harbor craft engines by model year, type of engines (mechanical versus electronically controlled) and their emissions contribution compared to total harbor craft emissions. This is being accomplished with the 2005 EI update project, which is currently ongoing.

Every year, SCAQMD receives a share of the state's Carl Moyer Program funds to reduce emissions from mobile source engines faster than required by state regulations. Both Ports should coordinate with SCAQMD staff to solicit these funds to clean harbor craft engines.

Port staff will provide assistance to identified candidate vessel owner/operators in applying for grant funding.

Since, some of the assist tugboats are common to Port of Los Angeles and Long Beach, it is important that Port staffs build a consensus plan to achieve the goals of this measure.

Port staff will develop a set of guidelines that will define "clean harbor craft." The Steering Committee will discuss and draft language for both Port's Executive Directors and respective Boards to approve. Due to the nature of emerging emissions reduction technologies, as well as cleaner engines, the "clean harbor craft" definitions for existing and new builds will be updated annually, as appropriate. Again this measure will rely heavily on the Technology Advancement Program to demonstrate verifiable emissions reduction technologies and cleaner fuels that can reduce emissions.

Air Quality Benefits

Air quality benefits will be updated upon completion of the 2005 emissions inventory updates.

Financial Costs

At this time there are no anticipated costs associated with the program other than those costs associated with the Technology Advancement Program.

Milestones

The following is a list of milestones and their schedule for completion for this control measure:

1. The Technology Advancement Program Steering Committee will discuss and draft proposed "clean harbor craft" guidelines with respect to air quality for both existing vessels and new builds. The draft language will be submitted to both Port's Executive Directors for approval and then to each Port's respective Boards. The approved guidelines will be used during lease negotiations with tenants that home-port harbor craft.

   Schedule: These guidelines will be reviewed and updated on an annual basis. The original set of guidelines will be presented to the Executive Director within ___ days after the control measure is approved and updates within ___ days after each update.

2. Port staff in cooperation with SCAQMD will develop and annually update a technical fact sheet detailing the status of various emissions control technologies, engine standards, and engines available (including alternative fuels). This fact sheet will contain details such as verification status of various emissions control devices and availability of low emitting engines. The fact sheet will be made available on Port websites as well as to customers at the time of lease negotiation.

   Schedule: Within ___ days after the control measure is approved or within 45 days after each update.

3. Port staff in cooperation with SCAQMD will develop and annually update, a fiscal fact sheet that will provide availability of grant funds __ days prior to application submissions deadline. The fact sheet will be made available on Port websites as well to customers at the time of lease negotiation.

   Schedule: Annual

4. Prior to the application deadline, Port's staff and SCAQMD will hold a joint outreach meeting for the customers to present the various grant funding processes and funding levels, program flexibility and status of technology as outlined in the technical/fiscal fact sheets mentioned above. This will also be an opportunity for Port staff to gather questions and concerns from customers so that these can be addressed prior to lease negotiations.

   Schedule: Annual

5. The Ports' staff will develop a status sheet/record to be updated by the customer showing original and repowered/retrofitted engine information (including the original vessel number, type, and characteristics of harbor craft) which is currently being provided by each customer to the Port for emissions inventory update purposes. At the time of lease renewal, the customer will update this sheet to include the number of harbor craft engines repowered or retrofitted, model year of repowered or replaced equipment, the engine manufacturer and the status of emission control devices installed and emissions certification status. This record and the information collected during the emissions inventory updates will be used to track compliance and reductions from this measure.

   Schedule: After every lease negotiation

6. Port staff will annually report to the Executive Directors the number of harbor craft affected by this program and the associated emissions reductions achieved.

   Schedule: Annual

7. The harbor craft EI will be updated annually to incorporate those changes that result from the enforcement of this program.

   Schedule: Every harbor craft emissions inventory update.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-HC1	Environmental (both Ports)	Lease schedule Carl Moyer funding level for marine application # of harbor craft repowered # of harbor craft retrofitted Activity Verification status (retrofits)	Ongoing Annual

5.5 Railroad Locomotives Control Measures

5.5.1 Measure Number SPBP-RL1

Measure Title: *Rail Switch Engine Modernization*

This measure implements an existing MOU between the ports and PHL, which calls for the following:

- ✓ *By 2008, all existing switch engines in the Ports will be replaced with Tier 2 engines and will use emulsified fuels as available or other equivalently clean alternative diesel fuels.*
- ✓ *Any new switch engine acquired after the initial replacement must meet EPA Tier 3 standards or a NOx standard of 3 grams/bhp-hr and a PM standard of 0.0225 g/bhp-hr.*
- ✓ *All switch engines will have 15-minute idling limit devices installed and operational.*
- ✓ *PHL will conduct a series of feasibility tests including: DOC or DPF retrofits, LNG locomotive and hybrid locomotive. Based on successful demonstration of a locomotive DOC or DPF, all of the Tier II engines will be retrofitted preferentially with the DPF, or with the DOC retrofit as a fallback if the DPF trial is not successful.*
- ✓ *The DPF trial and retrofits will be separately funded by the ports as an additional item not in the current MOU.*

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Increasing throughout five year period (see Table 5.22)*
Tonnage Reduced:	*Increasing throughout five year period (see Table 5.22)*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: MOU Agreement

Measure Description

This program will replace sixteen of PHL's switch engine fleet with newer and significantly cleaner Tier 2 compliant railroad locomotive engines equipped with idling

controls. Emissions associated with switch engine activities are significant and generally occur within Port boundaries.

The fundamental elements associated with this control measure:

1) According to the terms of the MOU between PHL, Port of Los Angeles and Port of Long Beach, PHL will procure and replace sixteen older technology locomotives with engines that meet or surpass the most stringent applicable emission standards.
2) Port staff will track the progress of locomotive replacement, testing of a locomotive DOC or DPF, demonstrations of LNG and hybrid locomotives, installation/operation of 15-minute idle restrictors, and use of emulsified fuels.
3) If the DOC or DPF testing is successful, DOCs or DPFs will be installed on all the Tier 2 locomotives.
4) If PHL purchases additional locomotives, they will exceed Tier 2 standards or the most stringent standards in effect at the time of their purchase.
5) The Ports will consider the effectiveness of tariff changes with respect to accelerating the installation of needed infrastructure. Emulsified diesel fuel or other equivalently clean alternative diesel fuel will be used in all switchers.

Implementation Approach

This program calls for sixteen of PHL's current fleet of 20 switching locomotives to be replaced by new locomotives meeting Tier 2 emission levels. Agreement among PHL, the Port of Los Angeles, and the Port of Long Beach to proceed with this measure has been reached, and deliveries of the new locomotives are expected beginning in early 2007.

The Ports have approved the funding for this modernization program. Carl Moyer grant funds have also been awarded to PHL for a portion of the fleet modernization costs. As part of the agreement with the Ports of Los Angeles and Long Beach, PHL will conduct demonstration testing of a hybrid electric and a LNG locomotive, and will also install a DOC or DPF on one of the Tier 2 locomotives for evaluation purposes. If the DPF test is successful, they will be installed on the remaining Tier 2 locomotives. In addition, if PHL purchases additional locomotives, they will meet Tier 2 standards or the most stringent standards in effect at the time of their purchase. In addition, emulsified fuels will be used in all switch engines.

Air Quality Benefits

The estimated reductions in DPM, NOx, and SOx associated with this measure are presented in the following table. The emission reductions associated with limiting idle times from switch engines included in the MOU between the CARB and the Rail industry has been quantified and the figures in the table have been adjusted to reflect these reductions.

Table 5.22: Emissions Reductions for SPBP-RL1 by Port by Fiscal Year

Reductions (tpy)	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
DPM	3	3	3	3	3
NOx	163	163	163	163	163
SOx	0.2	0.2	0.2	0.2	0.2

Financial Costs

The funding for this measure has been allocated prior to the period of this plan (i.e., prior to FY 2006/2007). The costs listed in the table below are for each Port's funding for the purchasing of new Tier 2 rail locomotives.

Table 5.23: Costs for SPBP-RL1 by Port by Fiscal Year

SPBP-RL1	PHL Moderinization	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
	POLA (Tier II Engines)	$5,000,000	$0	$0	$0	$0	$5,000,000
	POLB	$5,000,000	$0	$0	$0	$0	$5,000,000
	SCAQMD	$0	$0	$0	$0	$0	$0
	ARB	$0	$0	$0	$0	$0	$0
	FY Totals	$10,000,000	$0	$0	$0	$0	$10,000,000

Milestones

1. Meet and confer with representatives of PHL in order to track progress, discuss expediting the scheduled modernization and/or expansion of the modernization plan to encompass the remaining switch engines.

   Schedule: Quarterly

2. The benefits of the program will be quantified and reflected in the periodic updates to the Port's emissions inventories.

   Schedule: Annually

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-RL1 PHL Modernization	Environmental/ Executive (both Ports)	Delivery & number of switchers Activity of switchers Emulsified fuel consumption of switchers Amount of incentive funding Demonstration projects Installation/operation of 15-minute idling restrictors	Quarterly

5.5.2 Measure Number SPBP-RL2

Measure Title: ***Operational Controls for Line-Haul Locomotives***

By 2011, all diesel-powered line-haul locomotives entering Port facilities will meet Tier 2 engine standards, installation of DOC or DPF, use of 15-minute idle restrictors, and use of ULSD fuels.

By 2011, all line-haul locomotives entering Port facilities will be 90% below Tier 2 engine standards for PM and NOx, use of 15-minute idle restrictors, and use of ULSD fuels.

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*Implemented through MOU or lease requirements*
Tonnage Reduced:	*Unquantifiable at this time*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategies: Lease Requirement, MOU & Other Contracts

Measure Description

Depending upon the application, locomotives may spend from 40% to 80% of their operational time at idle. This is done for operational and technical reasons including reducing delays in starting the engine; maintaining water jacket temperature, battery voltage and brake system air pressure; and to reduce wear on the starting system and battery pack. However, each locomotive consumes 8,000 to 25,000 gallons of fuel per year during idle with associated emissions, noise, engine wear, and potential for disturbing nearby residents.

Under the MOU finalized between the CARB and the two major Class 1 railroads (BNSF and UP), intrastate locomotives (primarily switchers) will be fitted with devices that will shut off locomotive engines after they idle for a preset period of time (e.g., 20

minutes) in a phased program that began in 2005 and will be completed in 2008. That leaves the line haul locomotives operated by BNSF and UP as the focus of this measure.

This measure calls for the line-haul railroads to maximize the short-term use of Tier 2 locomotives, installation of verified DOCs or DPFs, installation and use of 15-minute idling restrictors, and use of ULSD fuels for rail movements associated with movement of goods to and from the San Pedro Bay Ports.

There are four key elements to this control measure:

1. Execute MOU or other contract mechanisms between the Ports and the line-haul locomotive operators who service the Port, to maximize use of Tier 2 engines with DOCs or DPFs, use of 15-minute idling controls, and ULSD to limit the health risk associated with emissions of diesel particulates.

2. Port staff will track compliance with the terms of the MOU.

3. The Ports will secure benefits over and above those called for in the MOU between the CARB and the railroads, in which idling restrictions are limited to switch engines.

4. Reductions from the idling and operational controls will be tracked through the annual emissions inventory.

Under this measure, the Ports will utilize all feasible contractual and project approval mechanisms, which may affect rail operations to achieve the above performance standard. These mechanisms include: lease requirements, CEQA mitigations, other contractual provisions or MOUs. The Ports will join SCAQMD and CARB to request that any public bond funding to the railroads be conditioned along this approach.

Finally, the ports, in partnership with SCAQMD and CARB, will jointly urge EPA to adopt Tier 3 emission standards for locomotives that require at least 90% control of PM and NOx as soon as possible.

Implementation Plan

This control measure calls for a formalized MOU with the line-haul operators.

With respect to 15-minute idling restrictors, BNSF's goal is to equip switchers and intrastate locomotives with idling controls within 3 to 4 years (as stated in 2005). The potential exists to accelerate this schedule to 2 years. Although installation of tamper proof idle control technology in an abbreviated timeframe would not be a problem on GE locomotives, a problem could exist on EMD locomotives. Therefore, a certain amount of research and testing may be necessary. This testing is called for in SPBP-RL3.

As for DOCs, the demonstration project identified in SPBP-RL1, would be expanded to include a line-haul duty cycle and locomotives.

Air Quality Benefits
Emissions reductions at this time are not quantifiable.

Financial Costs
At this time there are no anticipated costs associated with the control measure other than administrative costs.

Milestones

1. Meet and confer with representatives of the Rail industry to draft a plan for limiting idling from line-haul locomotives. Modification of the existing, or development of a new MOU, may be required.

   Schedule: Start meetings with line-haul operators within ___ days after plan approval.

2. Port staff will track the progress of idle control installation and explore opportunities to expedite installation. Progress reports will be prepared for Board review.

   Schedule: Monthly after installation commences.

3. Port staff will prepare a presentation and/or fact sheet outlining the air quality benefits of the program for distribution to customers, community members and other interested parties.

   Schedule: Within ___ days after plan approval.

4. The benefits of the program will be quantified and reflected in the periodic updates to the Port's emissions inventories.

   Schedule: Annually

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-RL2 Operational Controls for Line Hauls	Environmental (both Ports)	Number of line haul installations Activity of line hauls	Annual

5.5.3 Measure Number SPBP-RL3
Measure Title: *Clean Rail Yard Standards*

New or modified rail facilities on Port properties will incorporate the cleanest locomotive technologies into their operations. The requirements will include:

- *Cleanest locomotive technology (diesel-electric hybrids, multiple engine generator sets, retrofitted, alternative fuel, etc.)*
- *DPF and SCR retrofits for existing locomotives*
- *Idling shut-off devices*
- *Idling exhaust hoods*
- *ULSD*
- *Clean CHE and HDV requirements*

Initiation Year:	*FY2006/2007*
Implementation Schedule:	*New projects/lease requirements will be used to phase in the standards for clean rail yards.*
Tonnage Reduced:	*Not quantifiable at this time*
Key Milestone Dates:	*See Milestone Section*

Initial Implementation Strategy: Lease Requirements

Measure Description

Rail facilities include many emission-producing activities, including the operation of switching and line-haul locomotives, idling of switching and line-haul locomotives, and loading and unloading of railcars by CHE. New rail facilities, or modifications to existing rail facilities, will incorporate clean locomotive technologies. A list of clean locomotive technologies will be provided for project proponents to consider in developing new facilities, and choices will be formalized in lease requirements. The initial expectations for cleanest locomotive technologies include the following requirements:

- Newly acquired switching locomotives will be new technology locomotives (diesel-electric hybrids, multiple engine generator sets, or alternative fuel).

- DOCs, DPFs or equivalent will be installed on existing switching locomotives (at modified rail facilities – new rail facilities will be required to operate new equipment).
- Existing switching locomotives will have 15-minute idling shut-off devices installed and operational.
- Idling exhaust hoods equipped with emission controls will be used at locations where essential idling occurs routinely (such as for maintenance activities) if such hoods are shown to be effective emission control devices by testing currently underway.
- New and modified rail facilities will be subject to the conditions of CHE measure SPBP-CHE1, and will have provisions requiring service by clean trucks as defined by measure SPBP-HDV1.
- Line-haul locomotives in the short-term will be equipped with a commercially available DOC and the long-term goal is to have a 90% reduction in DPM and NOx from Tier 2 standards (as consistent with CARB's Goods Movement Plan).
- 15-minute idling shut-off devices on all long-haul locomotives.

Air Quality Benefits

The air quality benefits of this measure will accelerate the improvements to be gained from locomotive and CHE regulations and from the MOU between the class 1 railroads and the CARB. Since the measure will affect new or modified rail facilities that have not been designed, estimating the level of emission reductions is not possible at this time. However, the measure will result in reduction of emissions of DPM, NOx, other criteria pollutants, and other diesel-related pollutants beyond what will be achieved by upcoming regulations and the railroad/ARB MOU.

Financial Costs

At this time there are no anticipated costs to the ports associated with this control measure.

Milestones

1. Develop list of potential clean locomotive technologies that will form the basis of the requirements for this measure.

   Schedule: Within __ days after the control measure is approved.

2. Review/update list of potential clean locomotive technologies and provide to parties intending to develop new rail facilities or modify/expand existing rail facilities.

   Schedule: Within 10 days after notification of intent to initiate process of developing new facility or modification of existing facility (i.e., initiation of leasing/EIR process).

3. Negotiate specific emission reduction methods to be employed by the facility, using the BACT list including the requirements listed above.

   Schedule: To be completed during lease negotiation phase.

4. Estimate the emission reductions achieved by implementation of the measure's requirements compared with emissions under current regulations and MOU requirements. The reductions are to be reported in the next update to the SPBP Action Plan.

   Schedule: To be completed during leasing process.

Elements To Be Tracked

Measure	Lead Department	Initial Measure-Related Tracking Elements	Initial Frequency
SPBP-RL3 Performance Standards for New or Modified Rail Facilities	Environmental (both Ports)	Planned new rail facilities Rail facilities to be modified/expanded Upcoming rail facility lease renewals Status of evaluation/demonstration projects for innovative control technologies	On-going

5.6 Standards for New Leases and Lease Renewals

New leases and lease renewals will need to meet the Project Specific Standard described in Section 3. These standards are:

- Projects must meet the 10 in 1,000,000 excess cancer risk threshold, as determined by health risk assessments conducted during CEQA review and implemented through required CEQA mitigations associated with lease negotiations.
- Projects that exceed the AQMD CEQA significance thresholds for criteria pollutants must implement the maximum available controls and feasible mitigations for any emissions increases.

Again these standards will be implemented during the CEQA review process.

5.7 Construction Activity

As stated in Section 4.2, construction activity emissions will be assessed through the CEQA evaluation process and control strategies that may be required to meet CEQA mitigation requirements will be incorporated into bid packages for the actual construction work. The CEQA

process will be the implementation method for ensuring construction activities meet health risk mitigation requirements.

Construction equipment includes marine sources (primarily dredges) and land sources (excavators, cranes, etc.). For all dredging related projects there are two primary types of dredges that operate at the San Pedro Bay Ports: cutter-suction head and clamshell. For San Pedro Bay Ports, cutter-suction head dredging and all clamshell dredging will be required to be shore-powered.

Land and marine based construction equipment will be required to meet the control strategies that may be required as mitigations in the project's CEQA document. The Ports, SCAQMD, and ARB will be developing a list of Best Management Practices associated with construction activities by the end of 2007. These BMPs will be incorporated in construction contracts.

Additional emissions control strategies are being explored. For example, the Port of Los Angeles is developing a concept that would include emissions limits and controls in their bid packages. Bidders would receive a "calculator," which they would fill out and submit with their bids. "Emissions calculators" may be developed prior to the bid solicitation package going public and would incorporate that project's emissions limitations, control strategies applicable to construction equipment, and other limitations/specifications developed under the CEQA analysis. The calculator would be simplified to the extent that that dredge/construction companies would not need to hire air quality expertise to fill out the calculator to determine whether their bid meets the specific project requirements. In addition, contract specification language would be developed and incorporated into the construction contracts stating the reporting, recordkeeping requirements, and penalties (should any requirement not be met).

The bid package and contract language would be developed on the next project requiring CEQA analysis after the Clean Air Action Plan is adopted by each Port. The language would be shared between Ports to facilitate the process of incorporating air quality requirements into construction bids and contracting. It is also noted that the language would most likely be different for each Port due to each city's requirements.

5.8 Technology Advancement Program

The Clean Air Action Plan's Technology Advancement Program will evaluate, demonstrate, and incorporate new strategies into the suite of control measures that will ultimately result in significant reductions of DPM and criteria pollutants. This initiative builds on the success and synergies of the San Pedro Bay Ports, CARB, SCAQMD, EPA, and customers/tenants working together to find joint solutions.

Several successful projects have been completed over the years between these entities, and this program would help to build on that success. A coordination committee consisting of funding

partners including both Ports, SCAQMD, CARB, and EPA will be established. The coordination committee role would be to:

- Develop a list of potential jointly interested/funded projects
- Review potential upcoming projects that could be jointly funded
- Determine which projects would be approved and jointly funded
- Determine lead agency(ies) for approved projects
- Determine each group's responsibilities for approved projects
- Review findings of approved projects
- Jointly publish findings
- Continue the process

Within 60 days after the adoption of the Clean Air Action Plan by both Ports, the funding entities will meet to determine the details of the program and how this program can be incorporated into other existing similar programs lead by any of the funding entities. Port Staff will provide updates to their respective Executive Directors and Board of Harbor Commissioners on the activities of the coordination committee.

There are three fundamental areas in which the program will focus its initial work:

- Source Category Reductions
- "Green Container Transport" Solutions
  - ✓ Heavy-duty hybrid trucks
  - ✓ Shuttle systems including magnetic levitation, linear induction motors, etc.
  - ✓ Others as identified and developed
- Emissions Inventory Improvements

The program will be primarily funded by both Ports and participating agencies. Projects will be developed and implemented under each of the areas listed above. Successful demonstration projects will then be incorporated into the next update of the Clean Air Action Plan as control measures or additional emissions reduction strategies. There are numerous projects for each of these areas, including:

- Source Category Reductions
  - ✓ HDV demonstrations of alternative fueled trucks; demonstration of hybrid and electric drayage trucks; evaluation of new clean technologies, retrofits/repowers, etc.
  - ✓ OGV demonstrations of alternative hotelling emissions reduction technologies and other clean technologies that will reduce ship emissions; evaluation with engine manufacturers, shipping lines, and fuel providers to determine the quickest/safest approach to integrate lighter/cleaner/lower sulfur fuels into ship engines, etc.

- ✓ CHE demonstrations of hybrid, electric, and alternative fueled equipment
- ✓ HC demonstrations of biofuels at different grades; demonstration projects for retrofit technologies that reduce emissions, etc.
- ✓ RL demonstrations of hybrid or electric locomotives; demonstration of switch-engine and line-haul locomotive DOCs, etc.

➢ "Green Container Transport"
- ✓ Evaluation and demonstration on "green container transport" shuttle system strategies like linear-induction, "mag-lev", and electric conveyance systems, etc.
- ✓ Heavy-duty hybrid truck development
- ✓ Port of Los Angeles outreach and collaboration with other Pacific trading partner ports – Collaboration on methodologies, OGV fuel and engine emissions strategies, best management practices, program management, etc.

➢ Emissions Inventory Improvement
- ✓ Source testing to verify VSR emissions reductions; source testing to verify OGV emissions factors; duty-cycle data logging of sources to verify load factors; OGV fuel quality surveys to better understand where fuels are being purchased and their quality; emissions forecasting improvements; continued air monitoring; health risk assumption/input clarifications, etc.

The annual funding levels for the Technology Advancement Program, by Port, are presented in the following table.

Table 5.24: Annual Funding Level for Technology Advancement Program by Fiscal Year

		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Technology Advancement Program	POLA	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	**$7,500,000**
	POLB	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	**$7,500,000**
	FY Totals	**$3,000,000**	**$3,000,000**	**$3,000,000**	**$3,000,000**	**$3,000,000**	**$15,000,000**

5.9 Infrastructure & Operational Efficiency Improvements Initiatives

This initiative identifies projects at the San Pedro Bay Ports that improve infrastructure and operational efficiencies that also have an air quality benefit. The types of projects that are included in this element of the Clean Air Action Plan are generally initiated primarily as transportation or operational improvements; however, an air quality benefit does result from completing these projects. Projects examples include, but are not limited to:

- ➢ Focusing on on-dock versus near-dock rail infrastructure
- ➢ Grade separations
- ➢ OCR/RFID gates at terminals
- ➢ Terminal cargo handling/configuration efficiency improvements
- ➢ Evaluation of other potential operational efficiencies approaches that would reduce emissions associated with the port-related source categories

The emissions reduced from these projects would be quantified and reported under this element. This initiative will most likely be undertaken by the same group and structure as the Technology Advancement Program.

The annual funding levels for the Infrastructure & Operational Efficiency Improvements Initiatives, by Port, are presented in the following table.

Table 5.25: Annual Funding Level for Technology Advancement Program by Fiscal Year

		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Infrastructure Operational Improvements	POLA	$500,000	$500,000	$500,000	$500,000	$500,000	**$2,500,000**
	POLB	$500,000	$500,000	$500,000	$500,000	$500,000	**$2,500,000**
	FY Totals	**$1,000,000**	**$1,000,000**	**$1,000,000**	**$1,000,000**	**$1,000,000**	**$5,000,000**

5.10 POLA – China Shipping Settlement

In February 2003, the POLA joined environmental and Harbor-area community groups in a settlement agreement that includes a series of environmental programs designed to improve the area's air quality and quality of life. As part of this settlement, the POLA has committed over $20 million over five years to pay for air quality mitigation projects that reduce Port operation emissions that affect the communities of Wilmington and San Pedro. This program is known as the Port Air Quality Mitigation Incentive Program (PAQMIP). In accordance with the settlement agreement, the PAQMIP expends funds for projects and improvements that reduce emissions from Port operations that affect the communities of Wilmington and San Pedro. All emission reductions resulting from funded projects are retired by the POLA for the benefit of the environment.

The PAQMIP is in its third year[13], with the most recent Request for Proposals planned for issuance in June/July 2006. The primary purpose of this program is to provide financial incentives to assist in the implementation of projects that will accomplish two objectives: (1) reduction of emissions associated with port operations in the communities of San Pedro and Wilmington, and (2) research and development of specific technologies that can be applied in the San Pedro Bay Port area to achieve the first objective.

Near-term emission reductions are primarily sought for DPM, although reductions in other pollutants including NOx, CO, and VOCs are also desirable. All projects must provide emission reductions that are real, surplus, and quantifiable.

An additional $10 million in Port mitigation settlement funds is separately committed to the Gateway Cities Clean Air Program to be used as incentives to replace, repower or retrofit existing diesel-powered on-road trucks, in order to reduce emissions from these sources[14]. Since the Port

[13] 3rd time an RFP is issued to solicit projects.
[14] This program can be reviewed at http://www.gatewaycog.org/cleanairprogram/index.html

is committing significant resources to this Gateway Cities Program, projects submitted in response to the PAQMIP RFPs that could otherwise be funded by the Gateway Cities Program receive lower priority. This ensures that projects funded by the PAQMIP provide a broad range of technologies and applications, beyond that of the Gateway Cities Program.
Applications and proposals are reviewed and evaluated by the Port of Los Angeles Community Advisory Committee (PCAC) and the Port's Environmental Mitigation Coordinator (EMC), in consultation with the Port of Los Angeles Technical Advisory Committee (Port TAC). Roles of each entity are summarized below.

The Port of Los Angeles Community Advisory Committee was established as a standing committee of the Port of Los Angeles Board of Harbor Commissioners in 2001. The PCAC makes recommendations to the Board of Harbor Commissioners regarding applications/ proposals. Recommendation options include approval, denial or approval with modifications.
The settlement agreement created the Port TAC to: advise the PCAC and the EMC on the best use of air quality mitigation funding; support RFP development, and conduct proposal evaluations. The Port TAC consists of one representative from each of the following entities/agencies:

- SCAQMD
- CARB
- EPA
- Mobile Source Air Pollution Reduction Review Committee (MSRC)
- South Coast Carl Moyer Memorial Air Quality Fund

The EMC reviews and coordinates Port TAC and PCAC evaluation recommendations regarding eligible proposals. Port staff then prepares a Board staff report that incorporates the Port TAC and EMC evaluation recommendations for Board consideration. The Port TAC may also make recommendations directly to the Board, independent of the Port staff report or PCAC recommendations. PCAC Air Quality Subcommittee consultants also participate as non-voting observers and discussants in Port TAC discussions.

A wide range of potential project types can be used on a variety of port equipment. Emission reduction strategies may include: repowers, retrofits, after-market technologies and new engine purchases.

Several program categories have been identified for consideration under PAQMIP solicitation. These categories include:

- Stationary Source Projects including dockside equipment electrification/alternative fuel, fuel cell/cold ironing, emergency generation, dredges, etc.
- On-Road Heavy-duty vehicles
- Off-Road Heavy-Duty Equipment and Engines

- ✓ Specialty Port equipment (i.e., top-pick, side-pick, yard hostlers, etc.)
- ✓ Construction equipment, including crane electrification
- ✓ Marine engines and equipment on ships (ocean-going vessels and line-haul tugs) that regularly call at the Port
- ✓ Marine engines and equipment on tugs and harbor craft if the craft is berthed at, and directly serves the Port
- ✓ Forklifts
- ✓ Auxiliary power units
- ✓ Locomotives that regularly serve the Port

- ➢ Fueling Infrastructure for alternative fuel vehicles operating in and around the Port.
- ➢ Alternative Diesel Fuel Strategies
- ➢ Research and development, including intent to demonstrate. Research and development (R&D) or new technology demonstrations that are implemented on Port-specific equipment are eligible. R&D and/or demonstration projects are evaluated based on their ability to provide potential benefits in the Port and its surrounding communities (Wilmington and San Pedro).

The Port of Los Angeles funding levels for the CS settlement are presented in the following table.

Table 5.26: Port of Los Angeles Funding for CS Settlement by Fiscal Year

		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
China Shipping Settlement	POLA	$6,000,000	$6,000,000	$0	$0	$0	**$12,000,000**
		$6,000,000	**$6,000,000**	**$0**	**$0**	**$0**	**$12,000,000**

SECTION 6: EMISSIONS REDUCTIONS

This section discusses and presents an estimate of the reductions that will be achieved within the first five-year window of the Clean Air Action Plan by fully implementing the plan measures. The reductions represent the amount of emissions that would have been emitted in the absence of the corresponding control measure.

As discussed in Section 6.1, implementing the Clean Air Action Plan measures targeting vehicles, equipment, and vessels servicing the ports will result in a more than 50% reduction in diesel particulate matter (DPM) emissions (a known toxic air contaminant), over 45% reduction in oxides of nitrogen (NOx), a precursor to the formation of photochemical smog, and greater than 40% reduction in oxides of sulfur (SOx) which can form sulfuric acid when combined with water in the atmosphere. The estimated reductions achieved by the Clean Air Action Plan are over and above those reductions associated with regulatory programs either implemented or proposed by the California Air Resources Board. One such program, the ARB's Goods Movement Plan (GMP), is discussed in more detail in Section 6.2 and the estimated benefits of both the GMP and the Clean Air Action Plan are compared with the reductions projected to be achievable by the report issued by the No Net Increase (NNI) Task Force initiated by the former mayor of the City of Los Angeles.

While the NNI projections of emission reductions are often greater than those of the CAAP, it must be stressed that the NNI measures were conceptual measures developed without clear implementation methods and it is doubtful that all of the measures could have been implemented as written. In contrast, the CAAP measures have been designed with clear implementation mechanisms. The reduction estimates for CAAP measures have in many cases been conservative in that they are based on anticipated lease opening dates, while more aggressive implementation mechanisms, such as tariffs or early lease openings, will be evaluated and implemented if feasible, which would speedup the estimated emission reductions.

6.1 Clean Air Action Plan Reductions

It is important to note that the Clean Air Action Plan measures were developed in order to achieve the greatest amount of emission reductions possible, and thereby reducing the health risk associated with port-related operations as expeditiously as practicable given the implementation constraints of lease negotiation availability, potential funding sources and amounts, the limits of currently available emission reduction technology, and the viability of implementation by tariff. The plan does not focus on reducing emissions to, or maintaining emission at a particular level (such as the emissions estimated for some past year).

One issue that affects the presentation of emission reductions over a multi-year period is that of growth in port operations and resulting emissions. It is difficult to reliably estimate the growth in port operations over the period covered by the plan because of unknowns such as economic

development rates, manufacturing and shipping patterns, and physical or technological changes to transportation modes such as ocean-going vessels. Because of this difficulty, the Clean Air Action Plan has been developed without a specific set of growth assumptions. Instead, the measures have been developed with a focus on opportunities for implementation to ensure that what is planned has the highest probability of full implementation.

However, growth in port operations is important and is not being ignored. Growth will be separately addressed by the Ports after completion of the 2005 emissions inventory updates which are currently being developed. These inventories will provide a means of evaluating the changes in emissions (increases or decreases) that have occurred since the development of the 2001/2002 port emissions inventories, and will serve as a basis for estimating future growth rates. Before this process has been completed, and in order to compare the effectiveness of the Clean Air Action Plan with that of the GMP and NNI, the Clean Air Action plan emission reductions have been scaled to the growth estimates projected by ARB in their GMP (See Section 6.2).

Tables 6.1 and 6.2 present the DPM and NOx emission reductions attributable to the Clean Air Action Plan. The ton-per-year inventory estimates included in these tables reflects the best information on emissions and growth available at this time, taking into account changes in methods and inventory data since the development of the 2001/2002 port emissions inventories. The emission estimates for heavy-duty diesel trucks were derived from the 2001/2002 mileage estimates for trucks serving the Ports of Los Angeles and Long Beach, respectively, updated to reflect new activity information from the Ports and revised emission rate information from the ARB. The emission estimates from ocean-going vessels are those from the 2001 Port of Los Angeles and 2002 Port of Long Beach emissions inventories. The Cargo Handling Equipment emission estimates are the draft estimates developed for the 2005 port-wide inventory updates for the Ports of Long Beach and Los Angeles. For all of these source categories, the year-by-year increase or decrease in emissions is based on the growth assumptions developed by the ARB for their GMP, using their estimates of "no-GMP" changes in emissions (changes that would occur due to existing regulations but not due to any GMP measures) for south coast international goods movement.

It should be noted that the ARB's estimates of emissions related to international goods movement as presented in their GMP are not necessarily the same as the Ports' estimates of port-related emissions. The 2005 emissions inventory updates for each port, due to be completed later this year, will provide information on the actual rate of emissions growth over the period from the 2001/2002 baseline emissions inventories through 2005, and annual updates to the emissions inventories will provide one mechanism for evaluating the effects and effectiveness of the Clean Air Action Plan. Although the ARB's international goods movement emission estimates are not precisely the same as the Ports' emission estimates, they cover essentially the same emission sources and have been used as a consistent basis for the comparison of the Clean Air Action Plan with the GMP and the NNI report.

For each measure, Tables 6.1 and 6.2 list the estimated emission reductions in tons per year, and the percentages that those reductions represent of the assumed base emissions. For the OGV measures, the overall percent reductions are also listed. Because there are several OGV measures with overlapping effects, the overall reductions depend upon the sequencing of implementation, such that the final magnitude of reductions achieved by any one measure will depend on the order in which measures are enacted. Therefore, the final sum of the OGV measure reductions is different from the total of the individual OGV measure reductions shown in the tables.

Although not listed in the tables, Clean Air Action Plan measures focused on locomotives and harbor craft will also result in emission reductions. For example, the MOU between the Ports and the local switching railroad will result in the replacement of 20 old switching locomotives with new Tier 2 units, and includes provisions for testing and installing DPM emission control devices, testing various alternative technology switching locomotives, and purchasing ultra-low emission locomotives whenever additional locomotives are added to the fleet. The estimated reductions from this measure are 3 tons per year of DPM and 163 tons per year of NOx attributable to the change to Tier 2 locomotives. Additional reductions will come from control device installations and use of alternative technology locomotives.

Locomotive and harbor craft emission reductions will be estimated in more detail as these measures are more fully developed and implemented.

Table 6.1: Clean Air Action Plan Control Measure DPM Reductions

HDV Measures	'06/'07	'07/'08	'08/'09	'09/'10	'10/'11
Assumed base emissions	811	734	657	580	560
SPBP-HDV 1	22	180	301	367	454
	3%	25%	46%	63%	81%
	0	0	0	0	0
OGV Measures	**'06/'07**	**'07/'08**	**'08/'09**	**'09/'10**	**'10/'11**
Assumed base emissions before regulation	2,298	2,421	2,544	2,667	2,780
ARB Aux Engine Rule	83	174	183	197	211
	4%	7%	7%	7%	8%
Assumed base emissions after regulation	2,215	2,247	2,361	2,470	2,569
SPBP-OGV 1	0	0	0	0	0
(no PM reduction)	0%	0%	0%	0%	0%
SPBP-OGV 2	5	5	11	26	64
	0.2%	0.2%	0.4%	1.0%	2.5%
SPBP-OGV 3	2	3	14	13	9
	0.1%	0.1%	0.6%	0.5%	0.4%
SPBP-OGV 4	66	250	506	586	634
	3%	11%	21%	24%	25%
SPBP-OGV 5	52	136	208	241	261
	2%	6%	9%	10%	10%
Overall percent reduction SPBPCAAP measures	6%	17%	30%	33%	35%

CHE Measures	'06/'07	'07/'08	'08/'09	'09/'10	'10/'11
Assumed base emissions before regulation	128	116	104	91	85
ARB CHE Regulation	8	35	52	51	52
	7%	30%	50%	56%	61%
Assumed base emissions after regulation	120	81	52	40	33
SPBP-CHE 1	3	5	6	6	6
	3%	6%	12%	14%	19%

Table 6.2: Clean Air Action Plan Control Measure NOx Reductions

HDV Measures	'06/'07	'07/'08	'08/'09	'09/'10	'10/'11
Assumed base emissions	9,817	9,591	9,365	9,139	9,129
SPBP-HDV 1	195	1,719	3,131	4,382	5,704
	2%	18%	33%	48%	62%

OGV Measures	'06/'07	'07/'08	'08/'09	'09/'10	'10/'11
Assumed base emissions before regulation	23,276	24,416	25,556	26,696	27,801
ARB Aux Engine Rule	226	473	495	517	539
	1%	2%	2%	2%	2%
Assumed base emissions after regulation	23,050	23,943	25,061	26,179	27,262
SPBP-OGV 1	2,950	4,508	6,198	6,475	6,743
	13%	19%	25%	25%	25%
SPBP-OGV 2	165	184	428	1,036	2,542
	1%	1%	2%	4%	9%
SPBP-OGV 3	0	9	27	32	35
	0.0%	0.0%	0.1%	0.1%	0.1%
SPBP-OGV 4	76	302	617	716	777
	0.3%	1.3%	2.5%	2.7%	2.8%
SPBP-OGV 5	457	1,210	1,850	2,147	2,330
	2%	5%	7%	8%	9%
Overall percent reduction SPBPCAAP measures	15%	24%	33%	35%	40%

CHE Measures	'06/'07	'07/'08	'08/'09	'09/'10	'10/'11
Assumed base emissions before regulation	3,689	3,575	3,462	3,348	3,145
ARB CHE Regulation	117	705	1,146	1,112	1,106
	3%	20%	33%	33%	35%
Assumed base emissions after regulation	3,572	2,870	2,316	2,236	2,039
SPBP-CHE 1	120	178	256	287	302
	3%	6%	11%	13%	15%

6.2 Comparison with Other Studies

Although the Clean Air Action Plan does not focus on reducing emissions to a particular level or to some "baseline year," but rather attempts to define a series of specific, effective measures that will achieve significant emission reductions and form the basis for additional measures, comparisons will be made between the planned effectiveness of the Clean Air Action Plan measures and other, similar programs, specifically ARB's GMP and the NNI report.

For purposes of this comparison, the "assumed base emissions" listed for each emission source type and calendar year is the inventory as estimated by CARB that served as the basis of their Goods Movement Plan.

Figures 6.1 and 6.2 provide a graphical illustration of the DPM and NOx emissions estimated to remain after implementation of the Clean Air Action Plan, the GMP, and NNI. In these charts, the "projected growth" emissions line represents the emissions as estimated by the ARB that would occur with normal growth and the effect of regulations in place as of October, 2005. The "GMP" line represents the ARB's estimates of emissions that will occur after implementation of their GMP measures for South Coast ports and international goods movement. The "NNI" line represents emissions that the NNI report estimated would have occurred had the measures contained in that report been successfully implemented. The "CAAP" line represents emissions after implementation of the Clean Air Action plan measures.

These charts have been prepared as a means of comparing the relative effectiveness of the plans as they have been conceived, independent of the synergies that will occur between, for example, the GMP and the Clean Air Action Plan. Because the GMP will affect many of the same types of emission sources as the Clean Air Action Plan (e.g., for cargo handling equipment), the actual emissions after implementation of both plans will be lower than either of the relevant lines on the charts would indicate.

Figure 6.1: Comparison of DPM "Emissions Remaining" – All Source Categories

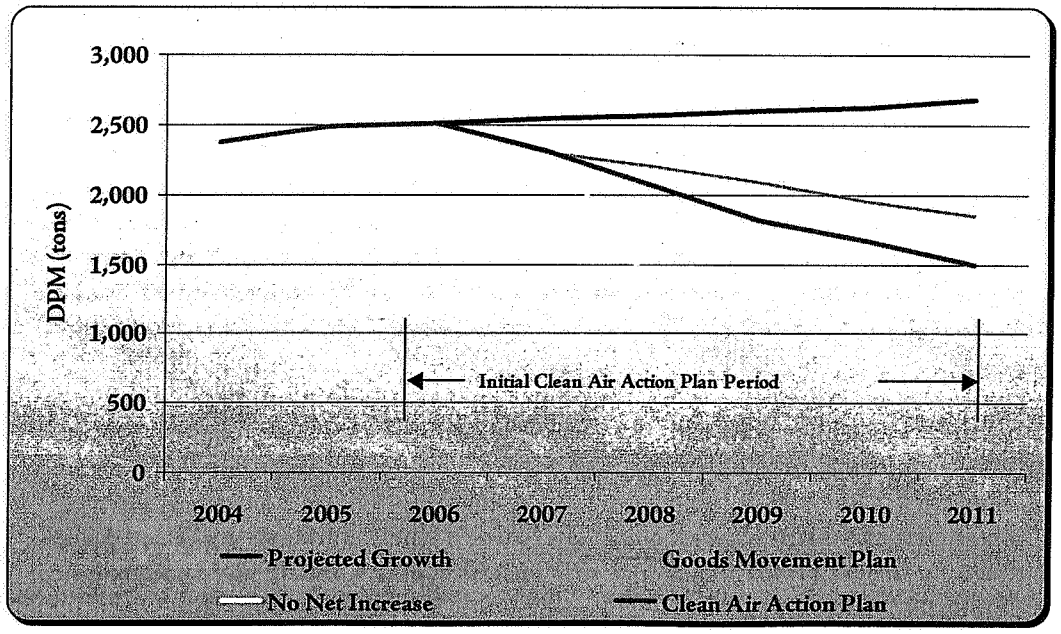
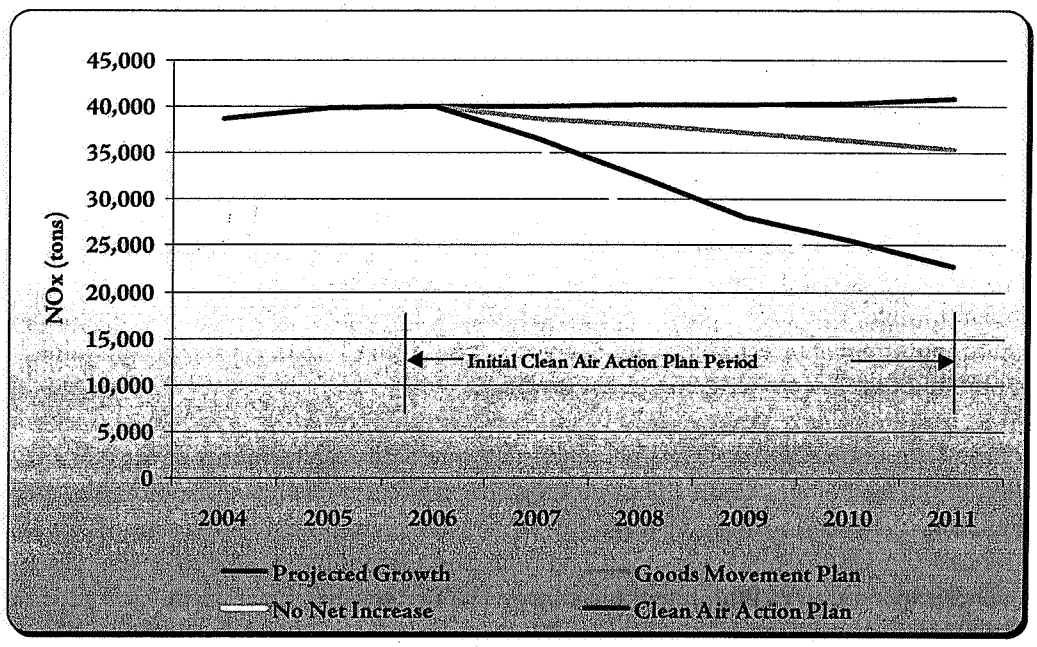


Figure 6.2: Comparison of NOx "Emissions Remaining" – All Source Categories



These charts show that the NNI projections of DPM reductions appear to be greater than the Clean Air Action Plan reductions. This is due in part due to differing implementation schedules and assumptions. The Clean Air Action Plan emissions reductions are based on a more detailed analysis of available implementation mechanisms. As an example, a large part of the DPM reductions projected by NNI relied on rapid and extensive implementation of the low-sulfur fuels requirements for ocean-going vessels without specifying particular, enforceable methods that would be used to implement these requirements. In contrast, the Clean Air Action Plan's measures relating to low-sulfur marine fuels have been based on a detailed assessment of the timing of lease openings, because lease provisions will provide the most certainty in implementing the requirements. If faster methods of implementation (such as tariffs) are found to be feasible, then the emission reductions projected by the plan will be accelerated and will more closely match the NNI line.

The reduction in health risk associated with the Clean Air Action Plan will be roughly equivalent to the reduction in emissions of diesel particulate matter. Therefore, reducing DPM by half represents a significant step toward eliminating the public health risk associated with port operations. It is important to note, however, that the location where emissions are released plays an important role in terms of exposure and therefore health risk is not directly correlated to emissions.

The figures on the following pages compare the three plans in terms of projections of tons per year of DPM and NOx remaining after implementation, and the percent reductions of DPM and

NOx, for the HDV, OGV, and CHE measures, respectively. The corresponding tables detail the data underlying these figures, including the projected growth in emissions without additional measures (from GMP) and the estimated emissions remaining after independent implementation of the plans.

In the following four figures covering the plans' effects on HDV emissions, it can be seen that the fifth year of the Clean Air Action Plan will result in emissions of DPM and NOx from HDVs that will be lower than the emissions projected by the GMP, emissions of DPM that are roughly equal to the emissions projected by the NNI, and emissions of NOx that are lower than those projected by NNI. By the year 2011, all frequent caller trucks (those that visit the port once per day or more) and semi-frequent trucks (those that visit the port at least once every other day) will be required to meet, or be cleaner than required by the 2007 US EPA emission standards for on-road PM (0.1 gram per brake-horsepower hour) and the most stringent NOx standard available at the time of purchase or replacement. The projected performance of the Clean Air Action Plan is largely due to this extensive replacement/retrofit measure that will replace many currently operating trucks with new lower emitting diesel or natural gas trucks, and install NOx reducing catalysts on others.

Figure 6.3: Comparison of DPM "Emissions Remaining" – HDVs

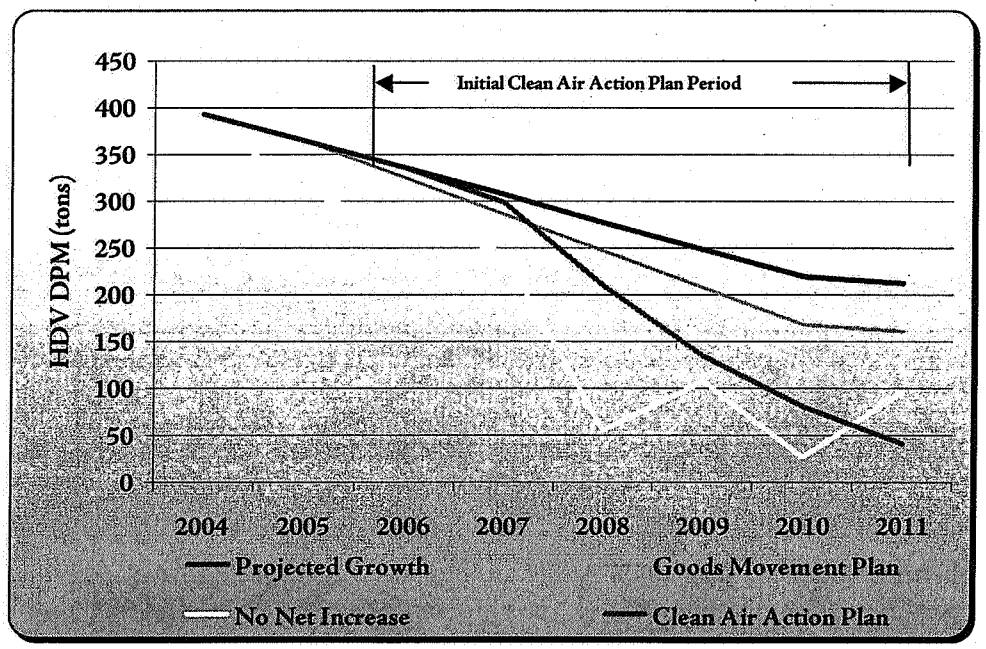


Figure 6.4: Comparison of DPM "Percent Reduction" – HDVs

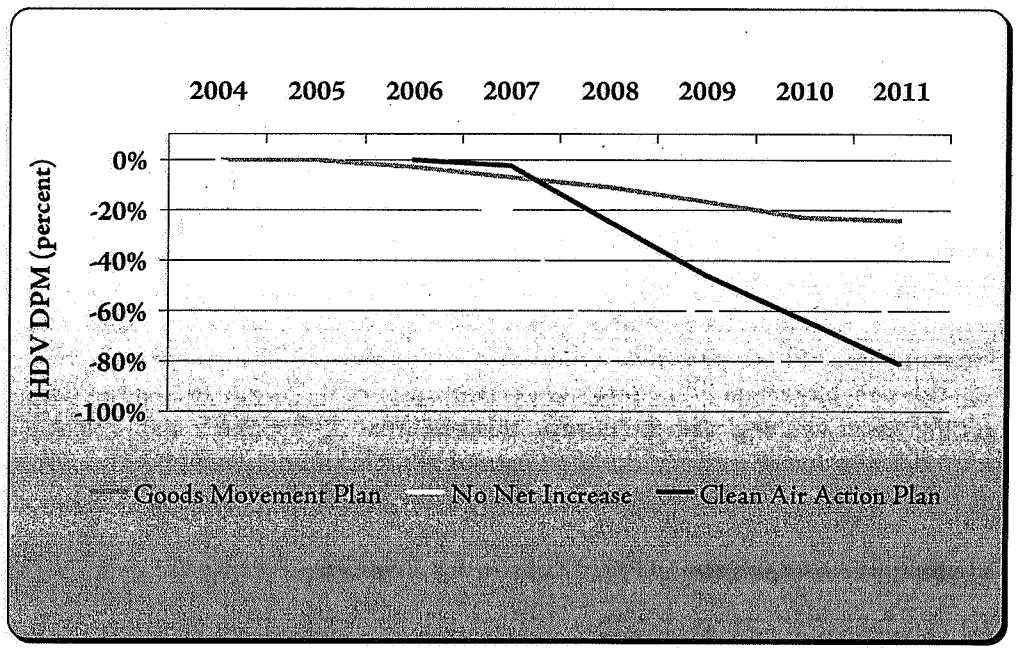


Figure 6.5: Comparison of NOx "Emissions Remaining" – HDVs

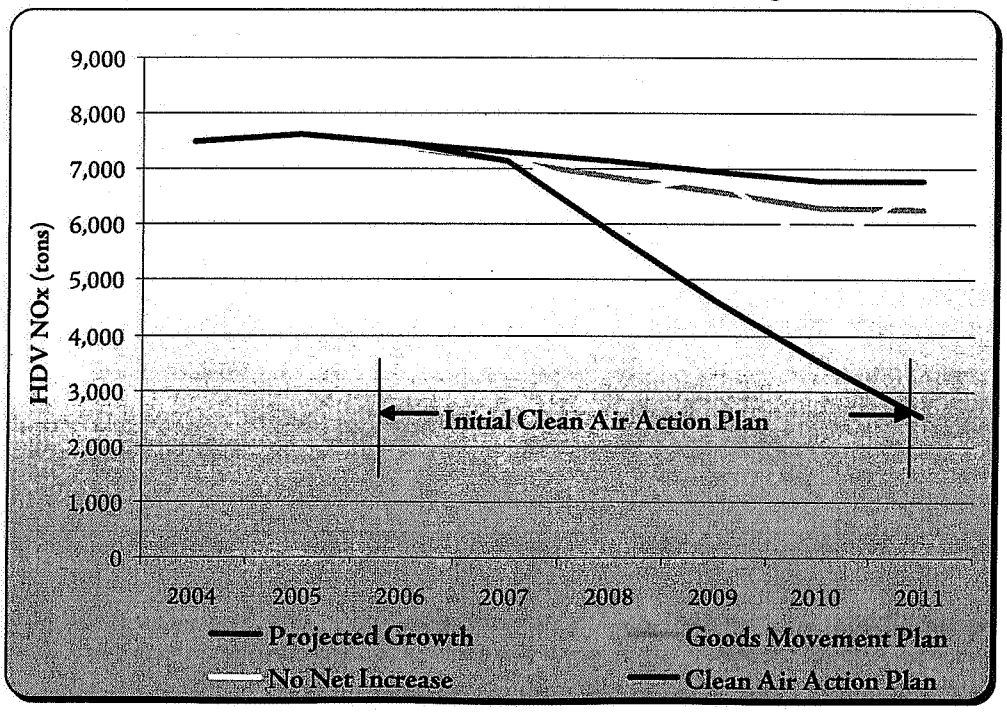


Figure 6.6: Comparison of NOx "Percent Reduction" – HDVs

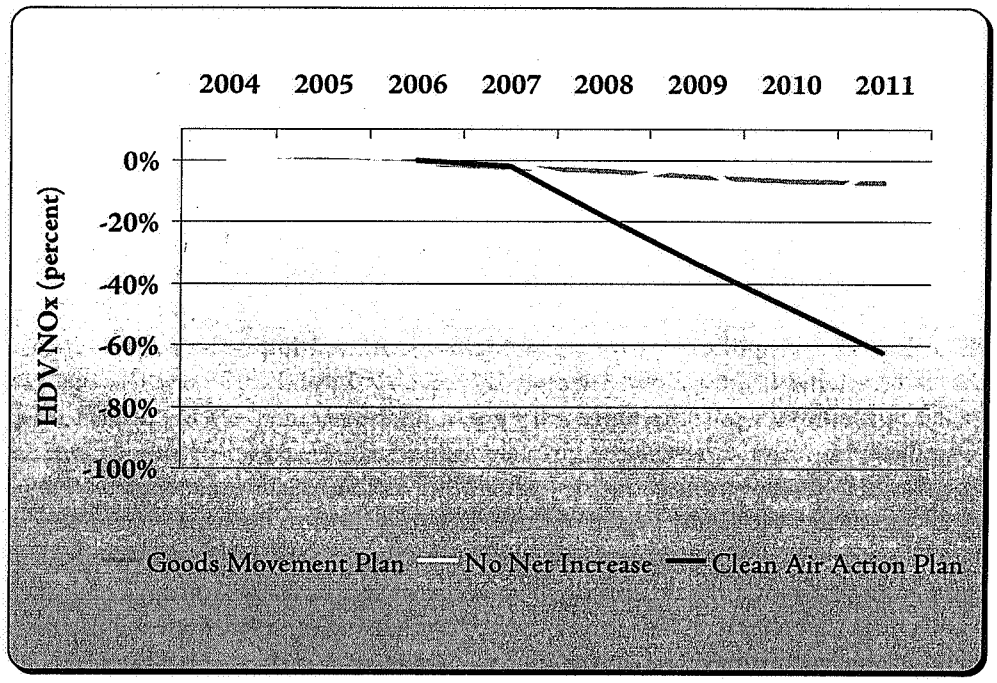


Table 6.3: Emissions Comparison by Plan – HDVs (tons/year)

		2004	2005	2006	2007	2008	2009	2010	2011
Growth	NOx	7,501	7,629	7,461	7,293	7,125	6,957	6,789	6,782
	DPM	392	365	336	307	277	248	219	212
GMP	NOx	7,501	7,629	7,378	7,122	6,861	6,592	6,315	6,283
	% Red	0%	0%	1%	2%	4%	5%	7%	7%
	DPM	392	365	325	285	246	207	168	160
	% Red	0%	0%	3%	7%	11%	17%	23%	25%
NNI	NOx	7,501	7,565	7,387	7,208	6,602	6,861	5,602	6,676
	% Red	0%	1%	1%	1%	7%	1%	17%	2%
	DPM	392	309	277	245	56	107	26	96
	% Red	0%	15%	18%	20%	80%	57%	88%	55%
CAAP	NOx	7,501	7,629	7,461	7,148	5,847	4,631	3,534	2,545
	% Red	0%	0%	0%	2%	18%	33%	48%	62%
	DPM	392	365	336	298	209	135	80	40
	% Red	0%	0%	0%	3%	25%	46%	63%	81%

Under the Clean Air Action Plan, ocean-going vessels will be required to reduce their speeds when approaching or departing the port, resulting in lower emissions from their main engines, use lower sulfur, distillate fuels in their main and auxiliary engines when within 20 to 40 nautical miles from Point Fermin, utilize shore power while at berth rather than running their diesel fired auxiliary engines while hotelling, and utilize NOx and PM control devices on new vessels and existing frequent callers to the ports.

Figure 6.7 shows that the Clean Air Action Plan emissions of DPM from OGVs do not appear to meet the projected emissions of either the Goods Movement Plan or the NNI report. With respect to the Goods Movement Plan, the reductions from that plan include the effects of CARB's auxiliary engine rule, while the reductions from the Clean Air Action Plan do not. In addition, the GMP emissions have been interpolated between the years 2010 and 2015 because these are the years reported in the GMP, possibly understating the 2011 emissions. With respect to the NNI projected reductions, the difference is primarily due to differences in implementation assumptions for the fuel improvement measures, with NNI assuming almost complete change-over of fuels by all vessels in a very short period of time, with no plan as to how that would actually be accomplished. In contrast, the implementation approach taken by the Clean Air Action Plan allows vessel operators a certain amount of time to refit their ships to carry sufficient fuel of the appropriate type, and relies on lease openings as a means of imposing the requirements. If a more expeditious method of implementation is determined to be effective, such as tariff requirements, then the CAAP reductions will be accelerated.

Figure 6.7: Comparison of DPM "Emissions Remaining" –OGVs

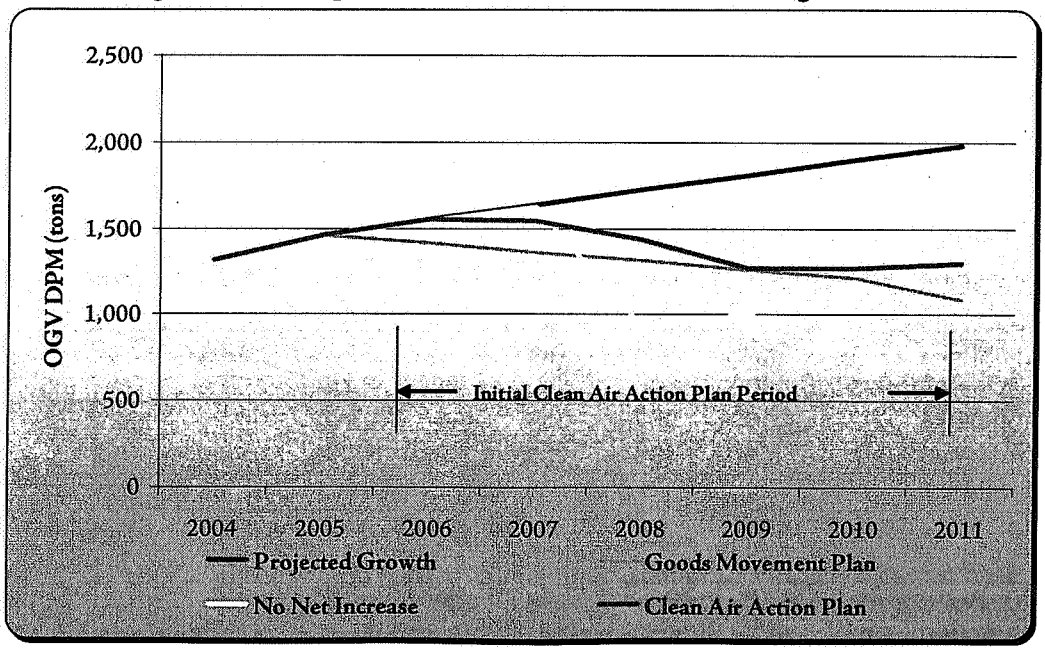


Figure 6.8: Comparison of DPM "Pecent Reduction" – OGVs

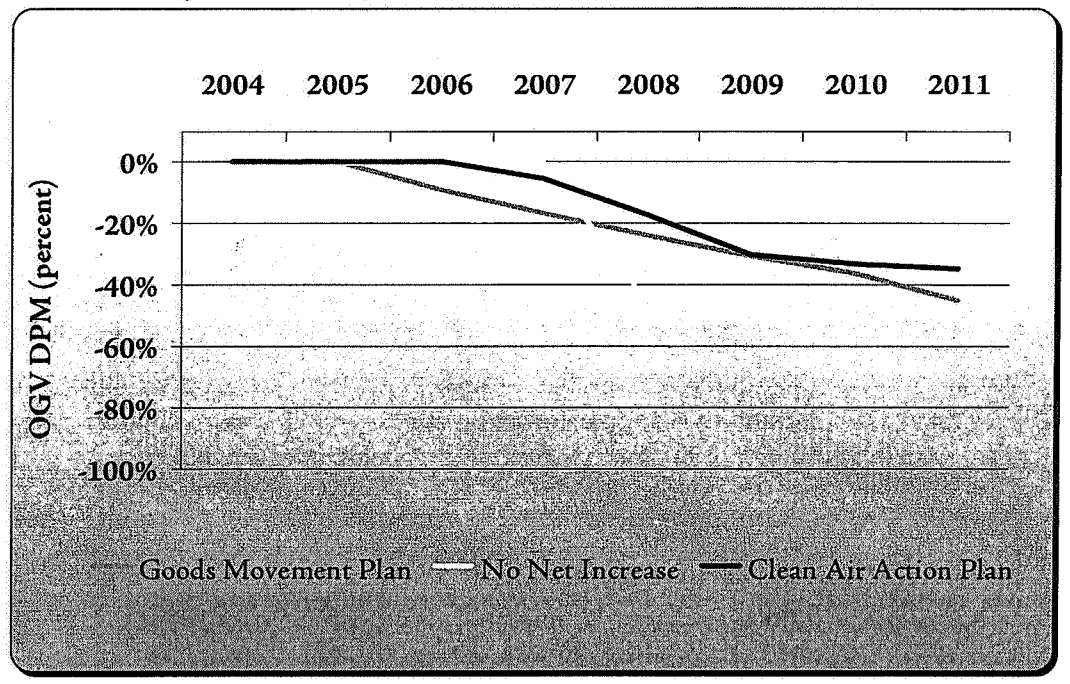


Figure 6.9: Comparison of NOx "Emissions Remaining" – OGVs

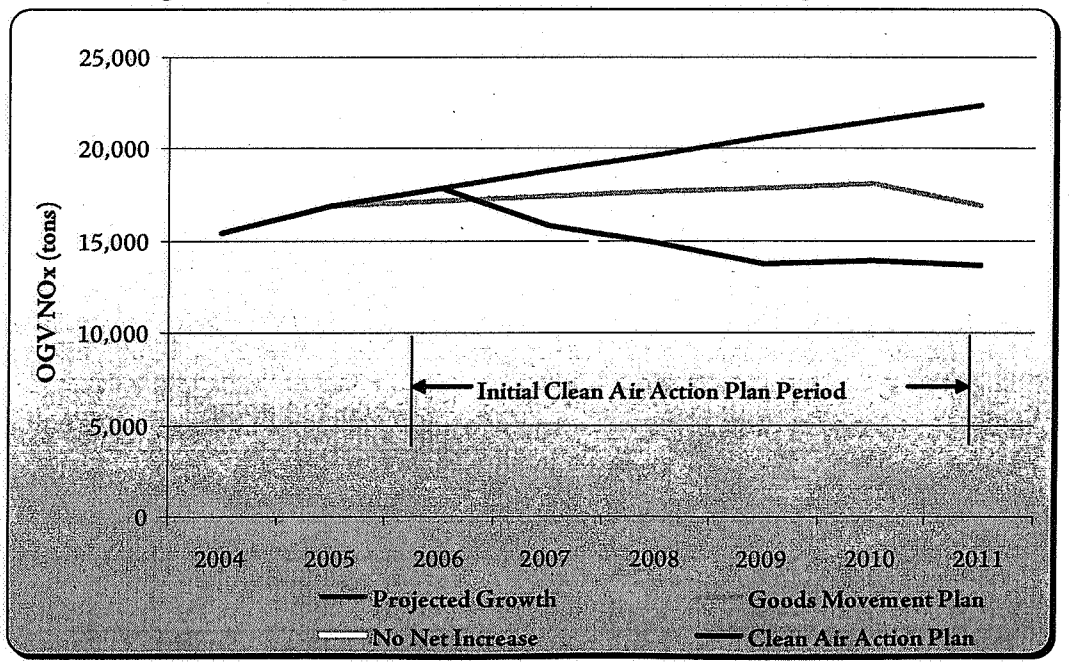


Figure 6.10: Comparison of NOx "Percent Reduction" – OGVs

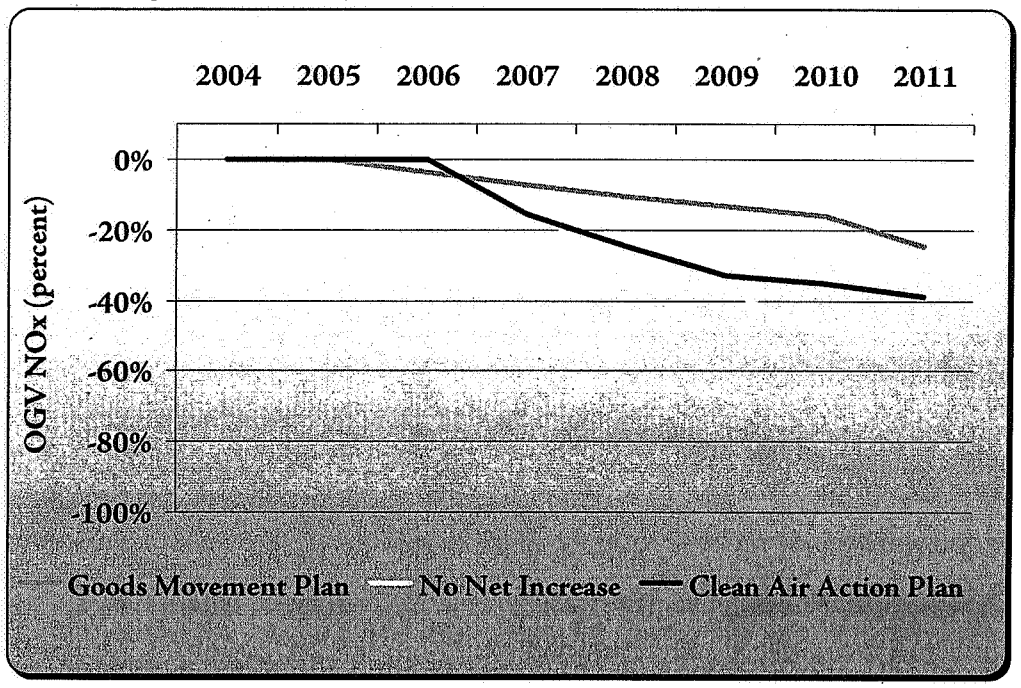


Table 6.4: Emission Reduction Comparison –OGVs (tons/year)

		2004	2005	2006	2007	2008	2009	2010	2011
Growth	NOx	15,440	16,936	17,856	18,776	19,695	20,615	21,535	22,426
	DPM	1,314	1,460	1,548	1,635	1,723	1,810	1,898	1,978
GMP	NOx	15,440	16,936	17,177	17,417	17,656	17,894	18,132	16,878
	% Red	0%	0%	4%	7%	10%	13%	16%	25%
	DPM	1,314	1,460	1,410	1,360	1,310	1,260	1,210	1,089
	% Red	0%	0%	9%	17%	24%	30%	36%	45%
NNI	NOx	15,440	15,409	15,992	16,579	12,825	13,014	11,056	11,236
	% Red	0%	9%	10%	12%	35%	37%	49%	50%
	DPM	1,314	1,457	1,543	1,628	931	1,003	795	816
	% Red	0%	0%	0%	0%	46%	45%	58%	59%
CAAP	NOx	15,440	16,936	17,856	15,884	14,873	13,802	13,980	13,702
	% Red	0%	0%	0%	15%	24%	33%	35%	39%
	DPM	1,314	1,460	1,548	1,544	1,430	1,267	1,267	1,295
	% Red	0%	0%	0%	6%	17%	30%	33%	35%

The Clean Air Action Plan measure CHE1 was designed to be complimentary to the ARB's cargo handling rule adopted in December of 2005. It requires that new purchases conform to the cleanest available technology for NOx and meet or emit less than the standard of 0.1 gram per brake-horsepower-hour for PM. By the end of 2011, all remaining equipment must meet or emit at rates lower than the standards required by U.S. EPA's Tier 4 emission standards. The emissions resulting from the implementation of both the Clean Air Action Plan measure CHE1 and CARB's cargo handling equipment rule are illustrated in figures 6.11 through 6.14 and are compared to the GMP and the NNI. This line shows that the combination of the two measures will results in DPM emissions, which are lower than those resulting from the GMP and are on a par with the NNI projections, and NOx emissions substantially less than those resulting from the GMP.

Figure 6.11: Comparison of DPM "Emissions Remaining" – CHE

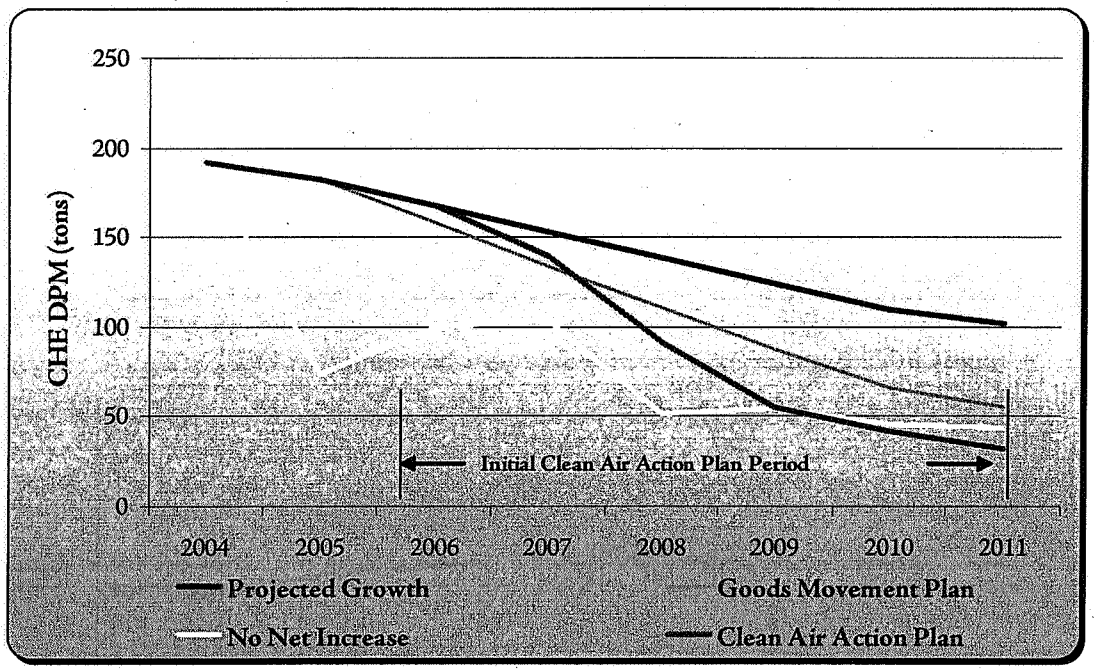


Figure 6.12: Comparison of DPM "Percent Reduction" – CHE

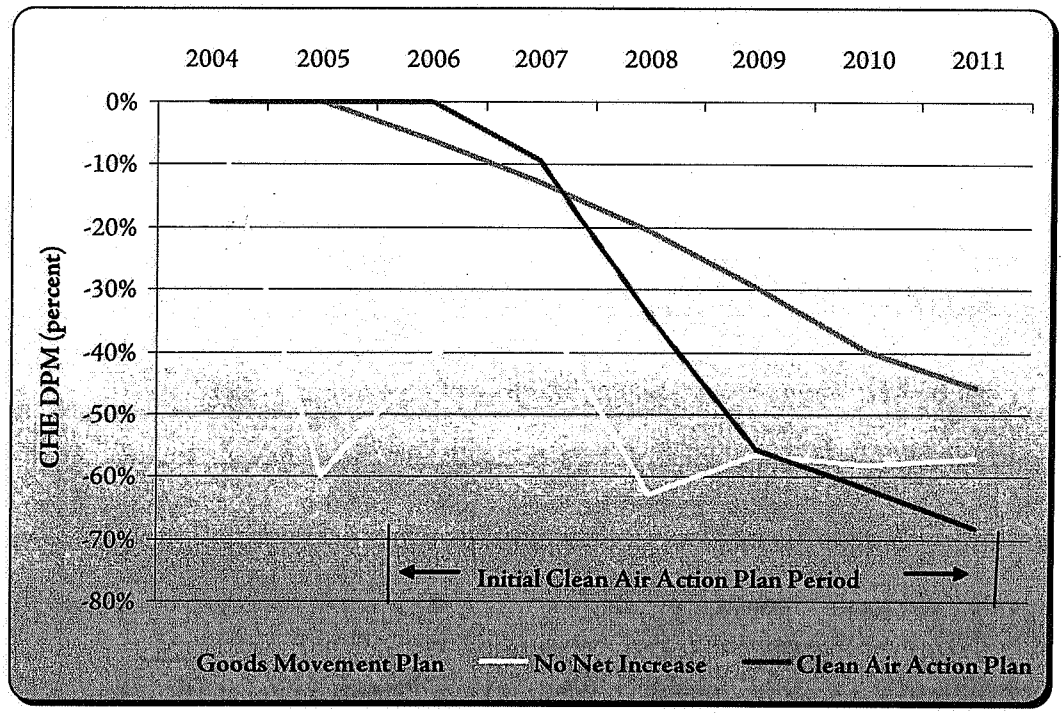


Figure 6.13: Comparison of NOx "Emissions Remaining" – CHE

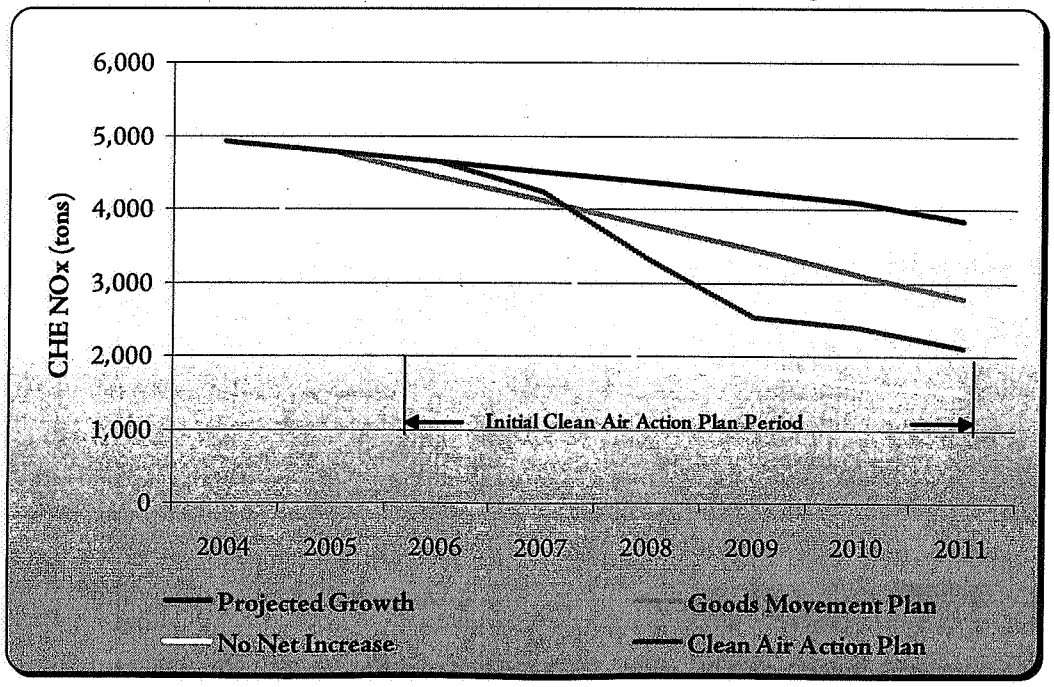


Figure 6.14: Comparison of NOx "Percent Reduction" – CHE

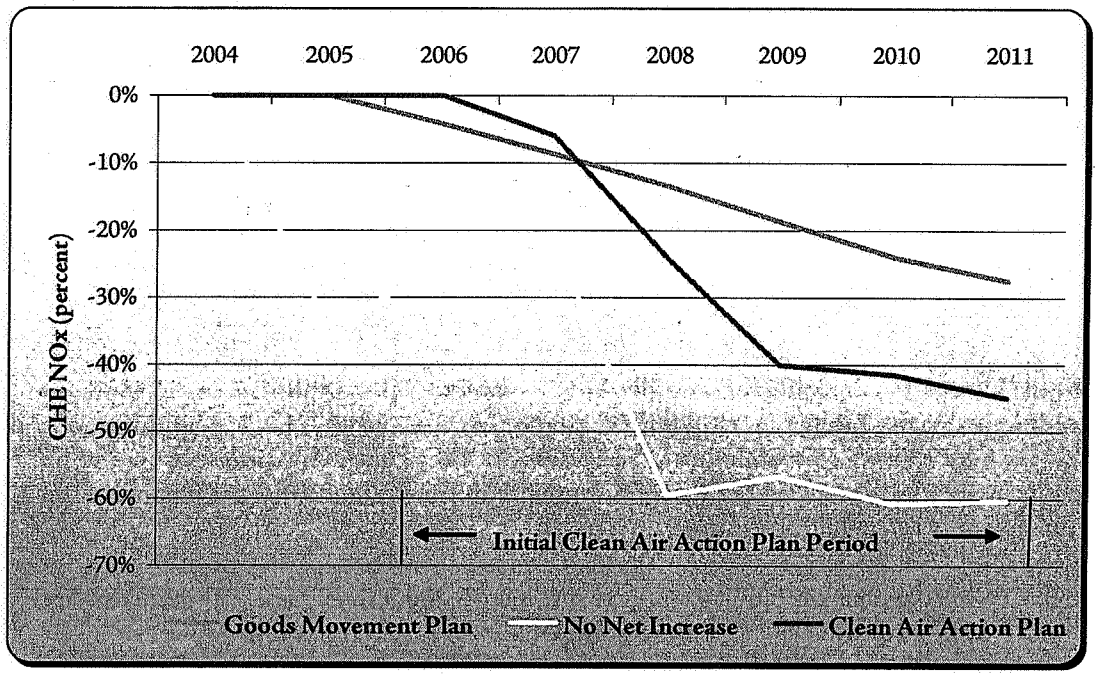


Table 6.14: Emission Reduction Comparison –CHE(tons/year)

		2004	2005	2006	2007	2008	2009	2010	2011
Growth	NOx	4,918	4,782	4,643	4,504	4,365	4,227	4,088	3,840
	DPM	192	183	168	153	139	124	110	102
GMP	NOx	4,918	4,782	4,446	4,110	3,774	3,439	3,104	2,782
	% Red	0%	0%	4%	9%	14%	19%	24%	28%
	DPM	192	183	158	134	110	87	66	55
	% Red	0%	0%	6%	12%	21%	30%	40%	46%
NNI	NOx	4,918	3,151	3,432	3,526	1,772	1,831	1,608	1,529
	% Red								
	DPM	192	73	99	104	51	54	46	44
	% Red	0%	34%	26%	22%	59%	57%	61%	60%
CAAP	NOx	4,918	4,782	4,643	4,234	3,310	2,538	2,394	2,113
	% Red	0%	0%	0%	6%	24%	40%	41%	45%
	DPM	192	183	168	139	91	55	42	32
	% Red	0%	0%	0%	9%	34%	56%	62%	68%

SECTION 7: BUDGET SUMMARY

There are several types of costs and funding sources associated with the implementation of the Clean Air Action Plan, including:

- Costs borne by the industries/terminals affected by the plan's requirements,
- Costs borne by the Ports in developing required infrastructure improvements and funding incentives, and
- Costs borne by regulatory agencies to fund incentives.

All of these funding sources are needed to assure the plan's successful implementation.

This section evaluates the available funding from both Ports, the SCAQMD, CARB, EPA, and potential additional public funds (such as bond funding) for the plan. This report does not include the significant direct costs to industry associated with the control measures that are to be implemented through lease requirements, tariffs, or other implementation strategies that move the cost to industry and ultimately the consumer.

The two types of costs presented in this section are direct costs and indirect costs. Direct costs are those costs that will need to be spent in the implementation of the proposed measures over the next five fiscal years. These costs were estimated to assist financial planning requirements of both Ports. Indirect costs are those costs that occur as a result of the implementation of the Clean Air Action Plan.

Similar to the entire Clean Air Action Plan, the budget estimates will be reexamined each year prior to the budget cycle so that the Ports can plan for the needed funding levels for the upcoming fiscal year. The revised budget estimates will be published for public review as part of the Clean Air Action Plan annual update.

7.1 Direct Costs

Both Ports are committing significant direct funding to the Clean Air Action Plan. For budgetary planning purposes, the Ports need to identify available funding streams from the air agencies, other entities, etc., and to identify Port-related funding that will be dedicated to the plan over the next five fiscal years and beyond. Incentive funding includes funding to accelerate emissions reductions from HDVs and OGVs, and funding of the Technology Advancement Program. Incentive funding does not include any capital infrastructure costs (shore side power costs), the existing PHL switch engine fleet turn over MOU, infrastructure and operational improvement funding, and the Port of Los Angeles' China Shipping Settlement funding. Administration costs include the level of effort anticipated to administer and track the performance of the various control measures and programs presented in the Clean Air Action Plan. Current total monetary commitments for each funding entity over the next five years:

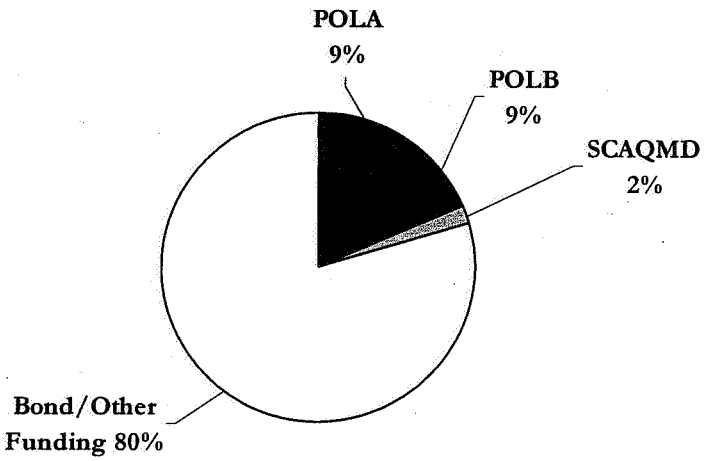
- Port of Los Angeles $177,400,000
- Port of Long Beach $181,000,000
- SCAQMD (initial) $36,000,000
- Bond & Other Funding $1,583,300,000 (not committed at this time)

Table 7.1 presents the fiscal year distribution of the above total Clean Air Action Plan funding anticipated to be spent over the next five years. These amounts include the elements as presented in Sections 4 and 5 (incentive funding, capital costs, the PHL MOU, Port of Los Angeles China Shipping settlement monies, and plan administration). Figure 7.1 presents the percent of that funding by entity.

Table 7.1: Total Costs by Entity Over Next Five Years

	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Totals
POLA	$39,500,000	$47,600,000	$35,100,000	$28,600,000	$26,600,000	**$177,400,000**
POLB	$40,200,000	$36,300,000	$34,900,000	$34,800,000	$34,800,000	**$181,000,000**
SCAQMD	$12,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$36,000,000**
Bond/Other Funding	$0	$425,400,000	$409,900,000	$374,000,000	$374,000,000	**$1,583,300,000**
FY Totals	**$91,700,000**	**$515,300,000**	**$485,900,000**	**$443,400,000**	**$441,400,000**	**$1,977,700,000**

Figure 7.1: Percent of Total Costs by Entity



Other potential funding entities could include the Maritime Goods Coalition, the West Coast Diesel Collaborative, the EPA, the US Department of Transportation, the Department of Energy, etc. Staff from both Ports will continue to identify potential entities and include them in the list of possible funding sources.

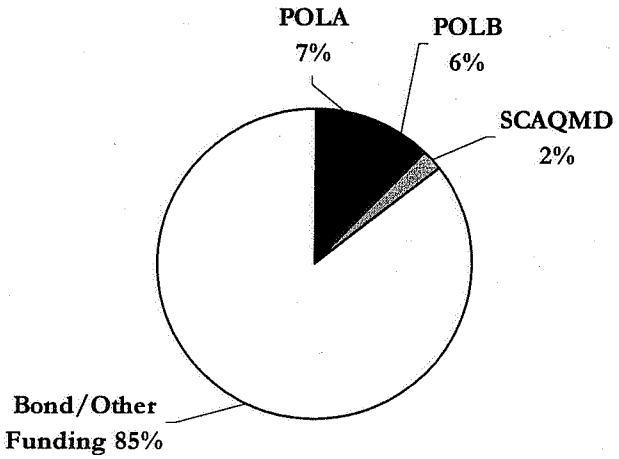
The San Pedro Bay Ports Clean Air Action Plan total operational costs (without the PHL MOU, shore-power infrastructure capital costs, and the Port of Los Angeles China Shipping settlement monies) are presented by entity and fiscal year in Table 7.2. Figure 7.2 presents the percentage of the total costs over the five fiscal years by entity. These operational costs represent the funding budgets beyond existing and capital projects for each Port.

Table 7.2: Total Operational Costs by Entity

	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
POLA	$23,000,000	$25,600,000	$22,600,000	$22,600,000	$22,600,000	**$116,400,000**
POLB	$21,700,000	$21,300,000	$20,300,000	$20,300,000	$20,300,000	**$103,900,000**
SCAQMD	$12,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$36,000,000**
Bond/Other Funding	$0	$425,400,000	$409,900,000	$374,000,000	$374,000,000	**$1,583,300,000**
Totals	**$56,700,000**	**$478,300,000**	**$458,800,000**	**$422,900,000**	**$422,900,000**	**$1,839,600,000**

Note: This does not include PHL, shore-power capital costs, and POLA CS monies.

Figure 7.2: Percent of Total Operational Costs by Entity



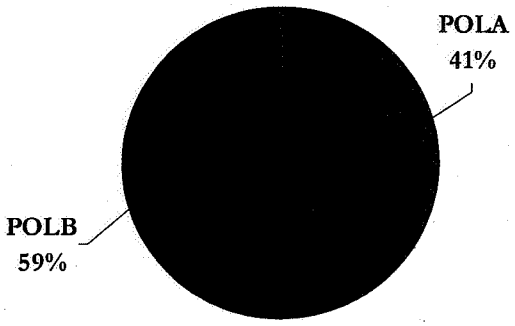
The total capital costs by Port are presented in Table 7.3 and Figure 7.3.

Table 7.3: Total Capital Costs by Port

	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Totals
POLA	$6,700,000	$21,100,000	$12,500,000	$6,000,000	$4,000,000	**$50,300,000**
POLB	$14,900,000	$16,000,000	$14,600,000	$14,500,000	$14,500,000	**$74,500,000**
SCAQMD	tbd	tbd	tbd	tbd	tbd	**$0**
Bond/Other Funding	$0	$0	$0	$0	$0	**$0**
FY Totals	**$21,600,000**	**$37,100,000**	**$27,100,000**	**$20,500,000**	**$18,500,000**	**$124,800,000**

Note: This does not include POLA CS monies

Figure 7.3: Percent of Total Capital Costs by Port



Note: This does not include POLA CS monies.

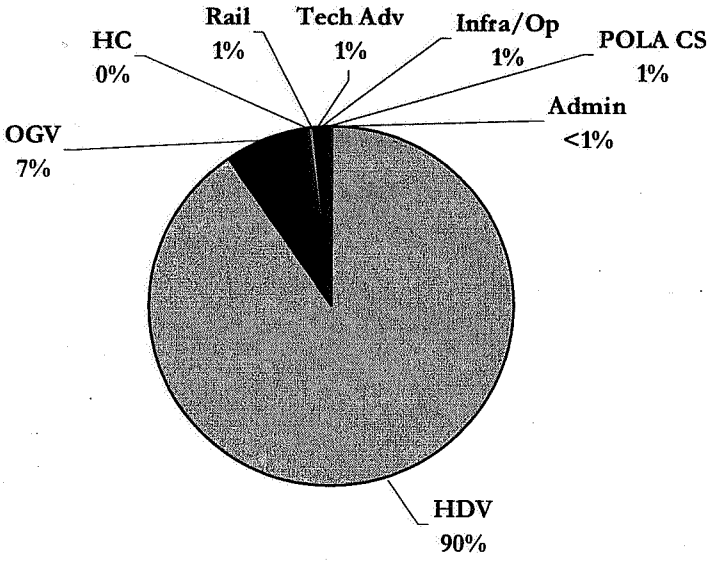
The total costs (operational and capital) spent by source category and Clean Air Action Plan initiative are provided by fiscal year in Table 7.4 and Figure 7.4 presents the percent of total funding for those categories over the five year period.

Table 7.4: Total Costs by Source Category & Initiative by Fiscal Year

Total SPBPCAAP Funding	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Totals
HDV	$46,000,000	$465,400,000	$449,900,000	$414,000,000	$414,000,000	**$1,789,300,000**
OGV	$25,100,000	$39,500,000	$31,500,000	$24,900,000	$22,900,000	**$143,900,000**
HC	$0	$0	$0	$0	$0	**$0**
Rail	$10,000,000	$0	$0	$0	$0	**$10,000,000**
Tech Adv	$3,000,000	$3,000,000	$3,000,000	$3,000,000	$3,000,000	**$15,000,000**
Infra/Op	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	**$5,000,000**
POLA CS	$6,000,000	$6,000,000	$0	$0	$0	**$12,000,000**
Admin	$500,000	$500,000	$500,000	$500,000	$500,000	**$2,500,000**
FY Totals	**$91,600,000**	**$515,400,000**	**$485,900,000**	**$443,400,000**	**$441,400,000**	**$1,977,700,000**

Note: POLA CS – Port of Los Angeles China Shipping settlement money

Figure 7.4: Percent of Total Costs Five by Source Category & Initiative



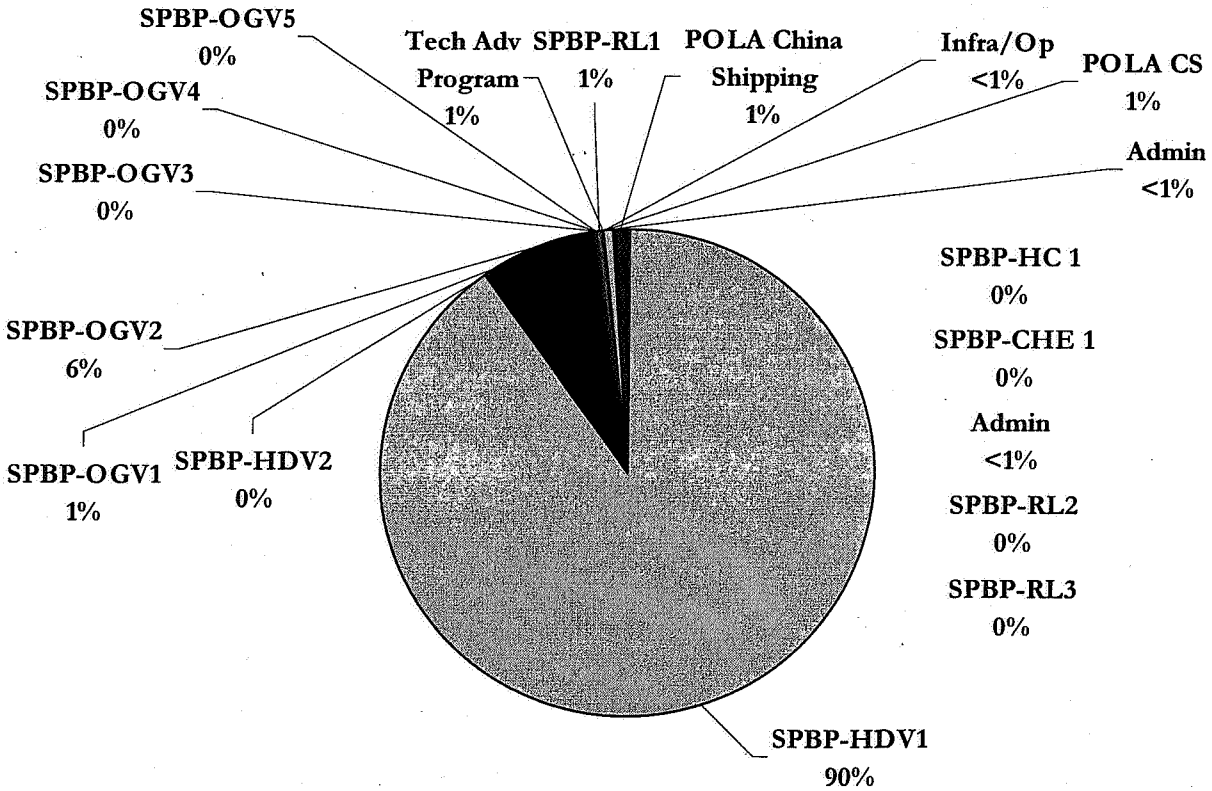
The total costs (operational and capital) associated by control measure and Clean Air Action Plan initiative by fiscal year are presented in Table 7.5 and the percent of total costs of each control measure and initiative are presented in Figure 7.5 on the next.

Table 7.5: Clean Air Action Plan Total Costs by Control Measure & Initiative by Fiscal Year

Total SPBPCAAP Funding	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Totals
SPBP-HDV1	$44,000,000	$463,400,000	$449,900,000	$414,000,000	$414,000,000	**$1,785,300,000**
SPBP-HDV2	$2,000,000	$2,000,000	$0	$0	$0	**$4,000,000**
SPBP-OGV1	$5,100,000	$4,400,000	$4,400,000	$4,400,000	$4,400,000	**$22,700,000**
SPBP-OGV2	$20,000,000	$35,100,000	$27,100,000	$20,500,000	$18,500,000	**$121,200,000**
SPBP-OGV3	$0	$0	$0	$0	$0	**$0**
SPBP-OGV4	$0	$0	$0	$0	$0	**$0**
SPBP-OGV5	$0	$0	$0	$0	$0	**$0**
SPBP-CHE 1	$0	$0	$0	$0	$0	**$0**
SPBP-HC 1	$0	$0	$0	$0	$0	**$0**
SPBP-RL1	$10,000,000	$0	$0	$0	$0	**$10,000,000**
SPBP-RL2	$0	$0	$0	$0	$0	**$0**
SPBP-RL3	$0	$0	$0	$0	$0	**$0**
Tech Advancement Program	$3,000,000	$3,000,000	$3,000,000	$3,000,000	$3,000,000	**$15,000,000**
Infra/Op	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	**$5,000,000**
POLA China Shipping	$6,000,000	$6,000,000	$0	$0	$0	**$12,000,000**
Admin	$500,000	$500,000	$500,000	$500,000	$500,000	**$2,500,000**
FY Totals	**$91,600,000**	**$515,400,000**	**$485,900,000**	**$443,400,000**	**$441,400,000**	$1,977,700,000

Note: Port of Long Beach shore-power operational and capital costs are being identified and are not included at this time.

Figure 7.5: Clean Air Action Plan Percent Total Costs by Control Measure & Initiative



7.2 Indirect Costs

The second type of costs associated with the Clean Air Action Plan are indirect costs to the Ports resulting from the implementation of the plan. Potential indirect costs include:

- Reduction of revenue from lost of invitees
- Reduction of revenue from reduced rate of return during lease negotiations
- Cargo diversion to other West Coast ports
- Other undetermined costs associated with implementation of the Clean Air Action Plan

These costs cannot be quantified at this time, however they could be significant and should be monitored throughout the implementation of the Clean Air Action Plan. These costs are factors that should be considered when developing Port budgets and may have an impact on bonding decisions.

DRAFT

SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN TECHNICAL REPORT

APPENDIX A

June 2006

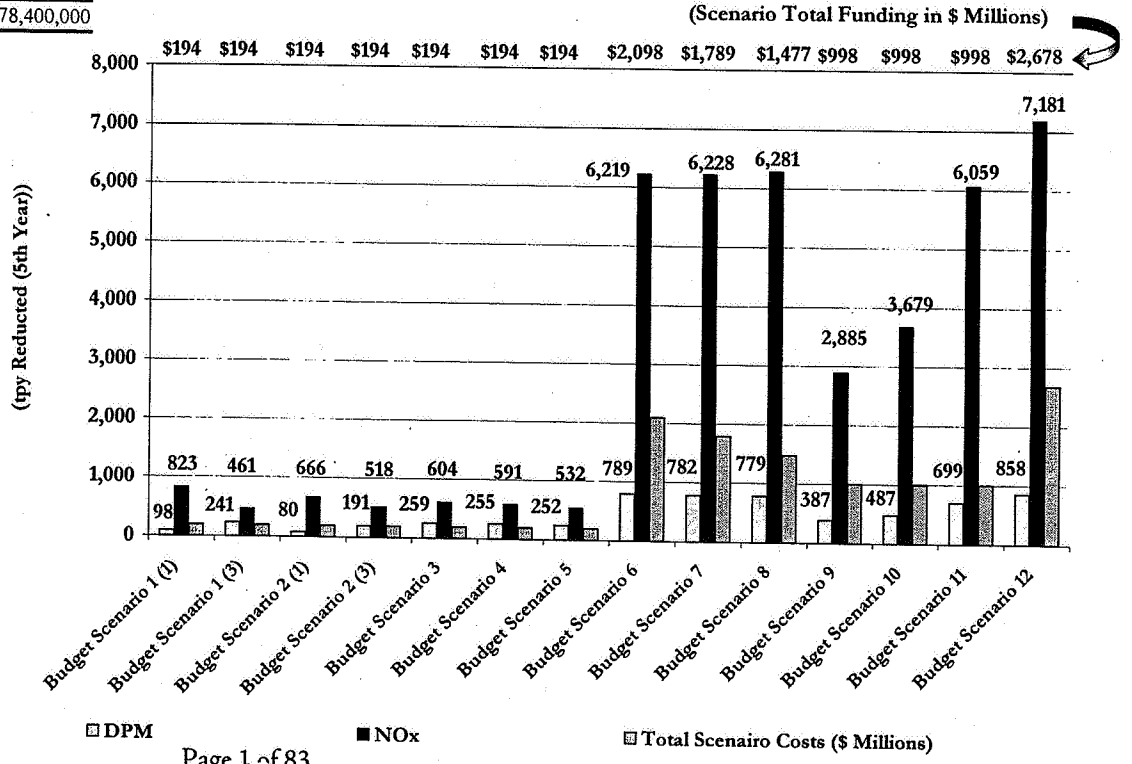
San Pedro Bay Ports Clean Air Action Plan

DRAFT - Scenarios for Policy Discussion

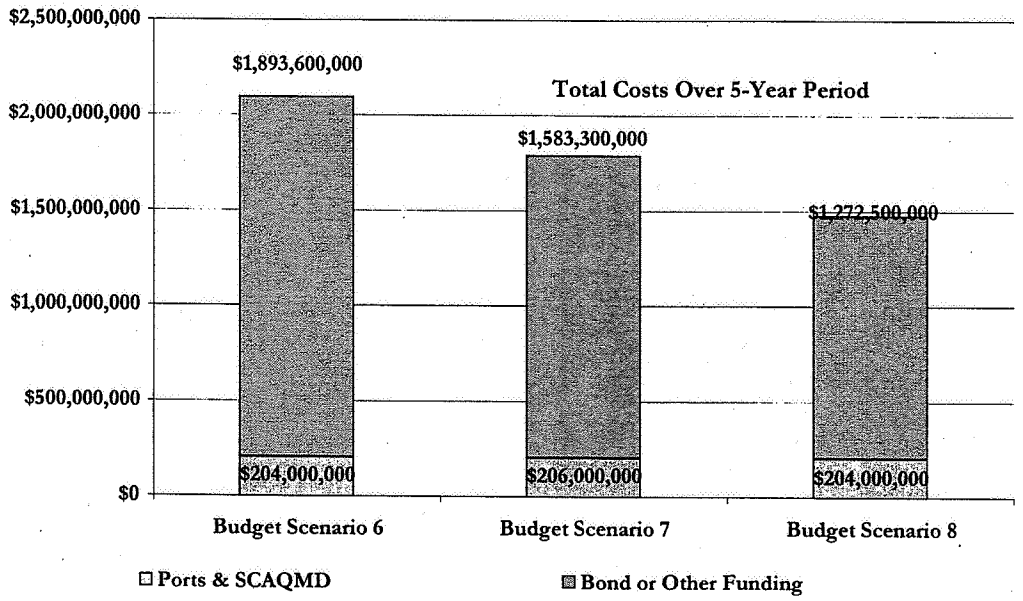
Heavy-Duty Vehicles (Trucks)

DRAFT

	Reductions (5th Year) DPM (tpy)	NOx (tpy)	Total Scenairo Costs (US$)
Budget Scenario 1 (1)	98	823	$194,000,000
Budget Scenario 1 (3)	241	461	$194,000,000
Budget Scenario 2 (1)	80	666	$194,000,000
Budget Scenario 2 (3)	191	518	$194,000,000
Budget Scenario 3	259	604	$194,000,000
Budget Scenario 4	255	591	$194,000,000
Budget Scenario 5	252	532	$194,000,000
Budget Scenario 6	789	6,219	$2,097,600,000
Budget Scenario 7	782	6,228	$1,789,300,000
Budget Scenario 8	779	6,281	$1,476,500,000
Budget Scenario 9	387	2,885	$998,000,000
Budget Scenario 10	487	3,679	$998,000,000
Budget Scenario 11	699	6,059	$998,000,000
Budget Scenario 12	858	7,181	$2,678,400,000



	Reductions (5th Year) DPM (tpy)	NOx (tpy)	Total Scenairo Costs (US$)	Ports & SCAQMD (US$)	Bond or Other Funding (US$)
Budget Scenario 6	789	6,219	$2,097,600,000	$204,000,000	$1,893,600,000
Budget Scenario 7	782	6,228	$1,789,300,000	$206,000,000	$1,583,300,000
Budget Scenario 8	779	6,281	$1,476,500,000	$204,000,000	$1,272,500,000



San Pedro Bay Ports Clean Air Action Plan
DRAFT - Scenarios for Policy Discussion
Heavy-Duty Vehicles (Trucks)

DRAFT

Totals Over 5 FY

	Total Clean Air Action Plan Clean Diesel (CD) Incentives	Total Clean Air Action Plan Alt Fuel Spending	Total 5 Fiscal Year Incentives	
Budget Scenario 1	$140,000,000	$54,000,000	$194,000,000	No Bond Funding
Budget Scenario 2	$36,000,000	$158,000,000	$194,000,000	
Budget Scenario 3	$152,000,000	$42,000,000	$194,000,000	
Budget Scenario 4	$142,000,000	$52,000,000	$194,000,000	
Budget Scenario 5	$104,000,000	$90,000,000	$194,000,000	
Budget Scenario 6	$102,300,000	$1,995,300,000	$2,097,600,000	Bond Funding
Budget Scenario 7	$784,100,000	$1,005,200,000	$1,789,300,000	
Budget Scenario 8	$1,444,500,000	$32,000,000	$1,476,500,000	
Budget Scenario 9	$6,000,000	$992,000,000	$998,000,000	
Budget Scenario 10	$486,000,000	$512,000,000	$998,000,000	
Budget Scenario 11	$966,000,000	$32,000,000	$998,000,000	
Budget Scenario 12	$1,072,800,000	$1,605,600,000	$2,678,400,000	

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HDV Fleet Truck Characteristic (from work on 2005 EI Update)
~40,000+ Individual Trucks Serving San Pedro Bay Ports

Of Those,
~7,000 Frequent Callers (7 trips/wk or more) = 50% of All Calls
~9,800 Semi-Frequent Callers (3.5 to <7 trips/wk) = 30% of All Calls
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Draft 37 Common Days Frequent Truck MY Distribution
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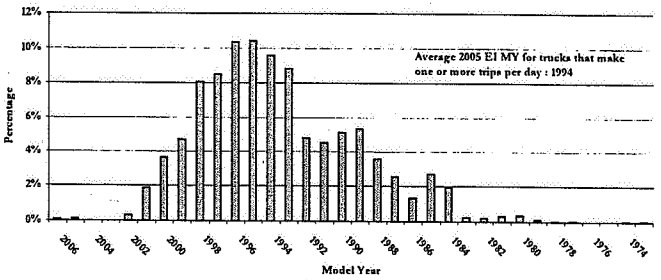


Note: $1M/year is included in Tech Adv Program for electric/hybrid trucks (not shown)

Budget Scenario 1
Funding Mostly CD New Trucks

Deployment Combination 1		Total #'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding New Trucks		1,081 trucks	77		653	
100% Alt Fuel Funding New LNG		276 trucks	20		170	
		1,357 trucks	98	298 Total	823	2,378 Total

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding New Trucks	1,081 trucks	77		653	
100% Alt Fuel Funding Westport LNG	276 trucks	20		185	
	1,357 trucks	98	298 Total	838	2,422 Total

Funding Mostly CD DPFs

Deployment Combination 3	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding DPFs	5,700 DPFs	186		0	
100% Alt Fuel Funding New LNG	746 trucks	55		461	
		241	814 Total	461	1,217 Total

Deployment Combination 4	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding DPFs	5,700 DPFs	186		0	
100% Alt Fuel Funding Westport LNG	746 trucks	54		501	
		241	814 Total	501	1,337 Total

Budget Scenario 2
Funding Mostly Alt Fuel New Trucks

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding New Trucks	278 trucks	20		148	
100% Alt Fuel Funding New LNG	828 trucks	61		518	
	1,106 trucks	80	254 Total	666	2,057 Total

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding New Trucks	278 trucks	20		148	
100% Alt Fuel Funding Westport LNG	828 trucks	60		560	
	1,106 trucks	80	254 Total	708	2,170 Total

Funding Mostly CD DPFs

Deployment Combination 3	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding DPFs	4,000 DPFs	131		0	
100% Alt Fuel Funding New LNG	828 trucks	61		518	
		191	796 Total	518	1,332 Total

Deployment Combination 4	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
100% CD Funding DPFs	4,000 DPFs	131		0	
100% Alt Fuel Funding Westport LNG	828 trucks	60		560	
		191	796 Total	560	1,445 Total

Budget Scenario 3
Funding Mostly CD

Deployment Combination 1		#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
CD Funding New Trucks	66%	775 trucks	56		473	
CD Funding DPFs	34%	5,742 DPFs	188		0	
Alt Fuel Funding New LNG		212 trucks	16		130	
		987 trucks	259	783 Total	604	1,724 Total
		5,742 DPFs				

Deployment Combination 2		#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
CD Funding New Trucks	66%	775 trucks	56		473	
CD Funding DPFs	34%	5,742 DPFs	188		0	
Alt Fuel Funding Westport LNG		212 trucks	15		142	
		987 trucks	259	783 Total	615	1,763 Total
		5,742 DPFs				

Budget Scenario 4
Fudning Mostly CD

Deployment Combination 1		#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
CD Funding New Trucks	64%	702 trucks	50		429	
CD Funding DPFs	36%	5,680 DPFs	186		0	
Alt Fuel Funding New LNG		265 trucks	19		163	
		967 trucks	255	773 Total	591	1,694 Total
		5,680 DPFs				

Deployment Combination 2		#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
CD Funding New Trucks	0%	702 trucks	50		429	
CD Funding DPFs	0%	5,680 DPFs	186		0	
Alt Fuel Funding Westport LNG		0 trucks	19		178	
		702 trucks	255	773 Total	606	1,743 Total
		5,680 DPFs				

Budget Scenario 5
Fudning Mostly Alt Fuels

Deployment Combination 1		#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding New LNG		467 trucks	34		287	
CD Funding New Trucks	50%	402 trucks	29		245	
CD Funding DPFs	50%	5,778 DPFs	189		0	
		868 trucks	252	771 Total	532	1,538 Total
		5,778 DPFs				

Deployment Combination 2		#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding Westport LNG		467 trucks	34		313	
CD Funding New Trucks	50%	402 trucks	29		245	
CD Funding DPFs	50%	5,778 DPFs	189		0	
		868 trucks	252	771 Total	558	1,621 Total
		5,778 DPFs				

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Scenarios for Policy Discussion

Heavy-Duty Vehicles (Trucks)

DRAFT

Totals Over 5 FY

	Total Clean Air Action Plan Clean Diesel (CD) Incentives	Total Clean Air Action Plan Alt Fuel Spending	Total 5 Fiscal Year Incentives	
Budget Scenario 1	$140,000,000	$54,000,000	$194,000,000	No Bond Funding
Budget Scenario 2	$36,000,000	$158,000,000	$194,000,000	
Budget Scenario 3	$152,000,000	$42,000,000	$194,000,000	
Budget Scenario 4	$142,000,000	$52,000,000	$194,000,000	
Budget Scenario 5	$104,000,000	$90,000,000	$194,000,000	
Budget Scenario 6	$102,300,000	$1,995,300,000	$2,097,600,000	Bond Funding
Budget Scenario 7	$784,100,000	$1,005,200,000	$1,789,300,000	
Budget Scenario 8	$1,444,500,000	$32,000,000	$1,476,500,000	
Budget Scenario 9	$6,000,000	$992,000,000	$998,000,000	
Budget Scenario 10	$486,000,000	$512,000,000	$998,000,000	
Budget Scenario 11	$966,000,000	$32,000,000	$998,000,000	
Budget Scenario 12	$1,072,800,000	$1,605,600,000	$2,678,400,000	

< PRELIMINARY DRAFT RESULTS >

HDV Fleet Truck Characteristic (from work on 2005 EI Update)

~40,000+ Individual Trucks Serving San Pedro Bay Ports

Of Those,

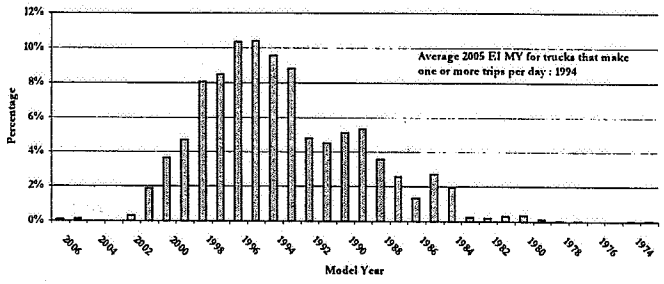
~7,000 Frequent Callers (7 trips/wk or more) = 50% of All Calls

~9,800 Semi-Frequent Callers (3.5 to <7 trips/wk) = 30% of All Calls

~16,800 Frequent/Semi-Frequent Callers Make 80% of All Calls

Note: $1M/year is included in Tech Adv Program for electric/hybrid trucks (not shown)

Draft 37 Common Days Frequent Truck MY Distribution
2005 EI for POLA & POLB



Budget Scenario 6
Funding Targets 80% of All Truck Calls.

Mostly Alt Fuel Replacements + Retrofits

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding New LNG	10,575 trucks	697		5,444	
CD Funding New Trucks	46 trucks	3		25	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	10,622 trucks	789	2,112 Total	6,219	16,644 Total
	5,956 DPFs				

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding Westport LNG	10,575 trucks	696		5,874	
CD Funding New Trucks	46 trucks	3		25	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	10,622 trucks	788	2,108 Total	6,649	17,757 Total
	5,956 DPFs				

Budget Scenario 7
Funding Targets 80% of All Truck Calls.

50/50 Alt Fuel & CD Replacments + Retrofits

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding New LNG	5,311 trucks	350		2,728	
CD Funding New Trucks	5,311 trucks	344		2,750	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	10,622 trucks	782	2,097 Total	6,228	16,297 Total
	5,956 DPFs				

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding Westport LNG	5,311 trucks	350		3,148	
CD Funding New Trucks	5,311 trucks	344		2,750	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	10,622 trucks	782	2,097 Total	6,648	17,266 Total
	5,956 DPFs				

Budget Scenario 8
Funding Targets 80% of All Truck Calls.

Mostly CD Replacements + Retrofits

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding New LNG	159 trucks	11		80	
CD Funding New Trucks	10,463 trucks	679		5,450	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	10,622 trucks	779	2,104 Total	6,281	16,162 Total
	5,956 DPFs				

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding Westport LNG	159 trucks	10		88	
CD Funding New Trucks	10,463 trucks	679		5,450	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	10,622 trucks	778	2,104 Total	6,288	16,186 Total
	5,956 DPFs				

Budget Scenario 9
Funding Targets 80% of All Truck Calls.

Mostly Alt Fuel Replacments

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding New LNG	5,252 trucks	384		2,860	
CD Funding New Trucks	46 trucks	3		25	
CD Funding Cleaire + Chip Reflash	0 DPFs	0		0	
CD Fudning Cleaire	0 DPFs	0		0	
	5,298 trucks	387	1,013 Total	2,885	7,548 Total
	0 DPFs				

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions DPM		NOx	
Alt Fuel Funding Westport LNG	5,252 trucks	382		3,310	
CD Funding New Trucks	46 trucks	3		25	
CD Funding Cleaire + Chip Reflash	0 DPFs	0		0	
CD Fudning Cleaire	0 DPFs	0		0	
	5,298 trucks	386	1,009 Total	3,335	8,716 Total
	0 DPFs				

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Scenarios for Policy Discussion

Heavy-Duty Vehicles (Trucks)

DRAFT

	Totals Over 5 FY: Total Clean Air Action Plan Clean Diesel (CD) Incentives	Total Clean Air Action Plan Alt Fuel Spending	Total 5 Fiscal Year Incentives	
Budget Scenario 1	$140,000,000	$54,000,000	$194,000,000	No Bond Funding
Budget Scenario 2	$36,000,000	$158,000,000	$194,000,000	
Budget Scenario 3	$152,000,000	$42,000,000	$194,000,000	
Budget Scenario 4	$142,000,000	$52,000,000	$194,000,000	
Budget Scenario 5	$104,000,000	$90,000,000	$194,000,000	
Budget Scenario 6	$102,300,000	$1,995,300,000	$2,097,600,000	Bond Funding
Budget Scenario 7	$784,100,000	$1,005,200,000	$1,789,300,000	
Budget Scenario 8	$1,444,500,000	$32,000,000	$1,476,500,000	
Budget Scenario 9	$6,000,000	$992,000,000	$998,000,000	
Budget Scenario 10	$486,000,000	$512,000,000	$998,000,000	
Budget Scenario 11	$966,000,000	$32,000,000	$998,000,000	
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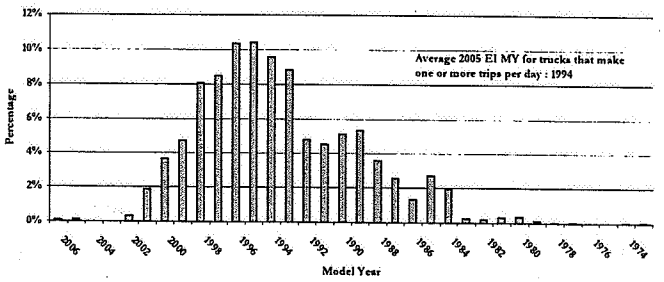

Budget Scenario 10
Funding Targets 80% of All Truck Calls.

50/50 Alt Fuel & CD Replacments + Retrofits

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions: DPM		NOx	
Alt Fuel Funding New LNG	2,706 trucks	198		1,473	
CD Funding New Trucks	3,273 trucks	234		1,746	
CD Funding Cleaire + Chip Reflash	3,000 DPFs	48		414	
CD Fudning Cleaire	844 DPFs	7		45	
	5,979 trucks	487	1,273 Total	3,679	9,591 Total
	3,844 DPFs				

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions: DPM		NOx	
Alt Fuel Funding Westport LNG	2,706 trucks	197		1,705	
CD Funding New Trucks	3,273 trucks	234		1,746	
CD Funding Cleaire + Chip Reflash	3,000 DPFs	48		414	
CD Fudning Cleaire	844 DPFs	7		45	
	5,979 trucks	487	1,270 Total	3,910	10,195 Total
	3,844 DPFs				

Budget Scenario 11
Funding Targets 80% of All Truck Calls.

Mostly CD Replacements + Retrofits

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions: DPM		NOx	
Alt Fuel Funding New LNG	159 trucks	11		86	
CD Funding New Trucks	8,900 trucks	599		5,222	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	9,059 trucks	699	1,633 Total	6,059	13,330 Total
	5,956 DPFs				

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions: DPM		NOx	
Alt Fuel Funding Westport LNG	159 trucks	11		94	
CD Funding New Trucks	8,900 trucks	599		5,222	
CD Funding Cleaire + Chip Reflash	5,112 DPFs	82		705	
CD Fudning Cleaire	844 DPFs	7		45	
	9,059 trucks	699	1,633 Total	6,067	13,356 Total
	5,956 DPFs				

Budget Scenario 12
Funding Targets 80% of All Truck Calls.

Bond Funding CD Retro/Replace Ports/SCAQMD Alt Fuel Replacements

Deployment Combination 1	#'s	Reductions (tpy) - 5th Year & Total Reductions: DPM		NOx	
Alt Fuel Funding New LNG	8,517 trucks	439.52		3,775	
Bond CD Funding New Trucks	8,283 trucks	418.98		3,407	
Bond CD Funding Cleaire + Chip Reflash	0 DPFs	0.00		0	
Bond CD Fudning Cleaire	0 DPFs	0.00		0	
	16,800 trucks	858	2,176 Total	7,181	18,033 Total
	0 DPFs				

Deployment Combination 2	#'s	Reductions (tpy) - 5th Year & Total Reductions: DPM		NOx	
Alt Fuel Funding Westport LNG	326 trucks	11		94	
CD Funding New Trucks	8,283 trucks	419		3,407	
CD Funding Cleaire + Chip Reflash	0 DPFs	0		0	
CD Fudning Cleaire	0 DPFs	0		0	
	8,609 trucks	430	1,633 Total	3,501	13,356 Total
	0 DPFs				

Assumptions

Mileage Accrual rate for Ports trucks is same as in EMFAC2002 ver 2.2

Replaced trucks VMT is same as of the original trucks

SCAQMD will commit $12 million first year then minimum of $6 million per year over the last four fiscal years

ARB & EPA funding not identified at this time

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 1 - Funding Focused on Greatest DPM Emissions Reductions

Budget Overview

Measure #	Measure Description	Budget by Measure						Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Funding Type
	Clean Diesel - POLA	$13,000,000	$15,000,000	$14,000,000	$13,000,000	$12,000,000	$67,000,000	Operational
	Clean Diesel - POLB	$13,000,000	$15,000,000	$14,000,000	$13,000,000	$12,000,000	$67,000,000	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	$6,000,000	Assumes SC annual $
	Clean Diesel - ARB	$0	$0	$0	$0	$0	$0	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	$0	
	Clean Diesel - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$32,000,000	$30,000,000	$28,000,000	$26,000,000	$24,000,000	$140,000,000	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$1,000,000	$1,000,000	$2,000,000	$3,000,000	$4,000,000	$11,000,000	Operational
	LNG - POLB	$1,000,000	$1,000,000	$2,000,000	$3,000,000	$4,000,000	$11,000,000	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	Assumes SCAQMD $6M/y
	LNG - ARB	$0	$0	$0	$0	$0	$0	
	LNG - EPA	$0	$0	$0	$0	$0	$0	
	LNG - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$8,000,000	$8,000,000	$10,000,000	$12,000,000	$14,000,000	$52,000,000	
	Measure FY Totals	$40,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$192,000,000	
SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	
	POLA	$1,000,000	$0	$0	$0	$0	$1,000,000	
	POLB	$1,000,000	$0	$0	$0	$0	$1,000,000	
	SCAQMD	$0	$0	$0	$0	$0	$0	
	ARB	$0	$0	$0	$0	$0	$0	
	EPA	$0	$0	$0	$0	$0	$0	
	Bond Funding	$0	$0	$0	$0	$0	$0	
	Measure FY Totals	$2,000,000	$0	$0	$0	$0	$2,000,000	
	TOTAL HDV COSTS	$42,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$194,000,000	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 1 - Funding Focused on Greatest DPM Emissions Reductions

Budget Scenario 1 - Options for Clean Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$32,000,000	$30,000,000	$28,000,000	$26,000,000	$24,000,000	$140,000,000	

CD Option 1 - Cleaner Diesel Trucks MY2007+

$129,500 /truck ($126k O/Op, $1.3k AVL, $2.2k admin $126K based on ARB's Por

Number of total trucks/year	**247**	**232**	**216**	**201**	**185**	**1,081**
Total DPM Emis Red tpy	18	34	50	64	77	**243**
Total NOx Emis Red tpy	132	255	371	517	653	**1,928**

CD Option 2 - Purchase of DPFs for 1994+ Trucks

$9,000 /truck ($8k DPF, $500 Installation, $500 Incentive)

Number of total DPFs/year	**1,500**	**1,500**	**1,500**	**1,200**	**0**	**5,700**
Total DPM Emis Red tpy	49	98	147	186	186	**667**

Assumes that this would put a DPF on all 1994+ trucks; If ARB rule comes out requiring this then money moves another scenario

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 1 - Funding Focused on Greatest DPM Emissions Reductions

Budget Scenario 1 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$8,000,000	$8,000,000	$10,000,000	$12,000,000	$14,000,000	$52,000,000	
	Number of total trucks/year	**42**	**42**	**53**	**64**	**74**	**276**	
	Total DPM Emis Red tpy	3.1	6.2	10.1	14.7	20.2	**54**	
	Total NOx Emis Red tpy	23	50	83	123	170	**450**	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$8,000,000	$8,000,000	$10,000,000	$12,000,000	$14,000,000	$52,000,000	
	Number of total trucks/year	**42**	**42**	**53**	**64**	**74**	**276**	
	Total DPM Emis Red tpy	3.1	6.2	10.1	14.7	20.1	**54**	
	Total NOx Emis Red tpy	26.7	55.6	91.6	134.8	185.3	**494**	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	**70**	**229**	**342**	**443**	**469**	**1,553**
Total NOx Reduction (tpy)	**155**	**377**	**558**	**735**	**908**	**2,732**
Total SOx Reduction (tpy)	**0.020**	**0.020**	**0.025**	**0.029**	**0.034**	**0.13**

Note

Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 2 - Funding Focused on Quickest POLA Movement to Alt Fuels

Budget Overview

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	Clean Diesel - POLA	$13,000,000	$2,000,000	$0	$0	$0	$15,000,000	Operational
	Clean Diesel - POLB	$13,000,000	$2,000,000	$0	$0	$0	$15,000,000	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	$6,000,000	Assumes SC annual $
	Clean Diesel - ARB	$0	$0	$0	$0	$0	$0	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	$0	
	Clean Diesel - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$32,000,000	$4,000,000	$0	$0	$0	$36,000,000	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$1,000,000	$14,000,000	$16,000,000	$16,000,000	$16,000,000	$63,000,000	Operational
	LNG - POLB	$1,000,000	$14,000,000	$16,000,000	$16,000,000	$16,000,000	$63,000,000	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	$0	
	LNG - EPA	$0	$0	$0	$0	$0	$0	
	LNG - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$8,000,000	$34,000,000	$38,000,000	$38,000,000	$38,000,000	$156,000,000	
	Measure FY Totals	$40,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$192,000,000	
SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	
	POLA	$1,000,000	$0	$0	$0	$0	$1,000,000	
	POLB	$1,000,000	$0	$0	$0	$0	$1,000,000	
	SCAQMD	$0	$0	$0	$0	$0	$0	
	ARB	$0	$0	$0	$0	$0	$0	
	EPA	$0	$0	$0	$0	$0	$0	
	Bond Funding	$0	$0	$0	$0	$0	$0	
	Measure FY Totals	$2,000,000	$0	$0	$0	$0	$2,000,000	
	TOTAL HDV COSTS	$42,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$194,000,000	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 2 - Funding Focused on Quickest POLA Movement to Alt Fuels

Budget Scenario 2 - Options for Clean Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$32,000,000	$4,000,000	$0	$0	$0	$36,000,000	

CD Option 1 - New Cleaner Diesel Trucks

$129,500 /truck ($126k O/Op, $1.3k AVL, $2.2k admin see note below

Number of total trucks/year	247	31	0	0	0	278
Total DPM Emis Red tpy	18	20	20	20	20	97
Total NOx Emis Red tpy	132	148	148	148	148	725

CD Option 2 - Purchase of DPFs for 1994+ Trucks

$9,000 /truck ($8k DPF, $500 Installation, $500 Incentive)

Number of total DPFs/year	3,556	444	0	0	0	4,000

Assumes that this would put a DPF on all 1994+ trucks; If ARB rule comes out requiring this then money moves another scenario

Total DPM Emis Red tpy	116	131	131	131	131	640

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 2 - Funding Focused on Quickest POLA Movement to Alt Fuels

Budget Scenario 2 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks — $188,500 /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$8,000,000	$34,000,000	$38,000,000	$38,000,000	$38,000,000	$156,000,000	
	Number of total trucks/year	42	180	202	202	202	828	
	Total DPM Emis Red tpy	3.1	16.3	31.0	45.8	60.5	157	
	Total NOx Emis Red tpy	23	137	264	391	518	1,332	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — $188,500 /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below — Based on A

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$8,000,000	$34,000,000	$38,000,000	$38,000,000	$38,000,000	$156,000,000	
	Number of total trucks/year	42	180	202	202	202	828	
	Total DPM Emis Red tpy	3.1	16.2	30.9	45.7	60.4	156	
	Total NOx Emis Red tpy	26.7	149.2	286.2	423.1	560.0	1,445	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	137	167	182	197	211	894
Total NOx Reduction (tpy)	155	285	412	539	666	2,057
Total SOx Reduction (tpy)	0.020	0.083	0.093	0.093	0.093	0.38

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 3 - Funding Focused on DPM w/Alt Fuel Funding $1M/yr (Replacement, Infrastructure, & R&D)

Budget Overview

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	Clean Diesel - POLA	$13,000,000	$15,000,000	$15,000,000	$15,000,000	$15,000,000	$73,000,000	Operational
	Clean Diesel - POLB	$13,000,000	$15,000,000	$15,000,000	$15,000,000	$15,000,000	$73,000,000	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	$6,000,000	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	$0	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	$0	
	Clean Diesel - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$32,000,000	$30,000,000	$30,000,000	$30,000,000	$30,000,000	$152,000,000	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$5,000,000	Operational
	LNG - POLB	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$5,000,000	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	$0	
	LNG - EPA	$0	$0	$0	$0	$0	$0	
	LNG - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$40,000,000	
	Measure FY Totals	$40,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$192,000,000	
SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	POLA	$1,000,000	$0	$0	$0	$0	$1,000,000	
	POLB	$1,000,000	$0	$0	$0	$0	$1,000,000	
	SCAQMD	$0	$0	$0	$0	$0	$0	
	ARB	$0	$0	$0	$0	$0	$0	
	EPA	$0	$0	$0	$0	$0	$0	
	Bond Funding	$0	$0	$0	$0	$0	$0	
	Measure FY Totals	$2,000,000	$0	$0	$0	$0	$2,000,000	
	TOTAL HDV COSTS	$42,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$194,000,000	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 3 - Funding Focused on DPM w/Alt Fuel Funding $1M/yr (Replacement, Infrastructure, & R&D)

Budget Scenario 3 - Options for Clean Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$32,000,000	$30,000,000	$30,000,000	$30,000,000	$30,000,000	$152,000,000	

CD Option 1 - Cleaner Diesel Trucks MY 2007+

66% CD Funding — **$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin see note below

Number of total trucks/year	**163**	**153**	**153**	**153**	**153**	**775**
Total DPM Emis Red tpy	12	23	34	45	56	**168**
Total NOx Emis Red tpy	87	169	250	362	473	**1,341**

34% CD Funding — **$9,000** /truck ($8k DPF, $500 Installation, $500 Incentive)

Number of total DPFs/year	**1,209**	**1,133**	**1,133**	**1,133**	**1,133**	**5,742**

Assumes that this would put a DPF on all 1994+ trucks; If ARB rule comes out requiring this then money moves another scenario

Total DPM Emis Red tpy	40	77	114	151	188	**568**

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 3 - Funding Focused on DPM w/Alt Fuel Funding $1M/yr (Replacement, Infrastructure, & R&D)

Budget Scenario 3 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$40,000,000	
	Number of total trucks/year	42	42	42	42	42	212	
	Total DPM Emis Red tpy	3.1	6.2	9.3	12.4	15.5	47	
	Total NOx Emis Red tpy	23	50	77	103	130	383	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$40,000,000	
	Number of total trucks/year	42	42	42	42	42	212	
	Total DPM Emis Red tpy	3.1	6.2	9.3	12.4	15.5	46	
	Total NOx Emis Red tpy	26.7	55.6	84.4	113.2	142.0	422	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	54	105	157	208	259	783
Total NOx Reduction (tpy)	110	218	327	465	604	1,724
Total SOx Reduction (tpy)	0.020	0.020	0.020	0.020	0.020	0.10

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 4 - Funding Focused on DPM w/Alt Fuel Funding $2M/yr (Replacement, Infrastructure, & R&D)

Budget Overview

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	Clean Diesel - POLA	$12,000,000	$14,000,000	$14,000,000	$14,000,000	$14,000,000	$68,000,000	Operational
	Clean Diesel - POLB	$12,000,000	$14,000,000	$14,000,000	$14,000,000	$14,000,000	$68,000,000	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	$6,000,000	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	$0	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	$0	
	Clean Diesel - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$30,000,000	$28,000,000	$28,000,000	$28,000,000	$28,000,000	$142,000,000	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$10,000,000	Operational
	LNG - POLB	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$10,000,000	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	$0	
	LNG - EPA	$0	$0	$0	$0	$0	$0	
	LNG - Bond Funding	$0	$0	$0	$0	$0	$0	Assumes no bond $
		$10,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000	$50,000,000	
	Measure FY Totals	**$40,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$192,000,000**	
SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	POLA	$1,000,000	$0	$0	$0	$0	$1,000,000	
	POLB	$1,000,000	$0	$0	$0	$0	$1,000,000	
	SCAQMD	$0	$0	$0	$0	$0	$0	
	ARB	$0	$0	$0	$0	$0	$0	
	EPA	$0	$0	$0	$0	$0	$0	
	Bond Funding	$0	$0	$0	$0	$0	$0	
	Measure FY Totals	**$2,000,000**	**$0**	**$0**	**$0**	**$0**	**$2,000,000**	
	TOTAL HDV COSTS	**$42,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$194,000,000**	

Budget Scenario 4 - Funding Focused on DPM w/Alt Fuel Funding $2M/yr (Replacement, Infrastructure, & R&D)

Budget Scenario 4 - Options for Cleaner Diesel (CD)

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
		$30,000,000	$28,000,000	$28,000,000	$28,000,000	$28,000,000	$142,000,000	

CD Option 1 - Clean Diesel Trucks MY2004+ w/DPF & DPFs

64% CD Funding — **$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin see note below

Number of total trucks/year	**148**	**138**	**138**	**138**	**138**	**702**
Total DPM Emis Red (tpy)	11	21	30	40	50	**152**
Total NOx Emis Red (tpy)	79	153	227	328	429	**1,215**

36% CD Funding — **$9,000** /truck ($8k DPF, $500 Installation, $500 Incentive)

Number of total DPFs/year	**1,200**	**1,120**	**1,120**	**1,120**	**1,120**	**5,680**

Assumes that this would put a DPF on all 1994+ trucks; If ARB rule comes out requiring this then money moves another scenario

Total DPM Emis Red (tpy)	39	76	113	149	186	**563**

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 4 - Funding Focused on DPM w/Alt Fuel Funding $2M/yr (Replacement, Infrastructure, & R&D)

Budget Scenario 4 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$10,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000	$50,000,000	
	Number of total trucks/year	53	53	53	53	53	265	
	Total DPM Emis Red (tpy)	3.9	7.8	11.6	15.5	19.4	58	
	Total NOx Emis Red (tpy)	29	62	96	129	163	479	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$10,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000	$50,000,000	
	Number of total trucks/year	53	53	53	53	53	265	
	Total DPM Emis Red (tpy)	3.9	7.7	11.6	15.5	19.3	58	
	Total NOx Emis Red (tpy)	33.4	69.5	105.5	141.5	177.6	527	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	54	104	155	205	255	773
Total NOx Reduction (tpy)	108	215	322	457	591	1,694
Total SOx Reduction (tpy)	0.025	0.025	0.025	0.025	0.025	0.12

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 5 - Funding Focused Matching SCAQMD Alt Fuel Funding of $6M/yr (Replacement, Infrastructure, & R&D)

Budget Overview

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	Clean Diesel - POLA	$9,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000	**$49,000,000**	Operational
	Clean Diesel - POLB	$9,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000	**$49,000,000**	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - Bond Funding	$0	$0	$0	$0	$0	**$0**	Assumes no bond $
		$24,000,000	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$104,000,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$5,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$29,000,000**	Operational
	LNG - POLB	$5,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$29,000,000**	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	**$0**	
	LNG - EPA	$0	$0	$0	$0	$0	**$0**	
	LNG - Bond Funding	$0	$0	$0	$0	$0	**$0**	Assumes no bond $
		$16,000,000	**$18,000,000**	**$18,000,000**	**$18,000,000**	**$18,000,000**	**$88,000,000**	
	Measure FY Totals	**$40,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$192,000,000**	
SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	POLA	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	POLB	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	SCAQMD	$0	$0	$0	$0	$0	**$0**	
	ARB	$0	$0	$0	$0	$0	**$0**	
	EPA	$0	$0	$0	$0	$0	**$0**	
	Bond Funding	$0	$0	$0	$0	$0	**$0**	
	Measure FY Totals	**$2,000,000**	**$0**	**$0**	**$0**	**$0**	**$2,000,000**	
	TOTAL HDV COSTS	**$42,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$38,000,000**	**$194,000,000**	

Budget Scenario 5 - Funding Focused Matching SCAQMD Alt Fuel Funding of $6M/yr (Replacement, Infrastructure, & R&D)

Budget Scenario 5 - Options for Cleaner Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$24,000,000	$20,000,000	$20,000,000	$20,000,000	$20,000,000	$104,000,000	

CD Option 1 - Clean Diesel Trucks MY2004+ w/DPF & DPFs

50%	**CD Funding**			**$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin see note below			
	Number of total trucks/year	**93**	**77**	**77**	**77**	**77**	**402**
	Total DPM Emis Red tpy	7	12	18	23	29	**89**
	Total NOx Emis Red tpy	49	91	132	188	245	**705**

50%	**CD Funding**			**$9,000** /truck ($8k DPF, $500 Installation, $500 Incentive)			
	Number of total DPFs/year	**1,333**	**1,111**	**1,111**	**1,111**	**1,111**	**5,778**
	Assumes that this would put a DPF on all 1994+ trucks; If ARB rule comes out requiring this then money moves another scenario						
	Total DPM Emis Red tpy	44	80	116	153	189	**582**

Budget Scenario 5 - Options for Alt Fuels

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 5 - Funding Focused Matching SCAQMD Alt Fuel Funding of $6M/yr (Replacement, Infrastructure, & R&D)

Alt Fuel Option 1 - Purchase of New LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Alt Fuel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
		$16,000,000	$18,000,000	$18,000,000	$18,000,000	$18,000,000	$88,000,000	
	Number of total trucks/year	**85**	**95**	**95**	**95**	**95**	**467**	
	Total DPM Emis Red tpy	6.2	13.2	20.2	27.1	34.1	**101**	
	Total NOx Emis Red tpy	46	106	167	227	287	**833**	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Alt Fuel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
		$16,000,000	$18,000,000	$18,000,000	$18,000,000	$18,000,000	$88,000,000	
	Number of total trucks/year	**85**	**95**	**95**	**95**	**95**	**467**	
	Total DPM Emis Red tpy	6.2	13.1	20.1	27.1	34.0	**101**	
	Total NOx Emis Red tpy	53.5	118.3	183.2	248.1	312.9	**916**	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	**56**	**105**	**154**	**203**	**252**	**771**
Total NOx Reduction (tpy)	**96**	**197**	**298**	**415**	**532**	**1,538**
Total SOx Reduction (tpy)	**0.039**	**0.044**	**0.044**	**0.044**	**0.044**	**0.22**

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

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DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 6 - Focus on Replacements w/Focus On Alt Fuels + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)	**9,800 Semi-Frequent Trucks (preliminary 2005 EI data)**	
7,000 Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,575 Semi-Freq Caller Trucks Alt Fuel Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
46 Semi-Freq Caller Trucks CD Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
10,622 Total Trucks Replaced		

Budget Overview

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	**FY 2007/2008**	**FY 2008/2009**	**FY 2009/2010**	**FY 2010/2011**	**Total**	**Notes**
SBP-HDV1	HDV Incentives (Clean Diesel)							
	Clean Diesel - POLA	$0	$0	$0	$0	$0	**$0**	Operational
	Clean Diesel - POLB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - Bond Funding	$0	$54,900,000	$41,400,000	$0	$0	**$96,300,000**	Assumes Bond Funding
		$6,000,000	**$54,900,000**	**$41,400,000**	**$0**	**$0**	**$102,300,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$16,000,000	$16,000,000	$18,000,000	$18,000,000	$18,000,000	**$86,000,000**	Operational
	LNG - POLB	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	**$80,000,000**	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	**$0**	
	LNG - EPA	$0	$0	$0	$0	$0	**$0**	
	LNG - Bond Funding	$0	$453,000,000	$451,000,000	$451,000,000	$442,300,000	**$1,797,300,000**	Assumes Bond Funding
		$38,000,000	**$491,000,000**	**$491,000,000**	**$491,000,000**	**$482,300,000**	**$1,993,300,000**	
	Measure FY Totals	**$44,000,000**	**$545,900,000**	**$532,400,000**	**$491,000,000**	**$482,300,000**	**$2,095,600,000**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 6 - Focus on Replacements w/Focus On Alt Fuels + Retrofits

7,000	**Frequent Trucks (preliminary 2005 EI data)**		**9,800**	**Semi-Frequent Trucks (preliminary 2005 EI data)**
7,000	Frequent Caller Trucks Alt Fuel Replaced		5,112	Cleaire + Chip Reflash — 1993 to 1998 MY trucks; 4 to 5 years useful life
3,575	Semi-Freq Caller Trucks Alt Fuel Replaced	←	844	Cleaire — 1999 to 2003 MY trucks; to 5 years useful life
46	Semi-Freq Caller Trucks CD Replaced	←	3,622	Cannot be Cleaire'd or DPF'd — Pre 1993 MY trucks
10,622	**Total Trucks Replaced**			

		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV2	Alternate Fuel Infrastructure							
	POLA	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	POLB	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	SCAQMD	$0	$0	$0	$0	$0	**$0**	
	ARB	$0	$0	$0	$0	$0	**$0**	
	EPA	$0	$0	$0	$0	$0	**$0**	
	Bond Funding	$0	$0	$0	$0	$0	**$0**	
	Measure FY Totals	**$2,000,000**	**$0**	**$0**	**$0**	**$0**	**$2,000,000**	
	TOTAL HDV COSTS	**$46,000,000**	**$545,900,000**	**$532,400,000**	**$491,000,000**	**$482,300,000**	**$2,097,600,000**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 6 - Focus on Replacements w/Focus On Alt Fuels + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
7,000 Frequent Caller Trucks Alt Fuel Replaced		5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,575 Semi-Freq Caller Trucks Alt Fuel Replaced	←	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
46 Semi-Freq Caller Trucks CD Replaced	←	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
10,622 Total Trucks Replaced			

Budget Scenario 6 - Options for Cleaner Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$6,000,000	$54,900,000	$41,400,000	$0	$0	$102,300,000	

CD Option 1 - Clean Diesel Trucks MY2007+

50% CD Funding — **$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin) see note below

Number of total trucks/year	**46**	**0**	**0**	**0**	**0**	**46**
Total DPM Emis Red tpy	3	3	3	3	3	**17**
Total NOx Emis Red tpy	25	25	25	25	25	**124**

50% CD Funding — **$16,200** /truck ($14.5k Cleaire, $200 Chip Reflash, $1,000 Installation, $500 Incentive)

# of Cleaire + Chip Units/year	**0**	**2,556**	**2,556**	**0**	**0**	**5,112**
Total DPM Emis Red tpy	0	41	82	82	82	**285**
Total NOx Emis Red tpy	0	353	705	705	705	**2,468**
# of Cleaire	**0**	**844**	**0**	**0**	**0**	**844**
Total DPM Emis Red tpy	0	7	7	7	7	**30**
Total NOx Emis Red tpy	0	45	45	45	45	**182**

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DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 6 - Focus on Replacements w/Focus On Alt Fuels + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)	**9,800 Semi-Frequent Trucks (preliminary 2005 EI data)**	
7,000 Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,575 Semi-Freq Caller Trucks Alt Fuel Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
46 Semi-Freq Caller Trucks CD Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
10,622 Total Trucks Replaced		

Budget Scenario 6 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$38,000,000	$491,000,000	$491,000,000	$491,000,000	$482,300,000	$1,993,300,000	
	Number of total trucks/year	202	2,605	2,605	2,605	2,559	10,575	
	Total DPM Emis Red tpy	13	185	357	529	697	1,781	
	Total NOx Emis Red tpy	90	1,434	2,779	4,123	5,444	13,870	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$38,000,000	$491,000,000	$491,000,000	$491,000,000	$482,300,000	$1,993,300,000	
	Number of total trucks/year	202	2,605	2,605	2,605	2,559	10,575	
	Total DPM Emis Red tpy	13	185	356	527	696	1,777	
	Total NOx Emis Red tpy	104	1,553	3,002	4,451	5,874	14,984	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	**17**	**236**	**449**	**621**	**789**	**2,112**
Total NOx Reduction (tpy)	**115**	**1,857**	**3,554**	**4,899**	**6,219**	**16,644**
Total SOx Reduction (tpy)	**0.1**	**1.2**	**1.2**	**1.2**	**1.2**	**5**

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 7 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		**9,800 Semi-Frequent Trucks (preliminary 2005 EI data)**	
3,500	Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,500	Frequent Caller Trucks CD Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
1,811	Semi-Freq Caller Trucks Alt Fuel Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
1,811	Semi-Freq Caller Trucks CD Replaced		
10,622	**Total Trucks Replaced**		

Budget Overview

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Clean Diesel)	**FY 2006/2007**	**FY 2007/2008**	**FY 2008/2009**	**FY 2009/2010**	**FY 2010/2011**	**Total**	**Notes**
	Clean Diesel - POLA	$8,000,000	$8,000,000	$9,000,000	$9,000,000	$9,000,000	**$43,000,000**	Operational
	Clean Diesel - POLB	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**	Assumes SCAQMD 1 Time $6M
	Clean Diesel - Bond/Other Funding	$0	$202,600,000	$188,100,000	$152,200,000	$152,200,000	**$695,100,000**	
		$22,000,000	**$218,600,000**	**$205,100,000**	**$169,200,000**	**$169,200,000**	**$784,100,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$8,000,000	$8,000,000	$9,000,000	$9,000,000	$9,000,000	**$43,000,000**	Operational
	LNG - POLB	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**	Assumes SCAQMD $6M/yr Match
	LNG - Bond/Other Funding	$0	$222,800,000	$221,800,000	$221,800,000	$221,800,000	**$888,200,000**	Assumes Bond Funding
		$22,000,000	**$244,800,000**	**$244,800,000**	**$244,800,000**	**$244,800,000**	**$1,001,200,000**	
	Measure FY Totals	**$44,000,000**	**$463,400,000**	**$449,900,000**	**$414,000,000**	**$414,000,000**	**$1,785,300,000**	
SBP-HDV2	Alternate Fuel Infrastructure	**FY 2006/2007**	**FY 2007/2008**	**FY 2008/2009**	**FY 2009/2010**	**FY 2010/2011**	**Total**	**Notes**
	POLA	$1,000,000	$1,000,000	$0	$0	$0	**$2,000,000**	
	POLB	$1,000,000	$1,000,000	$0	$0	$0	**$2,000,000**	
	SCAQMD	tbd	tbd	$0	$0	$0	**$0**	
	Bond Funding	$0	$0	$0	$0	$0	**$0**	
	Measure FY Totals	**$2,000,000**	**$2,000,000**	**$0**	**$0**	**$0**	**$4,000,000**	
	TOTAL HDV COSTS	**$46,000,000**	**$465,400,000**	**$449,900,000**	**$414,000,000**	**$414,000,000**	**$1,789,300,000**	

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Heavy-Duty Vehicles (Trucks)

Budget Scenario 7 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
3,500 Frequent Caller Trucks Alt Fuel Replaced		5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,500 Frequent Caller Trucks CD Replaced		844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
1,811 Semi-Freq Caller Trucks Alt Fuel Replaced	←	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
1,811 Semi-Freq Caller Trucks CD Replaced	←		
10,622 Total Trucks Replaced			

Budget Scenario 7 - Options for Cleaner Diesel (CD)

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Cleaner Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
		$22,000,000	$218,600,000	$205,100,000	$169,200,000	$169,200,000	$784,100,000	
CD Option 1 - Clean Diesel Trucks MY2007+								
50% CD Funding				**$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin) see note below				
Number of total trucks/year		**85**	**1,306**	**1,306**	**1,306**	**1,306**	**5,311**	
Baseline DPM in tpy		6	92	178	264	350	**888**	
Total DPM Emis Red tpy		5	90	174	259	344	**873**	
Baseline NOx in tpy		54	884	1,714	2,544	3,373	**8,568**	
Total NOx Emis Red tpy		37	613	1,188	1,969	2,750	**6,557**	
50% CD Funding				**$16,200** /truck ($14.5k Cleaire $200 Chip Reflash, $1,000 Installation, $500 Incentive)				
# of Cleaire + Chip Units/year		**679**	**2,217**	**2,217**	**0**	**0**	**5,112**	
Baseline DPM in tpy		13	54	96	96	96	**355**	
Total DPM Emis Red tpy		11	46	82	82	82	**302**	
Baseline NOx in tpy		214	913	1,612	1,612	1,612	**5,963**	
Total NOx Emis Red tpy		94	399	705	705	705	**2,609**	
# of Cleaire		**0**	**844**	**0**	**0**	**0**	**844**	
Total DPM Emis Red tpy		0	7	7	7	7	**30**	
Total NOx Emis Red tpy		0	45	45	45	45	**182**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 7 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
3,500	Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,500	Frequent Caller Trucks CD Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
1,811	Semi-Freq Caller Trucks Alt Fuel Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
1,811	Semi-Freq Caller Trucks CD Replaced		
10,622	**Total Trucks Replaced**		

Budget Scenario 7 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						Notes
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	
SBP-HDV1	HDV Incentives (Alt Fuel)	$22,000,000	$244,800,000	$244,800,000	$244,800,000	$244,800,000	$1,001,200,000	
	Number of total trucks/year	117	1,299	1,299	1,299	1,299	5,311	
	Baseline DPM in tpy	7.7	93.2	178.7	264.3	349.8	894	
	Total DPM Emis Red tpy	7.7	93.2	178.7	264.3	349.8	894	
	Baseline NOx in tpy	74	899	1724	2549	3373	8,619	
	Total NOx Emis Red tpy	52	721	1390	2059	2728	6,949	

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DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 7 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)	**9,800 Semi-Frequent Trucks (preliminary 2005 EI data)**	
3,500 Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,500 Frequent Caller Trucks CD Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
1,811 Semi-Freq Caller Trucks Alt Fuel Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
1,811 Semi-Freq Caller Trucks CD Replaced		
10,622 Total Trucks Replaced		

Alt Fuel Option 2 - Purchase of Westport LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						Notes
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	
SBP-HDV1	HDV Incentives (Alt Fuel)	$22,000,000	$244,800,000	$244,800,000	$244,800,000	$244,800,000	$1,001,200,000	
	Number of total trucks/year	**117**	**1,299**	**1,299**	**1,299**	**1,299**	**5,311**	
	Baseline DPM tpy	7.7	93.2	178.7	264.3	349.8	**894**	
	Total DPM Emis Red tpy	7.7	93.0	178.3	263.6	349.0	**892**	
	Baseline NOx in tpy	74	899	1785	2671	3557	**8,987**	
	Total NOx Emis Red tpy	60	781	1604	2325	3148	**7,918**	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	**24**	**237**	**442**	**612**	**782**	**2,097**
Total NOx Reduction (tpy)	**183**	**1,779**	**3,329**	**4,778**	**6,228**	**16,297**
Total SOx Reduction (tpy)	**0.1**	**0.7**	**1.3**	**1.9**	**2.5**	**6**

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

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Heavy-Duty Vehicles (Trucks)

Budget Scenario 8 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		**9,800 Semi-Frequent Trucks (preliminary 2005 EI data)**	
7,000	Frequent Caller Trucks CD Fuel Replaced	5,112 Cleaire + Chip Reflash	1994 to 1998 MY trucks; 4 to 5 years useful life
3,463	Semi-Freq Caller Trucks CD Replaced	844 Cleaire	1999 to 2002 MY trucks; to 5 years useful life
159	Semi-Freq Caller Trucks Alt Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1994 MY trucks
10,622	**Total Trucks Replaced**		

Budget Overview

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	**FY 2007/2008**	**FY 2008/2009**	**FY 2009/2010**	**FY 2010/2011**	**Total**	**Notes**
SBP-HDV1	HDV Incentives (Clean Diesel)							
	Clean Diesel - POLA	$16,000,000	$16,000,000	$18,000,000	$18,000,000	$18,000,000	**$86,000,000**	Operational
	Clean Diesel - POLB	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	**$80,000,000**	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - Bond Funding	$0	$345,700,000	$330,200,000	$298,300,000	$298,300,000	**$1,272,500,000**	Assumes Bond Funding
		$38,000,000	**$377,700,000**	**$364,200,000**	**$332,300,000**	**$332,300,000**	**$1,444,500,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$0	$0	$0	$0	$0	**$0**	Operational
	LNG - POLB	$0	$0	$0	$0	$0	**$0**	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	**$0**	
	LNG - EPA	$0	$0	$0	$0	$0	**$0**	
	LNG - Bond Funding	$0	$0	$0	$0	$0	**$0**	Assumes No Bond Funding
		$6,000,000	**$6,000,000**	**$6,000,000**	**$6,000,000**	**$6,000,000**	**$30,000,000**	
	Measure FY Totals	**$44,000,000**	**$383,700,000**	**$370,200,000**	**$338,300,000**	**$338,300,000**	**$1,474,500,000**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 8 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		**9,800 Semi-Frequent Trucks (preliminary 2005 EI data)**	
7,000	Frequent Caller Trucks CD Fuel Replaced	5,112 Cleaire + Chip Reflash	1994 to 1998 MY trucks; 4 to 5 years useful life
3,463	Semi-Freq Caller Trucks CD Replaced	844 Cleaire	1999 to 2002 MY trucks; to 5 years useful life
159	Semi-Freq Caller Trucks Alt Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1994 MY trucks
10,622	**Total Trucks Replaced**		

SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	POLA	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	POLB	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	SCAQMD	$0	$0	$0	$0	$0	**$0**	
	ARB	$0	$0	$0	$0	$0	**$0**	
	EPA	$0	$0	$0	$0	$0	**$0**	
	Bond Funding	$0	$0	$0	$0	$0	**$0**	
	Measure FY Totals	**$2,000,000**	**$0**	**$0**	**$0**	**$0**	**$2,000,000**	
	TOTAL HDV COSTS	**$46,000,000**	**$383,700,000**	**$370,200,000**	**$338,300,000**	**$338,300,000**	**$1,476,500,000**	

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DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 8 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
7,000 Frequent Caller Trucks CD Fuel Replaced		5,112 Cleaire + Chip Reflash	1994 to 1998 MY trucks; 4 to 5 years useful life
3,463 Semi-Freq Caller Trucks CD Replaced	←	844 Cleaire	1999 to 2002 MY trucks; to 5 years useful life
159 Semi-Freq Caller Trucks Alt Replaced	←	3,622 Cannot be Cleaire'd or DPF'd	Pre 1994 MY trucks
10,622 Total Trucks Replaced			

Budget Scenario 8 - Options for Clean Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$44,900,000	$377,700,000	$364,200,000	$332,300,000	$332,300,000	$1,451,400,000	

CD Option 1 - Cleaner Diesel Trucks MY2007+

50% CD Funding — **$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin) see note below

Number of total trucks/year	**200**	**2,566**	**2,566**	**2,566**	**2,566**	**10,463**
Total DPM Emis Red tpy	13	179	346	512	679	**1,730**
Total NOx Emis Red tpy	89	1,225	2,362	3,906	5,450	**13,032**

50% CD Funding — **$16,200** /truck ($14.5k Cleaire, $200 Chip Reflash, $1,000 Installation, $500 Incentive)

# of Cleaire + Chip Units/year	**1,173**	**1,970**	**1,970**	**0**	**0**	**5,112**
Total DPM Emis Red tpy	19	50	82	82	82	**313**
Total NOx Emis Red tpy	162	433	705	705	705	**2,711**
# of Cleaire	**0**	**844**	**0**	**0**	**0**	**844**
Total DPM Emis Red tpy	0	7	7	7	7	**30**
Total NOx Emis Red tpy	0	45	45	45	45	**182**

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 8 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
7,000 Frequent Caller Trucks CD Fuel Replaced		5,112 Cleaire + Chip Reflash	1994 to 1998 MY trucks; 4 to 5 years useful life
3,463 Semi-Freq Caller Trucks CD Replaced	←	844 Cleaire	1999 to 2002 MY trucks; to 5 years useful life
159 Semi-Freq Caller Trucks Alt Replaced	←	3,622 Cannot be Cleaire'd or DPF'd	Pre 1994 MY trucks
10,622 Total Trucks Replaced			

Budget Scenario 8 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	
	Number of total trucks/year	32	32	32	32	32	159	
	Total DPM Emis Red tpy	2	4	6	8	11	32	
	Total NOx Emis Red tpy	14	31	47	64	80	236	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	
	Number of total trucks/year	32	32	32	32	32	159	
	Total DPM Emis Red tpy	2	4	6	8	10	31	
	Total NOx Emis Red tpy	17	34	52	70	88	260	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	34	42	54	64	74	268
Total NOx Reduction (tpy)	265	1,735	3,160	4,721	6,281	16,162
Total SOx Reduction (tpy)	0.015	0.015	0.015	0.015	0.015	0.074

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 9 - Focus on Replacements w/Focus On Alt Fuels

7,000	**Frequent Trucks (preliminary 2005 EI data)**		
5,252	Frequent Caller Trucks Alt Fuel Replace		
46	Frequent Caller Trucks CD Replaced		
5,298	**Total Trucks Replaced**		

9,800	**Semi-Frequent Trucks (preliminary 2005 EI data)**	
5,112	Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
844	Cleaire	1999 to 2003 MY trucks; to 5 years useful life
3,622	Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks

Budget Overview

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)							
	Clean Diesel - POLA	$0	$0	$0	$0	$0	**$0**	Operational
	Clean Diesel - POLB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - Bond Funding	$0	$0	$0	$0	$0	**$0**	Assumes No Bond Funding
		$6,000,000	**$0**	**$0**	**$0**	**$0**	**$6,000,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	**$80,000,000**	Operational
	LNG - POLB	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	**$80,000,000**	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	**$0**	
	LNG - EPA	$0	$0	$0	$0	$0	**$0**	
	LNG - Bond Funding	$0	$200,000,000	$200,000,000	$200,000,000	$200,000,000	**$800,000,000**	Assumes Bond Funding
		$38,000,000	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$990,000,000**	
	Measure FY Totals	**$44,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$996,000,000**	

San Pedro Bay Ports Clean Air Action Plan

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Heavy-Duty Vehicles (Trucks)

Budget Scenario 9 - Focus on Replacements w/Focus On Alt Fuels

7,000	**Frequent Trucks (preliminary 2005 EI data)**	**9,800**	**Semi-Frequent Trucks (preliminary 2005 EI data)**
5,252	Frequent Caller Trucks Alt Fuel Replace	5,112	Cleaire + Chip Reflash — 1993 to 1998 MY trucks; 4 to 5 years useful life
		844	Cleaire — 1999 to 2003 MY trucks; to 5 years useful life
46	Frequent Caller Trucks CD Replaced	3,622	Cannot be Cleaire'd or DPF'd — Pre 1993 MY trucks
5,298	**Total Trucks Replaced**		

SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	POLA	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	POLB	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	SCAQMD	$0	$0	$0	$0	$0	**$0**	
	ARB	$0	$0	$0	$0	$0	**$0**	
	EPA	$0	$0	$0	$0	$0	**$0**	
	Bond Funding	$0	$0	$0	$0	$0	**$0**	
	Measure FY Totals	**$2,000,000**	**$0**	**$0**	**$0**	**$0**	**$2,000,000**	
	TOTAL HDV COSTS	**$46,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$998,000,000**	

San Pedro Bay Ports Clean Air Action Plan

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Heavy-Duty Vehicles (Trucks)

Budget Scenario 9 - Focus on Replacements w/Focus On Alt Fuels

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
5,252	Frequent Caller Trucks Alt Fuel Replace	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
		844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
46	Frequent Caller Trucks CD Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
5,298	**Total Trucks Replaced**		

Budget Scenario 9 - Options for Cleaner Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$6,000,000	$0	$0	$0	$0	$6,000,000	

CD Option 1 - Clean Diesel Trucks MY2007+

100% CD Funding — **$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin) see note below

Number of total trucks/year	**46**	**0**	**0**	**0**	**0**	**46**
Total DPM Emis Red tpy	3	3	3	3	3	**17**
Total NOx Emis Red tpy	25	25	25	25	25	**124**

0% CD Funding — **$16,200** /truck ($14.5k Cleaire, $200 Chip Reflash, $1,000 Installation, $500 Incentive)

# of Cleaire + Chip Units/year	**0**	**0**	**0**	**0**	**0**	**0**	Assumed no funding available
Total DPM Emis Red tpy	0	0	0	0	0	**0**	
Total NOx Emis Red tpy	0	0	0	0	0	**0**	
# of Cleaire	**0**	**0**	**0**	**0**	**0**	**0**	
Total DPM Emis Red tpy	0	0	0	0	0	**0**	
Total NOx Emis Red tpy	0	0	0	0	0	**0**	

San Pedro Bay Ports Clean Air Action Plan

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Heavy-Duty Vehicles (Trucks)

Budget Scenario 9 - Focus on Replacements w/Focus On Alt Fuels

7,000	**Frequent Trucks (preliminary 2005 EI data)**
5,252	Frequent Caller Trucks Alt Fuel Replace
46	Frequent Caller Trucks CD Replaced
5,298	**Total Trucks Replaced**

9,800	**Semi-Frequent Trucks (preliminary 2005 EI data)**	
5,112	Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
844	Cleaire	1999 to 2003 MY trucks; to 5 years useful life
3,622	Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks

Budget Scenario 9 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$38,000,000	$238,000,000	$238,000,000	$238,000,000	$238,000,000	$990,000,000	
	Number of total trucks/year	**202**	**1,263**	**1,263**	**1,263**	**1,263**	**5,252**	
	Total DPM Emis Red tpy	15	107	199	292	384	**997**	
	Total NOx Emis Red tpy	110	797	1,485	2,172	2,860	**7,424**	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$38,000,000	$238,000,000	$238,000,000	$238,000,000	$238,000,000	$990,000,000	
	Number of total trucks/year	**202**	**1,263**	**1,263**	**1,263**	**1,263**	**5,252**	
	Total DPM Emis Red tpy	15	107	198	290	382	**992**	
	Total NOx Emis Red tpy	127	923	1,718	2,514	3,310	**8,592**	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	**18**	**110**	**203**	**295**	**387**	**1,013**
Total NOx Reduction (tpy)	**134**	**822**	**1,510**	**2,197**	**2,885**	**7,548**
Total SOx Reduction (tpy)	**0.093**	**0.583**	**0.583**	**0.583**	**0.583**	**2.427**

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

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Heavy-Duty Vehicles (Trucks)

Budget Scenario 10 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000	**Frequent Trucks (preliminary 2005 EI data)**
2,706	Frequent Caller Trucks Alt Fuel Replaced
3,273	Frequent Caller Trucks CD Replaced
0	Semi-Freq Caller Trucks Alt Fuel Replaced
0	Semi-Freq Caller Trucks CD Replaced
5,979	**Total Trucks Replaced**

9,800	**Semi-Frequent Trucks (preliminary 2005 EI data)**	
5,112	Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
844	Cleaire	1999 to 2003 MY trucks; to 5 years useful life
3,622	Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
3,000	Cleaire + Chip Reflash	

Budget Overview

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)							
	Clean Diesel - POLA	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**	Operational
	Clean Diesel - POLB	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - Bond Funding	$0	$100,000,000	$100,000,000	$100,000,000	$100,000,000	**$400,000,000**	Assumes Bond Funding
		$22,000,000	**$116,000,000**	**$116,000,000**	**$116,000,000**	**$116,000,000**	**$486,000,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**	Operational
	LNG - POLB	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	**$40,000,000**	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	**$0**	
	LNG - EPA	$0	$0	$0	$0	$0	**$0**	
	LNG - Bond Funding	$0	$100,000,000	$100,000,000	$100,000,000	$100,000,000	**$400,000,000**	Assumes Bond Funding
		$22,000,000	**$122,000,000**	**$122,000,000**	**$122,000,000**	**$122,000,000**	**$510,000,000**	
	Measure FY Totals	**$44,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$996,000,000**	

Budget Scenario 10 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000	**Frequent Trucks (preliminary 2005 EI data)**	**9,800**	**Semi-Frequent Trucks (preliminary 2005 EI data)**
2,706	Frequent Caller Trucks Alt Fuel Replaced	5,112	Cleaire + Chip Reflash — 1993 to 1998 MY trucks; 4 to 5 years useful life
3,273	Frequent Caller Trucks CD Replaced	844	Cleaire — 1999 to 2003 MY trucks; to 5 years useful life
0	Semi-Freq Caller Trucks Alt Fuel Replaced	3,622	Cannot be Cleaire'd or DPF'd — Pre 1993 MY trucks
0	Semi-Freq Caller Trucks CD Replaced	3,000	Cleaire + Chip Reflash
5,979	**Total Trucks Replaced**		

		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV2	Alternate Fuel Infrastructure							
	POLA	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	POLB	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	SCAQMD	$0	$0	$0	$0	$0	**$0**	
	ARB	$0	$0	$0	$0	$0	**$0**	
	EPA	$0	$0	$0	$0	$0	**$0**	
	Bond Funding	$0	$0	$0	$0	$0	**$0**	
	Measure FY Totals	**$2,000,000**	**$0**	**$0**	**$0**	**$0**	**$2,000,000**	
	TOTAL HDV COSTS	**$46,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$998,000,000**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 10 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
2,706	Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,273	Frequent Caller Trucks CD Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
0	Semi-Freq Caller Trucks Alt Fuel Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
0	Semi-Freq Caller Trucks CD Replaced	3,000 Cleaire + Chip Reflash	
5,979	**Total Trucks Replaced**		

Budget Scenario 10 - Options for Cleaner Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)	$22,000,000	$116,000,000	$116,000,000	$116,000,000	$116,000,000	$486,000,000	

CD Option 1 - Cleaner Diesel Trucks MY2007+

90% CD Funding — $129,500 /truck ($126k O/Op, $1.3k AVL, $2.2k admin) see note below

Number of total trucks/year	**153**	**702**	**806**	**806**	**806**	**3,273**
Total DPM Emis Red tpy	11	61	119	177	234	**602**
Total NOx Emis Red tpy	82	456	886	1,316	1,746	**4,486**

10% CD Funding — $16,200 /truck ($14.5k Cleaire, $200 Chip Reflash, $1,000 Installation, $500 Incentive)

# of Cleaire + Chip Units/year	**136**	**716**	**716**	**716**	**716**	**3,000**
Total DPM Emis Red tpy	2	14	25	36	48	**125**
Total NOx Emis Red tpy	19	118	216	315	414	**1,081**
# of Cleaire	**0**	**844**	**0**	**0**	**0**	**844**
Total DPM Emis Red tpy	0	7	7	7	7	**30**
Total NOx Emis Red tpy	0	45	45	45	45	**182**

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DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 10 - Focus on Replacements w/Focus on 50/50 Alt Fuels & Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
2,706	Frequent Caller Trucks Alt Fuel Replaced	5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
3,273	Frequent Caller Trucks CD Replaced	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
0	Semi-Freq Caller Trucks Alt Fuel Replaced	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
0	Semi-Freq Caller Trucks CD Replaced	3,000 Cleaire + Chip Reflash	
5,979	**Total Trucks Replaced**		

Budget Scenario 10 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Alt Fuel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
		$22,000,000	$122,000,000	$122,000,000	$122,000,000	$122,000,000	$510,000,000	
	Number of total trucks/year	117	647	647	647	647	2,706	
	Total DPM Emis Red tpy	9	56	103	150	198	516	
	Total NOx Emis Red tpy	64	416	768	1,121	1,473	3,842	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Alt Fuel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
		$22,000,000	$122,000,000	$122,000,000	$122,000,000	$122,000,000	$510,000,000	
	Number of total trucks/year	117	647	647	647	647	2,706	
	Total DPM Emis Red tpy	8	56	103	150	197	513	
	Total NOx Emis Red tpy	74	481	889	1,297	1,705	4,447	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	22	138	255	371	487	1,273
Total NOx Reduction (tpy)	164	1,035	1,916	2,797	3,679	9,591
Total SOx Reduction (tpy)	0.054	0.299	0.299	0.299	0.299	1.250

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 11 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
7,000 Frequent Caller Trucks CD Fuel Replaced		5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
1,900 Semi-Freq Caller Trucks CD Replaced	←	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
159 Semi-Frequentr Trucks Alt Replaced	←	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
9,059 Total Trucks Replaced			

Budget Overview

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)							
	Clean Diesel - POLA	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	**$80,000,000**	Operational
	Clean Diesel - POLB	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	**$80,000,000**	
	Clean Diesel - SCAQMD	$6,000,000	$0	$0	$0	$0	**$6,000,000**	Assumes SCAQMD 1 Time $6M
	Clean Diesel - ARB	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	**$0**	
	Clean Diesel - Bond Funding	$0	$200,000,000	$200,000,000	$200,000,000	$200,000,000	**$800,000,000**	Assumes Bond Funding
		$38,000,000	**$232,000,000**	**$232,000,000**	**$232,000,000**	**$232,000,000**	**$966,000,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$0	$0	$0	$0	$0	**$0**	Operational
	LNG - POLB	$0	$0	$0	$0	$0	**$0**	
	LNG - SCAQMD	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	**$30,000,000**	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	**$0**	
	LNG - EPA	$0	$0	$0	$0	$0	**$0**	
	LNG - Bond Funding	$0	$0	$0	$0	$0	**$0**	Assumes No Bond Funding
		$6,000,000	**$6,000,000**	**$6,000,000**	**$6,000,000**	**$6,000,000**	**$30,000,000**	
	Measure FY Totals	**$44,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$996,000,000**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 11 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000	**Frequent Trucks (preliminary 2005 EI data)**	**9,800**	**Semi-Frequent Trucks (preliminary 2005 EI data)**	
7,000	Frequent Caller Trucks CD Fuel Replaced	5,112	Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
1,900	Semi-Freq Caller Trucks CD Replaced	844	Cleaire	1999 to 2003 MY trucks; to 5 years useful life
159	Semi-Frequentr Trucks Alt Replaced	3,622	Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
9,059	**Total Trucks Replaced**			

		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV2	Alternate Fuel Infrastructure							
	POLA	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	POLB	$1,000,000	$0	$0	$0	$0	**$1,000,000**	
	SCAQMD	$0	$0	$0	$0	$0	**$0**	
	ARB	$0	$0	$0	$0	$0	**$0**	
	EPA	$0	$0	$0	$0	$0	**$0**	
	Bond Funding	$0	$0	$0	$0	$0	**$0**	
	Measure FY Totals	**$2,000,000**	**$0**	**$0**	**$0**	**$0**	**$2,000,000**	
	TOTAL HDV COSTS	**$46,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$238,000,000**	**$998,000,000**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 11 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
7,000 Frequent Caller Trucks CD Fuel Replaced		5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
1,900 Semi-Freq Caller Trucks CD Replaced	←	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
159 Semi-Frequentr Trucks Alt Replaced	←	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
9,059 Total Trucks Replaced			

Budget Scenario 11 - Options for Clean Diesel (CD)

Measure #	Measure Description	Budget by Measure						Notes
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	
SBP-HDV1	HDV Incentives (Clean Diesel)	$38,000,000	$232,000,000	$232,000,000	$232,000,000	$514,900,000	$1,248,900,000	

CD Option 1 - Cleaner Diesel Trucks MY2007+

50% CD Funding — $129,500 /truck ($126k O/Op, $1.3k AVL, $2.2k admin) see note below

Number of total trucks/year	**147**	**1,441**	**1,545**	**1,792**	**3,976**	**8,900**
Total DPM Emis Red tpy	10	107	211	331	599	**1,258**
Total NOx Emis Red tpy	70	754	1,489	2,648	5,222	**10,183**

50% CD Funding — $16,200 /truck ($14.5k Cleaire, $200 Chip Reflash, $1,000 Installation, $500 Incentive)

# of Cleaire + Chip Units/year	**1,173**	**1,970**	**1,970**	**0**	**0**	**5,112**
Total DPM Emis Red tpy	19	50	82	82	82	**313**
Total NOx Emis Red tpy	162	433	705	705	705	**2,711**
# of Cleaire	**0**	**844**	**0**	**0**	**0**	**844**
Total DPM Emis Red tpy	0	7	7	7	7	**30**
Total NOx Emis Red tpy	0	45	45	45	45	**182**

San Pedro Bay Ports Clean Air Action Plan

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Heavy-Duty Vehicles (Trucks)

Budget Scenario 11 - Focus on Replacements w/Focus On Clean Diesel (CD) + Retrofits

7,000 Frequent Trucks (preliminary 2005 EI data)		9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
7,000 Frequent Caller Trucks CD Fuel Replaced		5,112 Cleaire + Chip Reflash	1993 to 1998 MY trucks; 4 to 5 years useful life
1,900 Semi-Freq Caller Trucks CD Replaced	←	844 Cleaire	1999 to 2003 MY trucks; to 5 years useful life
159 Semi-Frequentr Trucks Alt Replaced	←	3,622 Cannot be Cleaire'd or DPF'd	Pre 1993 MY trucks
9,059 Total Trucks Replaced			

Budget Scenario 11 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	
	Number of total trucks/year	32	32	32	32	32	159	
	Total DPM Emis Red tpy	2	4	7	9	11	33	
	Total NOx Emis Red tpy	15	33	51	69	86	254	

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$30,000,000	
	Number of total trucks/year	32	32	32	32	32	159	
	Total DPM Emis Red tpy	2	4	7	9	11	33	
	Total NOx Emis Red tpy	18	37	56	75	94	280	

SBP-HDV1	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
Total DPM Reduction (tpy)	31	169	306	429	699	1,633
Total NOx Reduction (tpy)	247	1,266	2,290	3,468	6,059	13,330
Total SOx Reduction (tpy)	0.015	0.015	0.015	0.015	0.015	0.074

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 12 - Focus on Replacements all FF and SFF trucks 50:50 CD and Alt Fuel

7,000 Frequent Trucks (preliminary 2005 EI data)	9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
4,258 Frequent Caller Trucks Alt Fuel Replaced	0 Cleaire + Chip Reflash SFF	1993 to 1998 MY trucks; 4 to 5 years useful life
4,258 Semi-Frequent Caller Alt Fuel Replaced	0 Cleaire + Chip Reflash (Frequent Callers)	1993 to 1998 MY trucks; 4 to 5 years useful life
4,258 Semi Frequent Caller Trucks CD Replaced	0 Cleaire (Frequent callers)	
4,258 Frequent Caller Trucks CD Replaced	0 Cleaire SFF	1999 to 2003 MY trucks; to 5 years useful life
17,033 Total Trucks Replaced	**0 Total Trucks Retrofitted**	
	0 Semi-Frequent Trucks Cannot be Cleaired	

Budget Overview

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Clean Diesel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	Clean Diesel - POLA	$0	$0	$0	$0	$0	$0	Operational
	Clean Diesel - POLB	$0	$0	$0	$0	$0	$0	
	Clean Diesel - SCAQMD	$0	$0	$0	$0	$0	$0	
	Clean Diesel - ARB	$0	$0	$0	$0	$0	$0	
	Clean Diesel - EPA	$0	$0	$0	$0	$0	$0	
	Clean Diesel - Bond Funding	$0	$268,200,000	$268,200,000	$268,200,000	$268,200,000	$1,072,800,000	
		$0	**$268,200,000**	**$268,200,000**	**$268,200,000**	**$268,200,000**	**$1,072,800,000**	
	HDV Incentives (Alt Fuels)							
	LNG - POLA	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$80,000,000	Operational
	LNG - POLB	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$16,000,000	$80,000,000	
	LNG - SCAQMD	$12,000,000	$12,000,000	$12,000,000	$12,000,000	$12,000,000	$60,000,000	Assumes SCAQMD $6M/yr Match
	LNG - ARB	$0	$0	$0	$0	$0	$0	
	LNG - EPA	$0	$0	$0	$0	$0	$0	
	LNG - Bond Funding	$0	$346,400,000	$346,400,000	$346,400,000	$346,400,000	$1,385,600,000	
		$44,000,000	**$390,400,000**	**$390,400,000**	**$390,400,000**	**$390,400,000**	**$1,605,600,000**	
	Measure FY Totals	**$44,000,000**	**$658,600,000**	**$658,600,000**	**$658,600,000**	**$658,600,000**	**$2,678,400,000**	

SBP-HDV2	Alternate Fuel Infrastructure	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	POLA	$1,500,000	$0	$0	$0	$0	$1,500,000	
	POLB	$1,500,000	$0	$0	$0	$0	$1,500,000	
	SCAQMD	tbd	$0	$0	$0	$0	$0	
	ARB	$0	$0	$0	$0	$0	$0	
	EPA	$0	$0	$0	$0	$0	$0	
	Bond Funding	$0	$0	$0	$0	$0	$0	
	Measure FY Totals	**$3,000,000**	**$0**	**$0**	**$0**	**$0**	**$3,000,000**	
	TOTAL HDV COSTS	**$47,000,000**	**$658,600,000**	**$658,600,000**	**$658,600,000**	**$658,600,000**	**$2,681,400,000**	

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 12 - Focus on Replacements all FF and SFF trucks 50:50 CD and Alt Fuel

7,000 Frequent Trucks (preliminary 2005 EI data)	9,800 Semi-Frequent Trucks (preliminary 2005 EI data)	
4,258 Frequent Caller Trucks Alt Fuel Replaced	0 Cleaire + Chip Reflash SFF	1993 to 1998 MY trucks; 4 to 5 years useful life
4,258 Semi-Frequent Caller Alt Fuel Replaced	0 Cleaire + Chip Reflash (Frequent Callers)	1993 to 1998 MY trucks; 4 to 5 years useful life
4,258 Semi Frequent Caller Trucks CD Replaced	0 Cleaire (Frequent callers)	
4,258 Frequent Caller Trucks CD Replaced	0 Cleaire SFF	1999 to 2003 MY trucks; to 5 years useful life
17,033 Total Trucks Replaced	**0 Total Trucks Retrofitted**	
	0 Semi-Frequent Trucks Cannot be Cleaired	

Budget Scenario 12 - Options for Cleaner Diesel (CD)

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Clean Diesel)							
	Bond Funding	$0	$268,200,000	$268,200,000	$268,200,000	$268,200,000	$1,072,800,000	

CD Option 12 - Clean Diesel Trucks MY2007+

Bond Funding				**$129,500** /truck ($126k O/Op, $1.3k AVL, $2.2k admin)			see note below
Number of FF+SF trucks/year	**0**	**2,071**	**2,071**	**2,071**	**2,071**	**8,283**	
Total DPM Emis Red tpy	0	105	209	314	419	**1,047**	
Total NOx Emis Red tpy	0	780	1,559	2,627	3,407	**8,373**	

Budget Scenario 12 - Options for Alt Fuels

Alt Fuel Option 1 - Purchase of New LNG Trucks **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
SBP-HDV1	HDV Incentives (Alt Fuel)							
	Ports/SCAQMD Funding	$44,000,000	$390,400,000	$390,400,000	$390,400,000	$390,400,000	$1,605,600,000	
Number of total trucks/year	**233**	**2,071**	**2,071**	**2,071**	**2,071**	**8,517**		
Total DPM Emis Red tpy	12.0	118.9	225.8	332.6	439.5	**1,129**		
Total NOx Emis Red tpy	90	1,011	1,932	2,853	3,775	**9,661**		

San Pedro Bay Ports Clean Air Action Plan

DRAFT - Clean Diesel & Alt Fuel Options for Policy Discussion

Heavy-Duty Vehicles (Trucks)

Budget Scenario 12 - Focus on Replacements all FF and SFF trucks 50:50 CD and Alt Fuel

7,000	**Frequent Trucks (preliminary 2005 EI data)**	**9,800**	**Semi-Frequent Trucks (preliminary 2005 EI data)**
4,258	Frequent Caller Trucks Alt Fuel Replaced	0	Cleaire + Chip Reflash SFF — 1993 to 1998 MY trucks; 4 to 5 years useful life
4,258	Semi-Frequent Caller Alt Fuel Replaced	0	Cleaire + Chip Reflash (Frequent Callers) — 1993 to 1998 MY trucks; 4 to 5 years useful life
4,258	Semi Frequent Caller Trucks CD Replaced	0	Cleaire (Frequent callers)
4,258	Frequent Caller Trucks CD Replaced	0	Cleaire SFF — 1999 to 2003 MY trucks; to 5 years useful life
17,033	**Total Trucks Replaced**	**0**	**Total Trucks Retrofitted**
		0	Semi-Frequent Trucks Cannot be Cleaired

Alt Fuel Option 2 - Purchase of Westport LNG Trucks — **$188,500** /truck ($185k O/Op, $1.3k AVL, $2.2k admin) see note below

Measure #	Measure Description	Budget by Measure						
SBP-HDV1	HDV Incentives (Alt Fuel)	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total	Notes
	Ports/SCAQMD Funding	$44,000,000	$390,400,000	$390,400,000	$390,400,000	$390,400,000	$1,605,600,000	
	Number of total trucks/year	**233**	**2,071**	**2,071**	**2,071**	**2,071**	**8,517**	
	Total DPM Emis Red tpy	12.0	118.6	225.2	331.9	438.5	**1,126**	
	Total NOx Emis Red tpy	104	1,097	2,089	3,082	4,075	**10,447**	
	Total (CD+Alt Fuel) DPM Red tpy	12.05	223.60	435.16	646.83	858.50		
	Total (CD+Alt Fuel) NOx Red tpy	90	1,791	3,492	5,480	7,181		

SBP-HDV1		FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	Total
	Total DPM Reduction (tpy)	**12**	**224**	**435**	**647**	**858**	**2,176**
	Total NOx Reduction (tpy)	**90**	**1,791**	**3,492**	**5,480**	**7,181**	**18,033**
	Total SOx Reduction (tpy)	**0.108**	**0.957**	**0.957**	**0.957**	**0.957**	**3.936**

Notes

Diesel Truck Cost - Based on ARB's Ports Truck Report, page B-16

LNG Truck Cost - Based on April 18, 2006 meeting between Westport, POLA, POLB and Starcrest

Implementation Schedule for the San Pedro Bay Ports Clean Air Action Plan Measures (Lease plus Phase In)

Measure	Description	Implementation Strategy	Overall Implementation				
			2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
					POLA		
SPBP-HDV1	All FF and SFF HDVs	Incentive Funding by Ports, SCAQMD and Bonds	5%	39%	68%	83%	100%
SPBP-OGV1	VSR speed to 20 nm	Voluntary, Incentive and Lease Requirement	100%	100%	100%	100%	100%
	VSR speed to 40 nm		0%	50%	100%	100%	100%
SPBP-OGV2	Reduction at Berth for container, liquid bulk and cruise terminals	Infrastructure-Ports OGV retrofit cost by OGV owners	2%	2%	7%	16%	23%
SPBP-OGV3	OGV Auxiliary Engine Fuel Improvement	Lease Based	9%	26%	39%	45%	48%
SPBP-OGV4	OGV Main Engine Fuel Improvement	Lease Based	9%	26%	39%	45%	48%
SPBP-OGV5	Slide Valve Retrofits for Main Engine OGVs	Lease Based	9%	26%	39%	45%	48%
SPBP-CHE1	Yard Tractors, Side Picks and Top Handlers	Lease Based	9%	26%	42%	50%	53%
	Other CHE	Lease Based	0%	0%	0%	0%	53%
					POLB		
SPBP-HDV1	All FF and SFF HDVs	Funding by Ports, SCAQMD and Bonds	5%	39%	68%	83%	100%
SPBP-OGV1	All ships VSR speed to 20 nm	Voluntary, Incentive and Lease Requirement	100%	100%	100%	100%	100%
	All Ships VSR speed to 40 nm		0%	50%	100%	100%	100%
SPBP-OGV2	Reduction at Berth for container and liquid bulk terminals	Infrastructure-Ports OGV retrofit cost by OGV owners	0%	1%	1%	1%	10%
SPBP-OGV3	OGV Auxiliary Engine Fuel Improvement	Lease Based	13%	28%	39%	42%	43%
SPBP-OGV4	OGV Main Engine Fuel Improvement	Lease Based	13%	28%	39%	42%	43%
SPBP-OGV5	Slide Valve Retrofits for Main Engine OGVs	Lease Based	13%	28%	39%	42%	43%
SPBP-CHE1	Yard Tractors, Side Picks and Top Handlers	Lease Based	13%	28%	44%	47%	49%
	Other CHE	Lease Based	0%	0%	0%	0%	49%

	Year 1	Year 2	Year 3	Year 4	Year 5
Lease Required phase in (SPBP-OGV3,4 and 5)	50%	70%	90%	90%	90%
Lease Required phase in (SPBP-CHE1)	50%	70%	100%	100%	100%

San Pedro Bay Ports Clean Air Action Plan

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Once the Lease is Renewed Following Phase in Schedule Applies for San Pedro Bay Ports Clean Air Action Plan Measures

Measure	Description	Implementation Strategy	Overall Implementation				
			FY 1	FY 2	FY 3	FY 4	FY 5
			POLA				
SPBP-HDV1	All FF and SFF HDVs	Incentive Funding by Ports, SCAQMD and Bonds	5%	39%	68%	83%	100%
SPBP-OGV1	VSR speed to 20 nm	Voluntary, Incentive and Lease Requirement	100%	100%	100%	100%	100%
	VSR speed to 40 nm		0%	50%	100%	100%	100%
SPBP-OGV2	Reduction at Berth for container, liquid bulk and cruise terminals	Infrastructure-Ports OGV retrofit cost by OGV owners	Refer to Ship Calls Assumptions Shown Below				
SPBP-OGV3	OGV Auxiliary Engine Fuel Improvement	Lease Based	50%	70%	90%	90%	90%
	Upto 20 nm from Pt. Fermin		100%	100%	100%	100%	100%
	Upto 40 nm from Pt. Fermin		0%	50%	100%	100%	100%
SPBP-OGV4	OGV Main Engine Fuel Improvement	Lease Based	50%	70%	90%	90%	90%
	Upto 20 nm from Pt. Fermin		100%	100%	100%	100%	100%
	Upto 40 nm from Pt. Fermin		0%	50%	100%	100%	100%
SPBP-OGV5	Slide Valve Retrofits for Main Engine OGVs	Lease Based	50%	70%	90%	90%	90%
	Upto 20 nm from Pt. Fermin		This measure provides emissions reduction through out the operation of OGV main engines				
	Upto 40 nm from Pt. Fermin						
SPBP-CHE1	Yard Tractors, Side Picks and Top Handlers	Lease Based	50%	70%	100%	100%	90%
	Other CHE	Lease Based	50%	70%	100%	100%	100%
			POLB				
SPBP-HDV1	All FF and SFF HDVs	Funding by Ports, SCAQMD and Bonds	5%	39%	68%	83%	100%
SPBP-OGV1	All ships VSR speed to 20 nm	Voluntary, Incentive and Lease Requirement	100%	100%	100%	100%	100%
	All Ships VSR speed to 40 nm		0%	50%	100%	100%	100%
SPBP-OGV2	Reduction at Berth for container and liquid bulk terminals	Infrastructure-Ports OGV retrofit cost by OGV owners	Refer to Ship Calls Assumptions Shown Below				
SPBP-OGV3	OGV Auxiliary Engine Fuel Improvement	Lease Based	50%	70%	90%	90%	90%
	Upto 20 nm from Pt. Fermin		100%	100%	100%	100%	100%
	Upto 40 nm from Pt. Fermin		0%	50%	100%	100%	100%
SPBP-OGV4	OGV Main Engine Fuel Improvement	Lease Based	50%	70%	90%	90%	90%
	Upto 20 nm from Pt. Fermin		100%	100%	100%	100%	100%
	Upto 40 nm from Pt. Fermin		0%	50%	100%	100%	100%
SPBP-OGV5	Slide Valve Retrofits for Main Engine OGVs	Lease Based	50%	70%	90%	90%	90%
	Upto 20 nm from Pt. Fermin		This measure provides emissions reduction through out the operation of OGV main engines				
	Upto 40 nm from Pt. Fermin						
SPBP-CHE1	Yard Tractors, Side Picks and Top Handlers	Lease Based	50%	70%	100%	100%	90%
	Other CHE	Lease Based	50%	70%	100%	100%	100%

San Pedro Bay Ports Clean Air Action Plan

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Once the Lease is Renewed Following Phase in Schedule Applies for San Pedro Bay Ports Clean Air Action Plan Measures

Ship Calls Assumptions for POLA -SPBP-OGV 2

YEAR	2006	2007	2008	2009	2010
B90-93 (Cruise Terminal)			40% of Princess Calls	80% of Princess Calls	80% of Princess Calls
Pier 300 (APL)					
Pier 400 (APM)					
B224-236 (Evergreen)		rebuilding wharf	Wharf work for 3/4 year	up to 70% at one Berth	up to 100% at one berth
B212-218 (YTI)	Assumes issues are resolved	rebuilding wharf	Wharf work for 3/4 year	up to 70% at one Berth	up to 100% at one berth
B175-181(Pasha)					
B136-147 (TraPac)	0	0	0	EIR/EIS Complete; Wharf Work complete mid year Mitigation: 30% MOL ships (assumes 1/2 MOL, 1/2 invitee)	EIR/EIS Complete; Mitigation: 60% MOL ships (assumes 1/2 MOL, 1/2 invitee)
B121-131 (WBCT)					
B100-102 (CS)	70% (1 weekly, 1 biweekly)	EIR/EIS Complete; Mitigation: 70% (1 weekly, 1 biweekly)	EIR/EIS Complete; Mitigation: 70% (1 weekly, 1 biweekly)	EIR/EIS Complete; Mitigation: 70% (2 weekly, 1 biweekly)	EIR/EIS Complete; Mitigation: 100% (2 weekly, 1 biweekly)
Pier 400 (Liquid Bulk) B195-199				bimonthly service 20% ship calls	bimonthly service 20% ship calls

Shore Power Schedule for the POLB

Site	Number of Berth	Anticipated Date of Operation	Number of Calls
Pier C(Matson)	1	Jan-11	52 calls per berth
Pier D,E,F (Middle Harbor)	1	Sep-11	17 calls per berth
Pier G (ITS)	2	Jan-11	50 calls per berth
Pier S	2	Sep-11	33 calls per berth
Pier T, berth T121 (BP)	1	4 th qtr of 2007	12 vessels per year

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2001 OGV Baseline Emissions in tpy for POLA

[1] **Applicable to all OGV measures**

Tons Per Year Type	NOx_{Main}	NOx_{Aux}	DPM_{Main}	DPM_{Aux}	SOx_{main}	SOx_{Aux}
Auto Carrier	125	31	13	1	72	17
Bulk	171	99	18	4	99	66
Containership	2,968	1,290	320	44	1,824	663
Cruise	839	604	86	14	500	201
General Cargo	60	27	6	1	35	20
Miscellaneous	5	10	1	1	3	8
Other Tug	11	1	1	0	8	0
Reefer	45	6	5	0	26	4
RoRo	10	25	3	1	63	21
Tanker	232	342	26	14	174	207
Totals	4,464	2,434	478	81	2,804	1,206
Total Main plus Auxiliary Engines		6,898		558		4,010

[1] VSR speeds not included

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2002 OGV Baseline Emissions in tpy for POLB

[1] **Applicable to all OGV measures**

Tons Per Year						
Type	**NOx_{Main}**	**NOx_{Aux}**	**DPM_{Main}**	**DPM_{Aux}**	**SOx_{main}**	**SOx_{Aux}**
Auto	91.9	43.0	12.1	2.0	45.0	28.1
Container	2518.3	1729.7	335.8	78.9	1140.2	1128.2
Other	500.4	434.1	69.6	19.8	292.1	139.8
RoRo	62.4	135.6	8.8	6.2	32.9	87.9
Reefer	42.8	90.2	6.7	4.1	26.3	58.6
Tanker	646.2	381.8	110.8	17.4	512.1	247.9
Totals	3862.1	2814.3	543.9	128.4	2048.7	1690.5
Total Main plus Auxiliary Engines		6,676		672		3,739

[1] VSR speeds not included

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Emission Reductions Achieved by Fuel Substitutions

The following tables present emission reduction percentages potentially achieved by switching fuels
Applied to calculate emissions reductions from CARB's Marine Auxiliary Engine regulation, SPBP-OGV3 and SPBP-OGV4

NOx		Substituted Fuel Type								
		2.7% S IFO	1.5% S IFO	1.5% S MDO	0.5% S MGO	0.2% S MGO	0.1% S MGO	500 ppm S EPA	500 ppm S CARB	15 ppm S CARB
Current Fuel Type	Designation	NOx Reduction from Switching								
Residual	2.7% S IFO	0%	0%	10%	10%	10%	10%	10%	15%	15%
Residual	1.5% S IFO		0%	10%	10%	10%	10%	10%	15%	15%
Distillate	1.5% S MDO			0%	0%	0%	0%	0%	7%	7%
Distillate	0.5% S MGO				0%	0%	0%	0%	7%	7%
Distillate	0.2% S MGO					0%	0%	0%	7%	7%
Low S Distillate	0.1% S MGO						0%	0%	7%	7%
EPA Onroad	500 ppm S EPA							0%	7%	7%
CARB Onroad	500 ppm S CARB								0%	0%
CARB Onroad	15 ppm S CARB									0%

Note: The 10% NOx redn. is based on lower N in distillate fuel per EPA420-D-02-002, 4/02, Table 8.3-4.

Note: The 7% reduction for CARB diesel is estimated based on the lower aromatic content.

Note: Entec reported a 6% NOx reduction for the residual to distillate switch (rather than 10%).

Emission Reductions Achieved by Fuel Substitutions

DPM		Substituted Fuel Type								
		2.7% S IFO	1.5% S IFO	1.5% S MDO	0.5% S MGO	0.2% S MGO	0.1% S MGO	500 ppm S EPA	500 ppm S CARB	15 ppm S CARB
Current Fuel Type	Designation	PM Reduction from Switching								
Residual	2.7% S IFO	0%	18%	53%	61%	64%	65%	68%	74%	75%
Residual	1.5% S IFO		0%	42%	51%	53%	54%	61%	68%	69%
Distillate	1.5% S MDO			0%	15%	20%	21%	61%	68%	69%
Distillate	0.5% S MGO				0%	5%	6%	7%	10%	10%
Distillate	0.2% S MGO					0%	2%	8%	25%	28%
Low S Distillate	0.1% S MGO						0%	4%	21%	25%
EPA Onroad	500 ppm S EPA							0%	20%	23%
CARB Onroad	500 ppm S CARB								0%	4%
CARB Onroad	15 ppm S CARB									0%

Assumption: Reduction due to S and Distillate are calculated using multiplicative CFs

Emission Reductions Achieved by Fuel Substitutions

SOx		Substituted Fuel Type								
		2.7% S IFO	1.5% S IFO	1.5% S MDO	0.5% S MGO	0.2% S MGO	0.1% S MGO	500 ppm S EPA	500 ppm S CARB	15 ppm S CARB
Current Fuel Type	Designation	SO2 Reduction from Switching								
Residual	2.7% S IFO	0%	44%	44%	81%	93%	96%	98%	98%	99%
Residual	1.5% S IFO		0%	0%	67%	87%	93%	97%	97%	99%
Distillate	1.5% S MDO			0%	67%	87%	93%	97%	97%	99%
Distillate	0.5% S MGO				0%	60%	80%	90%	90%	97%
Distillate	0.2% S MGO					0%	50%	75%	75%	93%
Low S Distillate	0.1% S MGO						0%	50%	50%	85%
EPA Onroad	500 ppm S EPA							0%	0%	97%
CARB Onroad	500 ppm S CARB								0%	97%
CARB Onroad	15 ppm S CARB									0%

Note: Gray color areas represent no emission reductions.
Note: Sulfur oxide reductions directly proportional to reductions in fuel sulfur content.

Emission Reductions Achieved by Fuel Substitutions

DPM Reduction Calculations

% S	% Rdn from 2.7%	
2.7	0%	
1.5	18%	From EPA420-D-02-002
0.5	56%	
0.3	63%	From EPA420-D-02-002,switching from 2.7% IFO to 0.3 % S distillate

	Reduction	CF
DPM reduction per 1% S reduction	15%	85%
DPM reduction due to S from 2.7 to 1.5 (2.7-1.5)	18%	82%
DPM reduction due to S from 2.7 to 0.5 (2.7-0.5)	33%	67%
DPM reduction due to S from 2.7 to 0.3 (2.7-0.3)	36%	64%
DPM reduction due to S from 2.7 to 0.2 (2.7-0.2)	38%	63%
DPM reduction due to S from 2.7 to 0.1 (2.7-0.1)	39%	61%
DPM reduction due to S from 1.5 to 0.5 (1.5-0.5)	15%	85%
DPM reduction due to S from 1.5 to 0.2 (1.5-0.2)	20%	81%
DPM reduction due to S from 1.5 to 0.1 (1.5-0.1)	21%	79%
DPM reduction due to S from .5 to 0.2 (1.5-0.2)	5%	96%
DPM reduction due to S from .5 to 0.1 (1.5-0.1)	6%	94%
DPM reduction due to S from .2 to 0.1 (.2-0.1)	2%	99%
DPM reduction due to switch from residual to distillate fuel	42%	58%

CARB's Adopted Marine Auxiliary Engines Regulation Adopted in December of 2005

Assumption: Ships utilizing AMP/Cold Ironing are also meeting CARB's Marine Auxiliary Engine regulation
Port of Los Angeles

Requirements for all OGV auxiliary engines operating within 24 nautical miles:
Starting January 1, 2007, use MGO 0.5% or less S content
Starting January 1, 2010, use MGO with 0.1% or less S content

Emission Reduction (tpy)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
[1] Baseline OGV NOx emissions (tpy)	6,898	6,898	6,898	6,898	6,898	6,898
NOx Emissions Reduced 24 nm	0	35	69	69	69	69
NOx CF (Total OGV)	1.000	0.995	0.990	0.990	0.990	0.990
[1] Baseline OGV PM emissions (tpy)	558	558	558	558	558	558
DPM Emissions Reduced 24 nm	0	12	23	23	24	25
DPM CF (Total OGV)	1.000	0.979	0.958	0.958	0.957	0.956
[1] Baseline SOx Emissions (tpy)	4010	4010	4010	4010	4010	4010
SOx Emissions Reduced 24 nm	0	373	747	747	747	747
SOx CF (Total OGV)	1.000	0.907	0.814	0.814	0.814	0.814

[1] Includes Main and Auxiliary Engine Emissions

CARB's Adopted Marine Auxiliary Engines Regulation Adopted in December of 2005

Percent of total POLA auxilairy and main OGV emissions within 24 nm 82%

	Fuel Use Distribution[2]		% Emissions			% of Emissions from IFO380 in all Auxiliary Engines		
	% IFO380	%MDO	Aux NOx	Aux PM	AuxSOx	NOx	PM	SOx
Containership	37.4%	62.6%	53.0%	54.8%	54.98%	20.5%	33.6%	34.7%
Tanker	54.8%	45.2%	14.0%	17.0%	17.19%	7.9%	13.0%	13.3%
Cruise Ship	4.1%	95.9%	24.8%	17.2%	16.64%	1.1%	1.8%	1.8%
Other	60.7%	39.3%	8.2%	11.0%	11.19%	5.1%	8.9%	9.1%
Composite			100.0%	100.0%	100.0%	34.5%	57.2%	59.0%

(2) Table 2.3, pg.53; FINAL DRAFT Port-Wide Baseline Air Emissions Inventory, 2004

Sample Calc:

% Emissions from IFO380 in Aux =

((%IFO x IFO EF) / ((%IFO x IFO EF)+(%MDO x MDO EF))) x % Emissions

Reduction in tpy =

Total Aux Emissions x % Emissions from IFO 380 in Aux x % Red due to fuel switch x % Emissions within 24 nm

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CARB's Adopted Marine Auxiliary Engines Regulation Adopted in December of 2005

Assumption: Ships utilizing AMP/Cold Ironing are also meeting CARB's Marine Auxiliary Engine regulation Port of Long Beach

Requirements for all OGV auxiliary engines operating within 24 nautical miles:
Starting January 1, 2007, use MGO with 0.5% or less sulfur content
Starting January 1, 2010, use MGO with 0.1% or less sulfur content

Emission Reduction (tpy)

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
[1] Baseline OGV NOx emissions (tpy)	6,676	6,676	6,676	6,676	6,676	6,676
NOx Emissions Reduced 24 nm	0	97	194	194	194	194
NOx CF (Total OGV)	1.000	0.985	0.971	0.971	0.971	0.971
[1] Baseline OGV PM emissions (tpy)	672	672	672	672	672	672
DPM Emissions Reduced 24 nm	0	33	65	65	67	69
DPM CF (Total OGV)	1.000	0.952	0.903	0.903	0.900	0.898
[1] Baseline SOx Emissions (tpy)	3739	3739	3739	3739	3739	3739
SOx Emissions Reduced 24 nm	0.000	640	1,279	1,279	1,279	1,279
SOx CF (Total OGV)	1.000	0.829	0.658	0.658	0.658	0.658

[1] Includes Main and Auxiliary Engine Emissions

San Pedro Bay Ports Clean Air Action Plan

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CARB's Adopted Marine Auxiliary Engines Regulation Adopted in December of 2005

Percent of total POLB auxilairy and main
OGV emissions within 24 nm 95%

	Fuel Use Distribution[2]		% Emissions			% of Emissions from IFO380 in all Auxiliary Engines		
	% IFO380	%MDO	Aux NOx	Aux PM	Aux SOx	NOx	PM	SOx
Containership	71.0%	29.0%	66.7%	66.7%	66.7%	48.1%	57.9%	58.4%
Tanker	71.0%	29.0%	14.7%	14.7%	14.7%	10.6%	12.7%	12.8%
Cruise Ship	71.0%	29.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other	71.0%	29.0%	18.6%	18.6%	18.6%	13.4%	16.1%	16.3%
Composite			100.0%	100.0%	100.0%	72.1%	86.7%	87.5%

Sample Calc:

% Emissions from IFO380 in Aux =
((%IFO x IFO EF) / ((%IFO x IFO EF)+(%MDO x MDO EF))) x % Emissions
Reduction in tpy =
Total Aux Emissions x % Emissions from IFO 380 in Aux x % Red due to fuel switch x % Emissions within 24 nm

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Los Angeles

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Participation rate @ 20 nm from Pt. Fermir	70%	100%	100%	100%	100%	100%
Participation rate @ 40 nm from Pt. Fermir	0%	0%	50%	100%	100%	100%

Emission Reduction Percentages[1]

	Main Engine	Auxiliaries	
NO_x	57.6%	-6.7%	Auxiliary engine emissions increase because
PM_{10}	0.0%	-8.1%	of increased time in transit (due to lower speeds)

Speed assumptions:

w/out VSR	22 knots
with VSR	12 knots

20-mile VSR

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Distance of Compliance Zone (nm)	20	20	20	20	20	20
Participation Rate[2] (at 12 kts)	70%	100%	100%	100%	100%	100%

Main Engine (relative to current VSR distance & emissions)	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
NO_x, % reduction	20%	29%	29%	29%	29%	29%
NO_x, tons reduction per year	900	1,286	1,286	1,286	1,286	1,286
DPM_{10}	(credit only taken for NOx reductions pending evaluation of effect on PM emissions)					
Increase in Auxiliary Engine Emissions due to longer transit times						
NO_x, % increase	2.3%	3.4%	3.4%	3.4%	3.4%	3.4%
NO_x, tons increase per year	11	16	16	16	16	16
DPM, % increase	2.8%	4.1%	4.1%	4.1%	4.1%	4.1%
DPM, tons increase per year	0.5	0.6	0.5	0.5	0.5	0.5
Net Decrease, tons NOx:	888	1,269	1,270	1,270	1,270	1,270
Expanded Distance VSR[3]						

San Pedro Bay Ports Clean Air Action Plan

DRAFT-June 2006

SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Los Angeles

DO NOT DOUBLE COUNT with current 20 nm program	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Additional Distance of Compliance Zone (nm)	20	20	20	20	20	20
Participation Rate[2] (at 12 kts)	0%	0%	50%	100%	100%	100%

Main Engine Emission Decreases (Only enhanced VSR distance)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
NO_x, % reduction	0%	0%	14%	29%	29%	29%
NO_x, tons reduction per year	0	0	643	1,286	1,286	1,286
DPM	(credit only taken for NOx reductions pending evaluation of effect on PM emissions)					
Increase in Auxiliary Engine Emissions due to longer transit times						
NO_x, % increase	0.0%	0.0%	1.7%	3.4%	3.4%	3.4%
NO_x, tons increase per year	0	0	8	16	16	16
DPM, % increase	0.0%	0.0%	2.0%	4.1%	4.1%	4.1%
DPM, tons increase per year	0.0	0.0	0.2	0.3	0.3	0.3
Net Decrease, tons NOx:	0	0	635	1,270	1,270	1,270
Net Decrease, tons NOx, only expanded VSR:	0	0	635	1,270	1,270	1,270
Nox CF for current plus expanded VSR	0.871	0.815	0.721	0.628	0.628	0.628

Notes:

1 - Reductions calculated using 20-mile VSR applicability distance @ 100% participation (12 knots)

2 - Participation Rate: Currently, as modeled, the participation rate only takes into account those vessels that reach the target speed of 12 knots, however the POLA VSR program takes into account the reductions associated w/all vessels that reduce speed over their baseline corrected speed. This difference will be incorporated into the next version of this control measure worksheet.

3 - Percent reductions and increases are relative to emissions within the expanded VSR zone. Tons of reductions and increases have been estimated using the ratio of expanded VSR distance to current (20 nm) VSR distance to adjust for the greater emissions basis of the expanded program.

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Los Angeles

Information Used to Estimate Emissions Reductions From VSR Program

1. BLEI Speed Emissions Total, tpy for POLA

Tons Per Year Type	$NO_{x\ Main}$	$NO_{x\ Aux}$	PM_{Main}	PM_{Aux}
Auto Carrier	124.6	30.5	13.2	1.1
Bulk	170.6	98.8	18.0	4.3
Containership	2,967.6	1,290.3	319.8	44.2
Cruise	838.5	603.8	85.6	13.9
General Cargo	59.8	27.3	6.3	1.3
Miscellaneous	5.3	9.6	0.6	0.5
Other Tug	10.6	1.1	0.6	0.0
Reefer	44.8	6.5	4.6	0.2
RoRo	9.8	24.8	2.9	1.4
Tanker	231.9	341.7	26.0	13.7
Totals	4,463.6	2,434.4	477.7	80.7

2. Modeled at 12-Knot Scenario in Fairway, tpy

Tons Per Year $NO_{x\ Main}$	$NO_{x\ Aux}$	PM_{Main}	PM_{Aux}
64.7	32.4	6.9	1.2
137.3	103.3	14.5	4.8
1,068.6	1,356.0	117.0	47.4
353.6	687.6	36.6	15.9
41.9	28.3	4.5	1.4
4.0	9.9	0.4	0.6
10.6	1.1	0.6	0.0
20.1	7.5	2.1	0.4
7.6	25.4	2.2	1.4
183.6	345.7	20.7	14.1
1,892.0	2,597.3	205.6	87.0

3. Reduction between Corrected & 12 Knot Scenario, tpy Based on POLA emissions

Tons Per Year Type	$NO_{x\ Main}$	$NO_{x\ Aux}$	PM_{Main}	PM_{Aux}
Auto Carrier	59.9	-1.9	6.3	-0.1
Bulk	33.3	-4.5	3.5	-0.4
Containership	1,899.0	-65.6	202.8	-3.2
Cruise	484.9	-83.8	49.0	-2.0
General Cargo	17.8	-1.1	1.9	-0.1
Miscellaneous	1.3	-0.3	0.1	-0.1
Other Tug	0.0	0.0	0.0	0.0
Reefer	24.7	-1.0	2.5	-0.2
RoRo	2.2	-0.5	0.7	0.0
Tanker	48.3	-4.0	5.3	-0.4
Totals	2,571.4	-162.7	272.1	-6.5

4. Percentage Reduction by Vessel Type

$NO_{x\ Main}$	$NO_{x\ Aux}$	PM_{Main}	PM_{Aux}
48%	-6%	48%	-9%
20%	-5%	19%	-9%
64%	-5%	63%	-7%
58%	-14%	57%	-14%
30%	-4%	30%	-8%
24%	-3%	17%	-20%
0%	0%	0%	0%
55%	-15%	54%	-100%
22%	-2%	24%	0%
21%	-1%	20%	-3%
57.6%	**-6.7%**	**57.0%**	**-8.1%**

Notes:

1 - Adjusted Speeds: 2001 Baseline OGV transit emissions modeled with speed correction factors used by the Port in estimating reductions from the VSR program

2 - 12-Knot Scenario: Modeled corrected speed emissions from all OGVs transiting at 12 knots; auxiliary engine emissions increased because of longer transit times

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Los Angeles

Percent of auxiliary emissions during transit:	20%

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Long Beach

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Participation rate @ 20 nm from Pt. Fermin	0%	100%	100%	100%	100%	100%
Participation rate @ 40 nm from Pt. Fermin	0%	0%	50%	100%	100%	100%

Emission Reduction Percentages[w]

	Main Engine	Auxiliaries	
NO_x	23.4%	-1.1%	Auxiliary engine emissions increase because
PM_{10}	0.0%	-1.1%	of increased time in transit (due to lower speeds)

Speed assumptions:

w/out VSR	22 knots
with VSR	12 knots

20-mile VSR

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Distance of Compliance Zone (nm)	20	20	20	20	20	20
Participation Rate* (at 12 kts)	78%	100%	100%	100%	100%	100%

Main Engine Emission Decreases (relative to current VSR distance & emissions)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
NO_x, % reduction	9%	12%	12%	12%	12%	12%
NO_x, tons reduction per year	353	453	453	453	453	453
DPM_{10}	(credit only taken for NOx reductions pending evaluation of effect on PM emissions)					

Increase in Auxiliary Engine Emissions due to longer transit times						
NO_x, % increase	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%
NO_x, tons increase per year	2	2	2	2	2	2
DPM, % increase	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%
DPM, tons increase per year	0.1	0.1	0.0	0.0	0.0	0.0
Net Decrease, tons NOx:	352	451	451	451	451	451

Expanded Distance VSR*

DO NOT DOUBLE COUNT with current 20 nm program

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Additional Distance of Compliance Zone (nm)	20	20	20	20	20	20
Participation Rate* (at 12 kts)	0%	0%	50%	100%	100%	100%

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Long Beach

Main Engine Emission Decreases (Only enhanced VSR distance)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
NO_x, % reduction	0%	0%	6%	12%	12%	12%
NO_x, tons reduction per year	0	0	226	453	453	453
DPM	(credit only taken for NOx reductions pending evaluation of effect on PM emissions)					
Increase in Auxiliary Engine Emissions due to longer transit times						
NO_x, % increase	0.0%	0.0%	0.3%	0.5%	0.5%	0.5%
NO_x, tons increase per year	0	0	1	2	2	2
DPM, % increase	0.0%	0.0%	0.3%	0.5%	0.5%	0.5%
DPM, tons increase per year	0.0	0.0	0.0	0.0	0.0	0.0
Net Decrease, tons NOx:	0	0	225	451	451	451
Net Decrease, tons NOx, only expanded VSR:	0	0	225	451	451	451
Nox CF for current plus expanded VSR	0.947	0.931	0.896	0.861	0.861	0.861

Notes:

1 - Reductions calculated using 20-mile VSR applicability distance @ 100% participation (12 knots)

2 - Participation Rate: 2002 baseline emissions inventory assumes before VSR speeds.

3 - Percent reductions and increases are relative to emissions within the expanded VSR zone. Tons of reductions and increases have been estimatec using the ratio of expanded VSR distance to current (20 nm) VSR distance to adjust for the greater emissions basis of the expanded program.

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Long Beach

Information Used to Estimate Emissions Reductions From VSR Program

2002 POLB, Emissions in TPY

NO VSR

Type	NOx_{Main}	NOx_{Aux}	NOx	PM_{Main}	PM_{Aux}	PM
Auto Carrier	91.94	43.03	134.97	12.11	1.96	14.07
Bulk	293.96	259.66	553.62	41.60	11.84	53.45
Containership	2,518.34	1,729.68	4,248.02	335.83	78.89	414.73
General Cargo	97.02	66.95	163.98	13.31	3.05	16.37
ITB	85.06	29.71	114.78	11.19	1.36	12.54
MISC	24.31	77.75	102.06	3.51	3.55	7.06
RORO	62.44	135.60	198.04	8.84	6.19	15.03
Reefer	42.82	90.19	133.01	6.73	4.11	10.84
Tanker	646.18	381.76	1,027.94	110.78	17.41	128.19
	3,862.08	2,814.35	6,676.43	543.91	128.37	672.27

Reductions

Type	NOx_{Main}	NOx_{Aux}	NOx	PM_{Main}	PM_{Aux}	PM
Auto Carrier	22.08	-0.78	21.29	3.02	-0.04	2.98
Bulk	23.51	-0.58	22.93	3.49	-0.03	3.47
Containership	755.55	-25.04	730.51	106.71	-1.14	105.56
General Cargo	10.92	-0.30	10.62	1.53	-0.01	1.51
ITB	8.04	-0.12	7.92	1.09	-0.01	1.08
MISC	1.31	-0.05	1.26	0.20	0.00	0.20
RORO	12.82	-0.52	12.30	1.88	-0.02	1.86
Reefer	6.90	-0.82	6.08	1.11	-0.04	1.08
Tanker	64.32	-2.12	62.20	11.61	-0.10	11.52
	905.44	-30.32	875.12	130.65	-1.38	129.26

Notes:

1 - Adjusted Speeds: 2001 Baseline OGV transit emissions modeled with speed correction factors used by the Port in estimating reductions from the VSR program

2 - 12-Knot Scenario: Modeled corrected speed emissions from all OGVs transiting at 12 knots; auxiliary engine emissions increased because of longer transit times

Percent of auxiliary emissions during transit: 13%

VSR to 20 Miles - 12 Knots

Type	NOx_{Main}	NOx_{Aux}	NOx	PM_{Main}	PM_{Aux}	PM
Auto Carri	69.87	43.81	113.68	9.09	2.00	11.09
Bulk	270.45	260.24	530.69	38.11	11.87	49.98
Container	1,762.79	1,754.72	3,517.51	229.13	80.04	309.16
General C	86.11	67.25	153.36	11.79	3.07	14.85
ITB	77.02	29.83	106.86	10.10	1.36	11.46
MISC	23.00	77.80	100.80	3.31	3.55	6.86
RORO	49.62	136.12	185.74	6.96	6.21	13.17
Reefer	35.92	91.01	126.93	5.61	4.15	9.76
Tanker	581.87	383.88	965.74	99.16	17.51	116.67
	2,956.64	2,844.67	5,801.31	413.26	129.75	543.01

Percentage Reductions

Type	NOx_{Main}	NOx_{Aux}	NOx	PM_{Main}	PM_{Aux}	PM
Auto Carri	24.0%	-1.8%	15.8%	24.9%	-1.8%	21.2%
Bulk	8.0%	-0.2%	4.1%	8.4%	-0.2%	6.5%
Container	30.0%	-1.4%	17.2%	31.8%	-1.4%	25.5%
General C	11.3%	-0.4%	6.5%	11.5%	-0.4%	9.3%
ITB	9.5%	-0.4%	6.9%	9.7%	-0.4%	8.6%
MISC	5.4%	-0.1%	1.2%	5.8%	-0.1%	2.9%
RORO	20.5%	-0.4%	6.2%	21.3%	-0.4%	12.4%
Reefer	16.1%	-0.9%	4.6%	16.6%	-0.9%	9.9%
Tanker	10.0%	-0.6%	6.1%	10.5%	-0.6%	9.0%
	23.4%	-1.1%	13.1%	24.0%	-1.1%	19.2%

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 1 - Vessel Speed Reduction (VSR) based on Tariff and Inventives

Applicable to all OGVs

Port of Long Beach

SPBP-OGV 1 - Vessel Speed Reduction (VSR) expanded to 20 nm POLB

	FY 2006/2007 (tpy)	FY 2007/2008 (tpy)	FY 2008/2009 (tpy)	FY 2009/2010 (tpy)	FY 2010/2011 (tpy)	Total (tons)
Current VSR participation (20 nm)	78%	100%	100%	100%	100%	
DPM Reduction	0	0	0	0	0	0
NOx Reduction	451	451	451	451	451	2,254
Incentives	0%	50%	100%	100%	100%	
DPM Reduction	0	0	0	0	0	0
NOx Reduction	0	225	451	451	451	1,578
Total SPBP-OGV1 Reduction						
TOTAL Measure DPM Reductions	0	0	0	0	0	0
TOTAL Measure NOx Reductions	451	676	902	902	902	3,833

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 2 - Reduction of At-Berth OGV Emissions through Lease requirement, Incentives and Capital Funding
Assumption: Ships utilizing AMP are also meeting CARB's Marine Auxiliary Engine regulation

Port of Los Angeles

	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Annual kW-hrs - Containerships	6,264,000	5,832,000	8,208,000	22,032,000	49,572,000
Annual kW-hrs - Tanker	0	0	0	648,000	1,296,000
Annual kW-hrs - Cruise Ships	0	0	6,400,000	12,800,000	12,800,000
NOx Reductions, tons, containerships	92	84	118	318	715
NOx Reductions, tons, Tankers	0	0	0	9	19
NOx Reductions, tons, cruise ships	0	0	91	181	181
Combined NOx Reductions, tons	92	84	209	509	916
NOx CF	0.987	0.988	0.969	0.926	0.866
DPM Reductions, tons, containerships	3	2	3	8	17
DPM Reductions, tons, Tankers	0.0	0.0	0.0	0.3	0.5
DPM Reductions, tons, cruise ships	0.0	0.0	1.5	3.0	3.0
Combined DPM Reductions, tons	3	2	4	11	21
DPM CF	0.995	0.996	0.992	0.979	0.961
SOx Reductions, tons, containerships	43	36	51	136	306
SOx Reductions, tons, Tankers	0	0	0	5	10
SOx Reductions, tons, cruise ships	0	0	25	50	50
Combined SOx Reductions, tons	43	36	76	191	366
SOx CF	0.987	0.988	0.975	0.937	0.880

Auxiliary Engine Emission Factors, g/kW-hr	Residual	Distillate	Container	Tanker	Cruise
NOx	14.70	13.90	14.20	14.34	13.93
PM	0.8	0.3	0.49	0.57	0.32
SOx	12.3	4.3	7.26	8.68	4.62
Percentage fuel used, Container	37%	63%			
Percentage fuel used, Tanker	55%	45%			
Percentage fuel used, Cruise	4%	96%			

From Table 2.3:Summary of Mono-Fuel or Dual-Fuel by Vessel Type, page 56 from report "Port of Los Angeles Baseline Air Emissions Inventory-2001"

Percentage of hoteling emissions eliminated: 95%

Assumed Schedule for Containership AMP Participation - POLA

	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
B212-218 (YTI)	4	0	11	36	52
B224-236 (Evergreen)	0	0	11	36	52
APM	0	0	0	0	10
B136-147 (Trapac)	0	0	0	40	106
Pier 300 (APL)	0	0	0	0	72
B100-102 (CS)	54	54	54	92	131
B121-131 (Yang Ming or WBCT)	0	0	0	0	36
Total container calls	58	54	76	204	459
5-year	851				
kW-HR	6,264,000	5,832,000	8,208,000	22,032,000	49,572,000

108,000 kW per call (72 hrs/ container&tanker call, 1,500 kW load during hoteling)

Assumed Schedule for Liquid Bulk (tanker) AMP Participation					
Pier 400 (Liquid Bulk)	0	0	0	6	12
kW-HR	0	0	0	648000	1296000

Assumed Schedule for Cruise Ship AMP Participation					
B90-93Cruise	0	0	100	200	200
kW-HR	0	0	6400000	12800000	12800000
Total Calls	58	54	176	410	671

kW/hrs per call: 64,000 (8 hrs per cruise call, 8,000 kW load during hoteling)

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 2 - Reduction of At-Berth OGV Emissions through Lease requirement, Incentives and Capital Funding
Assumption: Ships utilizing cold ironing are also meeting CARB's Marine Auxiliary engines regulation

Port of Long Beach

	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Annual kW-hrs - Containerships	0	0	0	0	21,816,000
Annual kW-hrs - Tanker	324,000	1,296,000	1,296,000	1,296,000	1,296,000
Annual kW-hrs - Cruise Ships	0	0	0	0	0
NOx Reductions, tons, containerships	0	0	0	0	307
NOx Reductions, tons, Tankers	5	18	18	18	18
NOx Reductions, tons, cruise ships	0	0	0	0	0
Combined NOx Reductions, tons	5	18	18	18	326
NOx CF	0.999	0.997	0.997	0.997	0.950
DPM Reductions, tons, containerships	0.0	0.0	0.0	0.0	6.9
DPM Reductions, tons, Tankers	0.2	0.6	0.6	0.6	0.4
DPM Reductions, tons, cruise ships	0.0	0.0	0.0	0.0	0.0
Combined DPM Reductions, tons	0.2	0.6	0.6	0.6	7.3
DPM CF	1.000	0.999	0.999	0.999	0.988
SOx Reductions, tons, containerships	0	0	0	0	150
SOx Reductions, tons, Tankers	3	9	9	9	9
SOx Reductions, tons, cruise ships	0	0	0	0	0
Combined SOx Reductions, tons	3	9	9	9	159
SOx CF	0.999	0.996	0.996	0.996	0.935

Auxiliary Engine Emission Factors, g/kW-	Residual	Distillate	Container	Average Tanker	Cruise
NOx	14.70	13.90	14.47	14.47	14.47
PM	0.8	0.3	0.66	0.66	0.66
SOx	12.3	4.3	9.98	9.98	9.98
Percentage used, Container	71%	29%			
Percentage used, Tanker	71%	29%			
Percentage used, Cruise	71%	29%			

Percentage of hoteling emissions eliminated: 95%

Assumed Schedule for Containership Cold Ironing Participation-POLB

Site	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	
Pier G (ITS K-Line - Two berths)	0	0	0	0	100	50 calls per berth
Pier C (Matson - One berth)	0	0	0	0	52	
Piers D, E, F (Middle Harbor)	0	0	0	0	17	
Pier S (Two berths)	0	0	0	0	33	
Total container calls	0	0	0	0	202	
5-year	202					
kW-HR	0	0	0	0	21,816,000	
108,000	kW per call (72 hrs/ container&tanker call, 1,500 kW load during hoteling)					

Assumed Schedule for Liquid Bulk (tanker) Cold Ironing Participation

Pier T 121	3	12	12	12	12	12 vessels per year, 3 utilizing shore power in 4 qtr of 2007
						Construction finishes in August of 2007
kW-HR	324,000	1,296,000	1,296,000	1,296,000	1,296,000	

Assumed Schedule for Cruise Ship Cold Ironing Participation

B90-93Cruise	0	0	0	0	0
kW-HR	0	0	0	0	0
Total Calls	3	12	12	12	214

kW/hrs per call: 64,000 (8 hrs per cruise call, 8,000 kW load during hoteling)

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 3 - Lease Required Auxiliary Engine Fuel Improvement (0.2% S Fuel)

Applicable to all OGVs

Port of Los Angeles

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Participation rate @ 20 nm from Pt. Fermin	0%	100%	100%	100%	100%	100%
Participation rate @ 40 nm from Pt. Fermin	0%	0%	50%	100%	100%	100%

Emission Reduction Estimates (tpy)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	
Implementation Schedule	0%	9%	25%	38%	44%	47%	Based on Lease Renewal
NOx Emissions Reduced	0	0	3	9	11	11	
NOx CF (Total OGV)	1.000	1.000	1.000	0.999	0.998	0.998	
DPM Emissions Reduced	0	0	1	3	3	2	
DPM CF (Total OGV)	1.000	1.000	0.997	0.994	0.994	0.995	
SOx Emissions Reduction	0	41	68	112	74	21	
SOx Emissions CF	1.000	0.989	0.979	0.966	0.977	0.994	

CARB's Marine Auxiliary Engine Regulation Adopted in December of 2005 is included in the CF calculations
2001 BLEI info on 40-mile radius

Percent of auxiliary emissions during transit	20%		
Percent of auxiliary emissions during transit within 20 nm plus hotelling::		90%	
Percent of auxiliary emissions during transit within40 nm plus hotelling::			100%

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 3 - Lease Required Auxiliary Engine Fuel Improvement (0.2% S Fuel)

Applicable to all OGVs

Port of Long Beach

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Participation rate @ 20 nm from Pt. Fermin	0%	100%	100%	100%	100%	100%
Participation rate @ 40 nm from Pt. Fermin	0%	0%	50%	100%	100%	100%

Emission Reduction Estimates (tpy)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	
Implementation Schedule	0%	13%	28%	39%	42%	43%	Based on Lease Renewal
NOx Emissions Reduced	0.0	0.0	1.8	5.0	5.3	5.4	
NOx CF (Total OGV)	1.000	1.000	1.000	0.999	0.999	0.999	
DPM Emissions Reduced	0.0	0.7	2.1	3.6	2.7	1.6	
DPM CF (Total OGV)	1.000	0.999	0.997	0.994	0.996	0.997	
SOx Reduction	0	76	70	99	57	8	
SOx CF (Total OGV)	1.000	0.976	0.972	0.960	0.977	0.997	

CARB's Marine Auxiliary Engine Regulation Adopted in December of 2005 is included in the CF calculations

Percent of auxiliary emissions during transit 13%
Percent of auxiliary emissions during transit within 20 nm plus hotelling:: 95%

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 4 -Main Engine Fuel Improvement

Fuel Switch from IFO 380 to 0.2% S MGO

Assumption: Applicable to all OGVs; Based on Lease Renewal

Port of Los Angeles

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Participation rate @ 20 nm from Pt. Fermin	0%	100%	100%	100%	100%	100%
Participation rate @ 40 nm from Pt. Fermin	0%	0%	50%	100%	100%	100%

Fuel Implementation	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	
IFO 380 to 0.2% S MGO participation rate	0%	9%	25%	38%	44%	47%	Lease based
Participation rate @ 20 nm from Pt. Fermin	0%	100%	100%	100%	100%	100%	
Participation rate @ 40 nm from Pt. Fermin	0%	0%	50%	100%	100%	100%	

Emission Reduction (tpy) Estimates

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
NOx Emissions Reduced , MGO	0	20	85	172	197	210
NOx CF (Total OGV)	1.000	0.997	0.988	0.975	0.971	0.969
DPM Emissions Reduced, MGO	0	14	58	117	135	143
DPM CF (Total OGV)	1.000	0.975	0.892	0.781	0.747	0.732
SOx Emissions Reduced, MGO	0.000	117	492	998	1,149	1,219
SOx CF	1.000	0.968	0.849	0.694	0.648	0.626

San Pedro Bay Ports Clean Air Action Plan

DRAFT-June 2006

SPBP-OGV 4 -Main Engine Fuel Improvement

Fuel Switch from IFO 380 to 0.2% S MGO

Assumption: Applicable to all OGVs; Based on Lease Renewal

Port of Long Beach
Apply to all Ship Types

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Participation rate @ 20 nm from Pt. Fermir	0%	100%	100%	100%	100%	100%
Participation rate @ 40 nm from Pt. Fermir	0%	0%	50%	100%	100%	100%

	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
NOx Emissions Reduced , MGO	0	24	82	152	162	165
NOx CF (Total OGV)	1.000	0.996	0.987	0.977	0.975	0.975
DPM Emissions Reduced , MGO	0	22	74	136	146	149
DPM CF (Total OGV)	1.000	0.966	0.878	0.775	0.759	0.754
SOx Reduction, MGO	0.000	119	405	744	796	812
SOx CF (Total OGV)	1.000	0.961	0.835	0.697	0.676	0.670

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 5 - Slide Valve Retrofit-
Main Engine

Assumption: Applicable to all OGVs; Based on Lease Renewal

Port of Los Angeles

Reductions due to Slide Valve-Main Engine	
NOx	30%
PM	25%

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	
Slide Valve Retrofit Implementation Rate	0%	9%	25%	38%	44%	47%	Lease based

Emission Reduction (tpy) Estimates

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Total NOx Emissions Reduced	0	121	338	515	592	629
NOx CF (Total OGV)	1.000	0.982	0.950	0.925	0.913	0.908
Total DPM Emissions Reduced	0	11	30	46	53	56
DPM CF (Total OGV)	1.000	0.980	0.944	0.914	0.901	0.895
Total SOx Emissions Reduced	0	0	0	0	0	0
SOx CF (Total OGV)	1.000	1.000	1.000	1.000	1.000	1.000

San Pedro Bay Ports Clean Air Action Plan

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SPBP-OGV 5 - Slide Valve Retrofit-
Main Engine

Assumption: Applicable to all OGVs;
Based on Lease Renewal

Port of Long Beach

Reductions due to Slide Valve-Main Engine	
NOx	30%
PM	25%

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011	
Slide Valve Retrofit Implementation Rate	0%	13%	28%	39%	42%	43%	Lease Based

Emission Reduction (tpy) Estimates

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Total NOx Emissions Reduced	0	146	330	455	486	496
NOx CF (Total OGV)	1.000	0.978	0.949	0.930	0.925	0.924
Total DPM Emissions Reduced	0	17	39	53	57	58
DPM CF (Total OGV)	1.000	0.973	0.936	0.912	0.906	0.904
Total SOx Emissions Reduced	0	0	0	0	0	0
SOx CF (Total OGV)	1.000	1.000	1.000	1.000	1.000	1.000

San Pedro Bay Ports Clean Air Action Plan

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Implementation and Reduction Estimates Used to Calculate Emissions Reduction Due to CARB's Cargo Handling Equipment Regulation Adopted in December of 2005 and SPBP-CHE 1

Implementation Schedule for Yard Tractors per CARB's Regulation

	Off-Road YT with no VDEC					Off-Road YT with VDEC				
[5] MY	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
pre-2003	50%	100%	100%	100%	100%		50%	100%	100%	100%
2003				25%	50%					25%
2004					25%					

	On-Road YT with no VDEC					On-Road YT with VDEC				
[5] MY	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
pre-2000	25%	50%	100%	100%	100%		25%	50%	100%	100%
2000		25%	50%	100%	100%			25%	50%	100%
2001			25%	50%	100%				25%	50%
2002				25%	50%					25%
2003					25%					

Following emissions reduction estimates were used to calculate control factors for CARB's cargo handling equipment regulation adopted in December of 2005.

Emissions Reduction Table for Diesel Yard Tractors

Off-Road Diesel	[1] NOx	[1] PM	[2] NOx	[2] PM
Tier 0 (Pre 1996)	87%	97%	98%	97%
Tier 1(1996-2001)	84%	98%	97%	98%
Tier 2 (2002-2005)	76%	93%	96%	93%
Tier 3 (2006-2010)	59%	93%	93%	93%
Tier 4 (2011-2013)	87%	33%	87%	33%
Tier 4 (2013+)	33%	33%	33%	33%

[1] Reduction (%) due to 2007-2009 on-road hdv replacement

[2] Reduction (%) due to 2010 + MY on-road hdv replacement

On-Road HDV Diesel Emission Rate (gm/hp-hr)		
2007-2009	1.1	0.01
2010+	0.2	0.01
On-Road HDV LNG Emissions Rate (gm/hp-hr)		
2007-2009	0.2	0.01

No adjustment for the off-road duty cycle was made when considering replacement with on-road engines

Implementation Schedule for Non-Yard Tractors

[5] MY	2007	2008	2009	2010	2011	2012	2013
Pre 1988	25%	50%	75%	100%	100%	100%	100%
1988-1995	0%	25%	50%	75%	100%	100%	100%
1996-2002	0%	0%	25%	50%	75%	100%	100%
2003-2006	0%	0%	0%	25%	50%	75%	100%

Emissions Reduction Table for Diesel Yard Tractors

	Cranes	Cranes	Excavator	Excavator	Forklift	Forklift	Loader	Loader
% Affected	91%	91%	100%	100%	100%	100%	100%	100%
[4] Technology	Passive DPF		DOC		Active DPF		DOC	
% Reduction	0%	85%	0%	25%	0%	85%	0%	25%

	RTG	RTG	Sweeper	Sweeper	Other	Other	Other
% Affected	100%	100%	100%	100%	100%	100%	100%
[4] Technology	DPF		DOC		[3] DOC or DOC w. Emulsified		
% Reduction	0%	85%	0%	25%	20%	50%	25%

[3] Except for pre 2003 where it is only DOC

Source:

Implementation schedule from CARB's staff report obtained from CARB's website under board reports dated Jan 28, 2006.

[4] Technology assumption from appendix D @
http://www.arb.ca.gov/regact/cargo2005/appd.pdf

[5] Implementation for remaining model years not applicable within FY 2006/2007 to 2010/2011

San Pedro Bay Ports Clean Air Action Plan

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CARB's Cargo Handling Equipment Regulation Adopted in December of 2005

Port of Los Angeles

Emission Reduction (tpy)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Baseline CHE NOx emissions (tpy)	2,106	2,106	2,106	2,106	2,106	2,106
NOx Emissions Reduced	0	95	449	708	713	755
NOx CF	1.000	0.955	0.787	0.664	0.661	0.642
Baseline CHE DPM emissions (tpy)	86	86	86	86	86	86
DPM Emissions Reduced	0	6	25	40	45	50
DPM CF	1.000	0.930	0.709	0.535	0.477	0.419
Baseline CHE SOx Emissions (tpy)	3	3	3	3	3	3
SOx Emissions Reduced	0	0	0	0	0	0
SOx CF	1.000	1.000	1.000	1.000	1.000	1.000

San Pedro Bay Ports Clean Air Action Plan

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CARB's Cargo Handling Equipment Regulation Adopted in December of 2005

Port of Long Beach

Emission Reduction (tpy)

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Baseline CHE NOx emissions (tpy)	1,810	1,810	1,810	1,810	1,810	1,810
NOx Emissions Reduced	0	29	323	588	588	622
NOx CF	1.000	0.984	0.822	0.675	0.675	0.656
Baseline CHE DPM emissions (tpy)	67	67	67	67	67	67
DPM Emissions Reduced	0	4	21	36	40	43
DPM CF	1.000	0.940	0.687	0.463	0.403	0.358
Baseline CHE SOx Emissions (tpy)	5	5	5	5	5	5
SOx Emissions Reduced	0	0	0	0	0	0
SOx CF	1.000	1.000	1.000	1.000	1.000	1.000

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SPBP-CHE 1 Performance Standards for CHE

Port of Los Angeles

Emission Reduction (tpy)

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
NOx Emissions Reduced (tpy)	0	90	126	179	199	225
[1] NOx CF	1.000	0.955	0.924	0.872	0.857	0.833
DPM Emissions Reduced (tpy)	0	2	3	5	5	6
[1] DPM CF	1.000	0.971	0.946	0.898	0.885	0.836
SOx Emissions Reduced (tpy)	0	0	0	0	0	0
SOx CF	1.000	1.000	1.000	1.000	1.000	1.000

[1] CARB's Cargo Handling Equipment Regulation Adopted in December of 2005 is included in the baseline for the CF calculation

Emissions Reduction Calculations Basis for SPBP-CHE 1:

50% of the 2003+ MY Yard Tractors, Top Handlers and Side Handlers not covered by CARB's regulation within next five years with those equipped with cleanest available 2007+ MY on-road diesel and remaning

50% with 2007+ MY LNG engines meeting 0.01 g/hp-hr PM and 0.2 g/hp-hr NOx standards.

CHE other than Yard Tractors, Top Handlers and Side Handlers will be replaced with those meeting Tier 4 standards in FY 2010

San Pedro Bay Ports Clean Air Action Plan

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SPBP-CHE 1 Performance Standards for CHE

Port of Long Beach

Emission Reduction (tpy)

	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
NOx Emissions Reduced (tpy)	0	37	69	110	136	151
NOx CF	1.000	0.979	0.954	0.910	0.889	0.873
DPM Emissions Reduced (tpy)	0	2	3	4	5	5
DPM CF	1.000	0.973	0.938	0.861	0.831	0.786
SOx Emissions Reduced (tpy)	0	0	0	0	0	0
SOx CF	1.000	1.000	1.000	1.000	1.000	1.000

[1] CARB's Cargo Handling Equipment Regulation Adopted in December of 2005 is included in the baseline for the CF calculations

Emissions Reduction Calculations Basis for SPBP-CHE 1:
50% of the 2003+ MY Yard Tractors, Top Handlers and Side Handlers not covered by CARB's regulation within next five years will be with those equipped with cleanest available 2007+ MY on-road diesel and remaning
50% with 2007+ MY LNG engines meeting 0.01 g/hp-hr PM and 0.2 g/hp-hr NOx standards.
CHE other than Yard Tractors, Top Handlers and Side Handlers will be replaced with those meeting Tier 4 standards in FY 2010/2011

San Pedro Bay Ports Clean Air Action Plan

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SPBP - RL1 PHL Agreement

Port of Los Angeles

[1]Emission Reduction (tpy)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Baseline NOx emissions (tpy)	2,466	2,466	2,466	2,466	2,466	2,466
NOx Emissions Reduced	0	163	163	163	163	163
NOx CF	1.000	0.934	0.934	0.934	0.934	0.934
BaselineDPM emissions (tpy)	60	60	60	60	60	60
DPM Emissions Reduced	3	3	3	3	3	3
DPM CF	0.950	0.950	0.950	0.950	0.950	0.950
Baseline SOx Emissions (tpy)	90	90	90	90	90	90
SOx Emissions Reduced	0.2	0.2	0.2	0.2	0.2	0.2
SOx CF	0.998	0.998	0.998	0.998	0.998	0.998

[1] Estimated in August 2005 based on MOU terms and on data associated with baseline emissions inventories:

San Pedro Bay Ports Clean Air Action Plan

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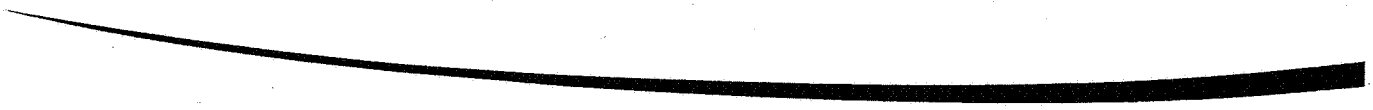
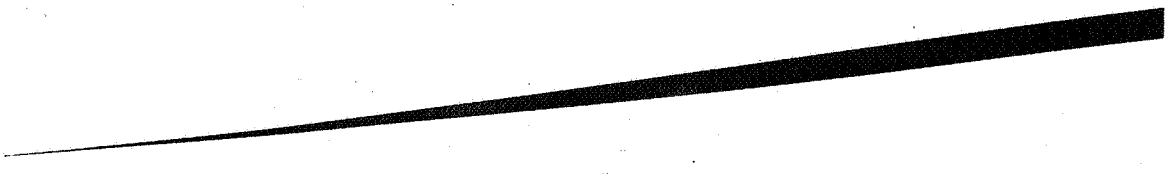
SPBP - RL1 PHL Agreement

Port of Los Angeles

[1]Emission Reduction (tpy)	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	FY 2010/2011
Baseline NOx emissions (tpy)	2,067	2,067	2,067	2,067	2,067	2,067
NOx Emissions Reduced	0	137	137	137	137	137
NOx CF	1.000	0.934	0.934	0.934	0.934	0.934
BaselineDPM emissions (tpy)	51	51	51	51	51	51
DPM Emissions Reduced	2.6	2.6	2.6	2.6	2.6	2.6
DPM CF	0.949	0.949	0.949	0.949	0.949	0.949
Baseline SOx Emissions (tpy)	86	86	86	86	86	86
SOx Emissions Reduced	0.2	0.2	0.2	0.2	0.2	0.2
SOx CF	0.998	0.998	0.998	0.998	0.998	0.998

[1] Estimated using POLA and POLB baseline emissions inventories ratio applied to POLAemissions reduction benefit





NOTICE OF PUBLIC MEETING

STATE OF CALIFORNIA
Air Resources Board

Research Screening Committee

The Air Resources Board's (ARB) Research Screening Committee will hold a public meeting at the time and place specified below to review and consider one interagency proposal and one contract augmentation. The above items for review and approval, and any other matters that will be presented at the meeting are listed on the attached agenda. The presentation and discussion of the Planned Air Pollution Research for Fiscal Year 2006/2007 with the Board will begin at approximately 10:00 a.m. in the Byron Sher Auditorium. Upon completion of that item, the Research Screening Committee will reconvene in Conference Room 2550.

Date:	July 20, 2006
Time:	9:00 a.m.
Place:	Cal/EPA Headquarters Building 1001 I Street, Room 2550 Sacramento, California 95814

If you have any questions regarding this meeting, please contact Bart E. Croes, P.E., Chief, Research Division, Air Resources Board, P.O. Box 2815, Sacramento, California 95812, at (916) 323-4519, or bcroes@arb.ca.gov.

This notice and the advance agenda containing a brief summary of the items are available on the ARB Internet site at http://www.arb.ca.gov/research/rsc/rsc/htm. To obtain this document in an alternative format, please contact the ARB Americans with Disabilities Act Coordinator at (916) 323-4916, TDD (916) 324-9531, or (800) 700-8326 for TDD calls outside the Sacramento area.

Michael N. Scheible

for Catherine Witherspoon
Executive Officer

Dated: July 6, 2006

Attachment

The energy challenge facing California is very 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 Web-site at www.arb.ca.gov

Location #2:
Environmental Protection Agency
National Health and Environmental Effects Research Laboratory
Research Triangle Park, NC 27711
Phone: 919-966-6255

Location #3:
4518 Whisper Way Road
Troy, MI 48098
Phone: 248-641-7272

State of California
AIR RESOURCES BOARD

Joint Meeting with the Board and the
Research Screening Committee
To Present the Planned Air Pollution Research
Fiscal Year 2006/2007

AGENDA
Cal/EPA Headquarters Building
1001 I Street
Conference Room 2550
Sacramento, California 95814
(916) 445-0753

July 20, 2006
9:00 a.m.

Minutes of Previous Meeting

May 25, 2006

Interagency Proposal

1. "Ventilation and Indoor Air Quality (IAQ) in Small and Medium Commercial Buildings (SMCB) Phase II Field Study," University of California, Davis, $1,059,996, Proposal No. 2610-252 — Ash Lashgari

Contract Augmentation

2. "Improvements to Versatile Aerosol Concentration Enrichment System," University of California, Davis, $29,109, Augmentation to Contract No. 04-332, Proposal No. 2611-252 — William Vance

Other Business

3. Discussion of the Priorities for the 2007-2008 Research Solicitation — Annmarie Mora

California Environmental Protection Agency

Air Resources Board

DRAFT

PLANNED AIR POLLUTION RESEARCH

Fiscal Year 2006-2007

July 2006

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 ADA Coordinator at (916) 322-4505, TDD (916) 324-9531, or (800) 700-8326 for TDD calls from outside the Sacramento areas. 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, 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.

Principal Author:
Annmarie Mora

Reviewed By:

Research Screening Committee
Harold Cota, Ph.D. (Chairman)
John Balmes, M.D. (abstained)
Robert Devlin, Ph.D.
Barbara Finlayson-Pitts, Ph.D.
Steven Japar, Ph.D.
Chung Liu, D.Env.
Rachel Morello-Frosch, Ph.D.
Tracy Thatcher, Ph.D. (abstained)
Forman Williams, Ph.D.

Ex Officio Members
Michael Lipsett, M.D., J.D. (abstained)
Michael Prather, Ph.D.

Executive Research Review Committee
Catherine Witherspoon, Executive Officer
Thomas Cackette, Chief Deputy Executive Officer
Michael Scheible, Deputy Executive Officer
Lynn Terry, Deputy Executive Officer
Bart Croes, P.E., Chief, Research Division

External Reviewers and Collaborators
California Energy Commission
Coordinating Research Council
Health Effects Institute
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 2006-2007. Thirty-four projects are proposed. Twenty-one projects are recommended for funding and seven are recommended if funding is available. This research portfolio is organized into four main areas of research: Health and Welfare Effects, Exposure Assessment, Technology Advancement and Pollution Prevention, and Global Air Pollution. This year the Board is expecting to receive funds specific for climate change research from the Legislature. In response to the Governor's climate change targets, the Board requested funds to focus on various areas of research in order to achieve those targets. The research included in this year's plan is in direct response and in accordance with achieving the Governor's climate change reduction goals.

Another very important area is environmental justice (EJ). Over the last few fiscal years, the Board has invested over a $1 million dollars into areas of environmental justice, such as developing community tools for exposure assessment, and investigating health effects. Although this year's plan does not have a dedicated set of projects to address environmental justice, EJ aspects and factors can be found throughout several projects in other subject areas.

This annual plan proposes research in the four areas mentioned above, with a significant effort to characterize and assess the behavior of pollutants in the atmosphere, and develop and improve technologies to reduce and control emissions, especially greenhouse. The proposed budget for the recommended projects is approximately $5,000,000.

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, and 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 the various aspects of air pollution, including air pollution's effects on health and the environment, the atmospheric reactions and transport of pollutants, and the inventory and control of air polluting emissions. In recent years, several legislative mandates have expanded and further defined the scope of the program.

The ARB's mission to protect California's public health, welfare, and ecological resources is supported through a Strategic Plan for Research covering the years 2001-2010. The Strategic Plan is based on the ARB's regulatory priorities for the next several years and provides direction for the ARB's research program. The four main areas of research identified in the Strategic Plan are: Health and Welfare Effects, Exposure Assessment, Technology Advancement and Pollution Prevention, and Global Air Pollution. They are also the categories that guide this plan. These areas encompass the comprehensive mission of ARB's air pollution research. The Strategic Plan can be found at http://www.arb.ca.gov/research/apr/apr.htm.

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 the timely scientific and technical information that will allow the Board and local districts to make the public policy decisions necessary to implement an effective air pollution control program in California.

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 committees, led by ARB staff, to review research ideas. In response to this years solicitation, approximately 200 research ideas were submitted. Proposed projects were examined for relevance to regulatory questions facing the Board and modified as necessary. Committee members 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 the Health and Safety Code section 39705, reviewed these candidate projects. The list of projects, along with comments from the RSC, was forwarded to the Executive Research Review Committee, whose members are the Executive Officer, her three deputies, and the Chief of the Research Division. The Executive Research Review Committee reviewed all of the proposed projects and established project priorities. Selected projects are then placed into two categories: 1) those that are recommended for funding, and 2) those that are recommended if funding is available. The Research Screening Committee 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. There is a list serve that can be subscribed to in order to receive updates on research activities. Visit www.arb.ca.gov/listserv/research/research.htm for more information.

Research Budget. The 21 recommended projects total approximately $5,000,000. The allocations for the proposed recommended projects among research categories are as follows:

RESEARCH CATEGORY	BUDGET
Health and Welfare Effects	$950,000
Exposure Assessment	$1,967,000
Technology Advancement and Pollution Prevention	$850,000
Global Air Pollution[1]	$1,350,000
TOTAL	**$5,117,000**

Project Co-sponsorships. The Research Division is continually looking for cofunding 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 be out of the state's fiscal reach. ARB has had great success in working with other research organizations and has been part of multimillion-dollar studies with nominal cash contributions. Several of the projects in this plan have either confirmed or have potential cofunding dollars included in the cost category.

Summaries of Past Research. Ongoing research projects and 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.

Electronic copies of all of the Research Division's final reports are available for downloading at the same web site.

[1] Contingent upon one time funding to support climate change projects. This proposed augmentation is uncertain at this time. If additional funding is not obtained, all projects may have to reprioritized.

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HEALTH AND WELFARE EFFECTS – *the projects funded under this section are dedicated to the memory of Dr. William Friedman, former ARB Board Member who passed away on August 25, 2005. Dr. Friedman was a strong advocate for the ARB's health research and guided many of the projects that have increased the Board's understanding of how air pollution affects human health, especially children's health.*

Human Health Effects – *Recommended Projects*

Source-Oriented Ambient Aerosol Biosampling and Toxicology, $400,000 9

To examine the pulmonary and cardiovascular health effects of both laboratory and ambient particles.

Extending the American Cancer Society Study of Particulate Air Pollution and Mortality to the Intra-urban Scale in California, $375,000 11

To derive detailed assessments of the impact of particulate air pollution on all-cause and cause specific mortality in California and investigate whether critical exposure windows exist in the relationship between air pollution and mortality in California.

Improving Air Pollution Exposure Estimates in the Analysis of Mortality in the California Teachers Study Cohort, $175,000 13

To conduct multiple sensitivity analyses as part of the ongoing study which aims to provide a prospective examination of the disease and mortality experience of over 100,000 current and former female public school teachers and administrators.

Recommended if funding available

Data Validation and Support of Continuous Monitoring at the Fresno Supersite as part of FACES, $300,000 15

To keep the Fresno Supersite in operation through December 2007 in order to assist ARB in researching the health and welfare effects of PM exposure and for evaluating long term particulate trends at the Fresno Supersite.

Relationship between Exposure to Ambient Air-Borne Particulate Matter and the Risk of Neurological Disease, $400,000 17

To study the effect of ambient particulate matter air pollution on the central nervous system.

Development and Use of a Mobile Facility for Animal Inhalation Studies to Particulate Matter from Various Sources, $800,000.....18

To develop a mobile facility to conduct animal inhalation studies to various PM sources at a variety of different sites and during different seasons.

EXPOSURE ASSESSMENT

Atmospheric Processes – *Recommended Projects*

Satellite Measurements to Improve California's Models for Ozone and Particulate Matter, $350,000 21

To develop the capability for routine application of inverse modeling techniques in combination with satellite measurements to improving the retrospective and predictive capabilities of models applied to ozone and PM and the movement of goods in California.

A Universal Land Use Regression for Predicting Ambient Air Pollution Concentrations in California, $250,000 23

To develop a universal land use regression model for predicting NO_2 and PM2.5 concentrations for use in burden of illness and epidemiologic investigations across California.

Flux Measurements of Biogenic Precursors to Ozone and Particulate Matter in the Central Valley, $400,000 25

To evaluate biogenic volatile organic compound (BVOC) emission model performance and improve the representation of emissions and atmospheric processes using in-situ measurements of BVOC emissions, micrometeorology and atmospheric chemical reactions within selected agricultural landscapes over growing seasons.

Deployment of a Novel Aerosol Mobility/Mass Spectrometer for Quantitative Chemical Analysis of Organic Aerosols from Mobile Sources, $240,000 27

To deploy an aerosol mobility/mass spectrometer in collaboration with ongoing field measurements through the Southern California PM Center and target light and heavy duty freeways, the L.A. shipping port, and LAX airport.

Characterization of Source-Specific Contributions to Air Pollution by Measurements of Isotope Ratios and Marker Compounds, $427,000 30

To identify the contribution of fossil fuel combustion, wood burning, meat cooking, and natural direct input to the burden of size-resolved carbonaceous PM and volatile organic compounds.

Emission Inventory – *Recommended Projects*

Assessing Near-Field Exposures from Distributed Combustion Sources, $250,000 32

Characterize the near-field components of intake fraction attributable to certain important distributed combustion sources. In doing so, improve the base of knowledge for assessing the near-field exposure impacts of sources that emit close to people.

An Observational Investigation of Offshore Ship Emissions of CO, NO_X, and SO_X from Continuous Observations at a Coastal Site, $50,000.....34

To support continued and expanded monitoring operations at Bodega Bay for the purpose of quantifying emissions of CO, NO_X, and SO_X from offshore shipping channels. Careful analysis of the dimensions and sum of these pollutant plumes will help characterize the regional pollutant sources from offshore shipping.

Recommended if funding available

Laboratory and Field Studies of the Atmospheric Chemistry of Aromatic and Polycyclic Aromatic Compounds and the Role of NO_2 in their Product Distributions, $300,000.....36

To provide a more complete picture of the products formed from atmospheric reactions of monocyclic aromatic hydrocarbons and their yields and the formation routes to nitro-PACs in the atmosphere and the role of NO_2 in their formation.

On-Road Motor Vehicle Emissions Measurements Including Ammonia and Sulfur Dioxide, $95,000.....38

To monitor pollutants from light duty vehicles in three regions of California, the Los Angeles basin, the central valley and the Bay area.

Secondary Port Truck Activity Study, $150,000.....40

To characterize the fleet of trucks that make secondary trips related to the movement of international containerized goods in the South Coast, identify distribution center facilities that service these containerized goods, and quantify emissions associated with those truck trips, and activity of trucks and other equipment operating at distribution centers.

TECHNOLOGY ADVANCEMENT AND POLLUTION PREVENTION

Clean Air Technologies – *Recommended Projects*

Development of the UCB Particle Monitor for California Applications in Epidemiology and Environmental Justice, $250,000.....42

To adapt and test a low-cost datalogging particle monitor using commercial smoke-alarm sensors developed by UC Berkeley for third-world use in California conditions.

Evaluation of Existing Air Pollution Control Technologies for Use in Controlling Exhaust Emissions from Ocean-Going Vessels at Sea, $150,000.....44

To identify the most promising emission control technologies for ocean-going vessels considering all possible technologies, especially those not currently used on marine vessels.

Update ARB's Solvent Cleaning Emissions Inventory, $200,000.....46

To update ARB's solvent cleaning emissions inventory and speciation profiles to reflect current solvent cleaning materials and technologies.

An Assessment of Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California, $150,000 47

To fill knowledge gaps to provide the necessary data to facilitate life cycle assessments needed for programs implementing greenhouse gas emissions reductions and the evaluations required under AB1007.

Engine Lubricating Oil Impacts on Mobile Source PM Emissions, $100,000 49

To characterize the significance of lube oil in PM formation and to determine whether lube oil can be formulated to reduce in-use PM emissions from mobile sources, if it is demonstrated that lube oil is the largest contributor to PM from mobile sources.

Clean Air Technologies – *Recommended if funding avaliable*

Diesel Engine Crankcase Blow-By and Diesel High PM Emitters: Determination of Contributions to Ambient Particulate Matter and Potential Health Effects, $350,000 52

To determine the influence of diesel engine blow-by and high PM emitter source profiles on chemical mass balance modeling results, while the second objective would be to investigate the toxicity of these emissions.

GLOBAL AIR POLLUTION

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To develop an algorithm for quantifying the life cycle emission effects of any measure that ARB staff may propose to meet the California GHG emission-reduction goals.

Improving the California Inventory for HFC Use and Emissions from Commercial Refrigeration, $150,000.....54

To quantify the populations of commercial systems by the type of HFC used, the application, the emissions rate, and the turnover rate to develop a baseline inventory for California.

Emissions of HFC-134a from Auto Dismantling and Recycling, $150,000.....56

To obtain an accurate estimate of "end-of-life" emissions of HFC-134a which occur when vehicles are dismantled.

HFC-134a Refrigerant Use by Non-Light-Duty Vehicles, $150,000 57

To develop an emissions inventory of HFC-134a from non-light duty motor vehicle air conditioning systems.

Evaluation of the Potential Impact of Emissions of HFC-134a from Non-Professional Servicing of Motor Vehicle Air Conditioning Systems, $150,000.....58

To obtain experimental data to support an estimate of the potential impact of emissions of HFC-134a from non-professional servicing of motor vehicle air conditioning systems.

Impact of Climate Change on the Frequency and Intensity of Low-Level Temperature Inversions in California, $250,000 60

To better understand how the frequency and intensity of low-level temperature inversions might vary or change in California in a changing climate.

Climate Change– *Recommended if funding available*

Economic Impacts and Benefits of Climate Change Control Strategies, $250,000. 62

To improve ARB's in-house capability to model the economic impact of climate change control strategies.

Conduct Tropospheric Ozone Model Simulations- to Reproduce Observed Long Term Trends in Background Ozone Levels, $300,000.....64

To improve the ability of climate model to reproduce observed long-term trends in background tropospheric ozone, and to better understand the factors controlling the concentrations and trends of tropospheric OH, and the implications for the methane lifetime and for methane trends.

TITLE: Source-Oriented Ambient Aerosol Biosampling and Toxicology

PROBLEM: Numerous epidemiological studies demonstrate a correlation between ambient particulate matter concentrations and increased morbidity and mortality, yet the mechanistic and causal links between health effects and particulate matter concentrations have eluded identification. One possible confounder is that ambient particles derive from a range of sources and experience a range of atmospheric processes that may alter their toxicity. Direct exposures of animals to emissions neglects atmospheric photochemistry that may enhance toxicity, while exposure to ambient or concentrated ambient particles (CAPs) combines the effect of many sources so does not elucidate which source contributes to the toxicity. The use of an ultrafine single particle mass spectrometer (RSMS-II) could be used to selectively collect ambient aerosol particles with a series of SKC biosamplers attached to a Versatile Aerosol Concentration System (VACES) and instill these samples to deduce their toxicity.

PREVIOUS WORK: Kent Pinkerton of the University of California, Davis (UCD) has extensive experience exposing rodents to CAPs to determine their relative toxicity and toxicity mechanisms. Anthony Wexler of UCD has developed an ultrafine single particle mass spectrometer that has been used in four of EPA's supersites (Atlanta, Houston, Pittsburgh and Baltimore) to determine the composition of individual ultrafine particles and associate these compositions with their sources. Studies to examine the health effects in animals have been done in Davis, Sacramento and Fresno. These studies have demonstrated unique responses to particle exposure with differences noted based on particle size and composition.

OBJECTIVE: The objective is to assess the toxicity of source-oriented ambient samples by using a single particle mass spectrometer, a VACES, and many biosamplers to collect ambient samples that are characteristic of a given source. Individuals are exposed to a wide range of atmospheric particle sizes and compositions. UCD has obtained an award from the United States Environmental Protection Agency for its San Joaquin Valley Aerosol Health Effects Research Center (SAHERC). Scientists from the center will examine the pulmonary and cardiovascular health effects of both laboratory and ambient particles. The ambient particles will be collected near Fresno using a VACES attached to a SKC biosampler. The toxicity of the particles will be assessed by instillation into rodents and subsequent toxicity studies. Typically, individuals at a given location are exposed to a range of particle compositions depending on the wind direction, which sources are in the vicinity, the mixing state of the atmosphere, and other factors. Collecting one VACES biosample mixes the particles from various sources together obscuring the relative toxicity of each.

DESCRIPTION: With RSMS-II, investigators are able to collect single particle spectra over the size range from about 40 nm to 1.2 μm, and classify them in real time using ART2a (this was done at the Houston supersite). That is, each particle analyzed possesses a mass spectrum and, in real time, these spectra are classified into similar groups indicative of their primary emissions source and the degree of their atmospheric processing. By sampling over weeks, different meteorological conditions prevail bringing different primary emissions to the sampling site and causing different degrees of

secondary processing, which in turn cause the particles to have different compositions and different levels of toxicity.

Methods (Sample Collection): Investigators will locate the RSMS-II ultrafine single particle mass spectrometer and a VACES in biosampler mode side by side in Fresno where other SAHERC ambient samples are collected. RSMS-II will be modified in two ways. First, they will only sample at one size, 200 μm, characteristic of the ultrafine size range. Second, they will use the real-time categorization capabilities of RSMS-II to control the sampling of ambient particles in real time, as described in a moment. The VACES will be used in biosampler mode but it too will be modified such that 10 biosamplers will be employed. A 10-position rotary valve will direct the output from VACES to one of the biosamplers. RSMS-II will control the rotary valve such that two biosamplers collect fine and ultrafine particles characteristic of one source profile. A source profile will be defined by either (1) detection of a single particle type or (2) detection of multiple particle types that often appear together. Sites are often influenced by a range of primary particle sources and secondary processing, but 9 source categories should be sufficient. The 10^{th} biosampler will collect samples when the source profile detected does not fit into one of the first nine.

Methods (Toxicity): Young adult Sprague Dawley rats will be used to test the relative toxicity of ambient particles collected via the VACES for each biosampler. A precise concentration of biosampler material will be instilled into the lungs of each individual animal. Following 24 hours post-instillation, the lungs will be lavaged to determine recovered cell numbers, cell viability, phagocytic index and the cell differential. Indicators of oxidative stress such as glutathione, heme oxygenase and selected cytokines will be measured in lung tissues. For each biosampler material, eight animals will be analyzed. Sham controls will receive an equivalent instillation of sterile saline. Of the 40 biosamples collected, toxicity will be tested on the 28 most prevalent samples.

Tasks:
1. Build and test RSMS-II/VACES/Biosampler using Davis ambient air (4 months)
2. Establish facility in Fresno (primarily SAHERC funded) (in parallel with #1)
3. Install and operate RSMS-II and collect biosamples for summer and winter seasons
4. Test biosamples for toxicity (in parallel with #3)
5. Identify sources of particles classes (in parallel with #3)
6. Associate toxicity with source class (4 months)
7. Publish results and write final report (4 months)

BENEFITS: Californians breathe air pollution particles emitted by a wide range of sources. For the first time, investigators will extract particulate samples from the atmosphere that are associated with the major sources of pollution in the San Joaquin Valley of California and deduce the toxicity of these samples by instillation in rodents. The result will be relative toxicity index for particles derived from each source category.

COST: $400,000 (an additional $361,496 will be contributed by EPRI)

TITLE: Extending the American Cancer Society Study of Particulate Air Pollution and Mortality to the Intra-urban Scale in California

PROBLEM: Studies using the American Cancer Society (ACS) cohort to assess the relation between particulate air pollution and mortality rank among the most influential and widely cited. The original study, a reanalysis that introduced new random effects methods and spatial analytic techniques, and recent studies with longer follow-up and improved exposure data have all demonstrated statistically significant and substantively large air pollution effects on all cause and cause-specific mortality. Due to this robust association and a lack of other studies on the long-term effects, the ACS studies in addition to the Six-Cities study have proven important to government regulatory interventions and health burden assessments. The assessment of air pollution exposure using only community average concentrations likely underestimates the health burden attributable to elevated concentrations in the vicinity of sources. Health effects may be larger around sources, and these effects are diminished when using average concentrations for the entire community. At present, there are no specific estimates of mortality in relation to particulate air pollution for the entire state California.

PREVIOUS WORK: Recently the first assessment of mortality and particulate air pollution estimates was published for the intra-urban or within-city scale in Los Angeles. Results suggest the chronic health effects associated with intra-urban gradients in exposure to PM2.5 may be even larger than previously reported across metropolitan areas. Observed effects were nearly three times greater than in models relying on between-community exposure contrasts. Given these remarkable findings, a need exists to investigate whether the findings hold for other parts of California and are robust to alternative measures of exposure assessment and confounding control. Researchers have also been investigating whether there are temporal patterns in the relative risk of mortality from air pollution. These studies suggest that with increasing mobile source contributions are *increased* dose-response functions over time.

OBJECTIVE: The objectives are to derive detailed assessments of the impact of particulate air pollution on all-cause and cause specific mortality in California and investigate whether critical exposure windows exist in the relationship between air pollution and mortality in California.

DESCRIPTION: Over 40,000 subjects have been identified in the ACS cohort who will serve as the study population. These subjects are widely distributed across California, giving good coverage of much of the population of the State. For the first time, subjects will be geocoded to their home address at time of enrolment. Previous studies have been restricted to zip code areas, limiting our ability to assign exposures based on proximity to source.

As a basis for exposure assessment, newly developed estimates will be utilized for the California Teachers Cohort Study. These estimates will be extended with advanced Bayesian Maximum Entropy kriging models to allow for spatiotemporal exposure assignment with explicit incorporation for errors in the exposure estimates. Following current national analysis, refined exposure data will be used to assess whether critical exposure windows exist in the mortality experience. Because the data will be geocoded

researchers will also have the opportunity to assess proximity to sources such as the Port of Los Angeles and the major highways in the state.

The standard suite of 44 individual confounders documented in earlier ACS studies will be employed investigating air pollution health effects. These variables control for lifestyle, dietary, demographic, occupational, and educational influences that may confound the air pollution-mortality association. Eight ecological variables will be assembled for the ZCAs to control for "contextual" neighbourhood confounding. "Contextual" effects occur when individual differences in health outcome associate with the grouped variables that represent the social, economic, and environmental settings where the individuals live, work or spend time (e.g., e.g., poverty or crime rate in a neighborhood).

BENEFITS: California currently has no state-wide estimates of mortality to support policymaking and regulatory activities. Extension of the ACS study to address scientific uncertainties and to derive estimates specific to California will provide information that will allow the ARB to assess the benefits of regulatory interventions with more specificity than is currently possible. This work can also increase understanding of specific source contributions to the mortality experience and of whether there are temporal patterns in the relative risks of mortality from air pollution. All of this information will strengthen efforts by ARB to implement policies that protect public health.

BUDGET: $375,000 (potential cofunding from the South Coast Air Quality Management District to augment the budget.)

TITLE: Improving Air Pollution Exposure Estimates in the Analysis of Mortality in the California Teachers Study Cohort

PROBLEM: Hundreds of studies implicate exposure to short-term ambient air pollution as a risk factor for exacerbation of pre-existing illness and for mortality in susceptible individuals. In contrast, much less is known about the health consequences associated with long-term exposures to air pollution and traffic. The effects associated with long-term exposure play an important role in determining annual ambient air quality standards and are a major factor in the calculation of health and economic benefits associated with air quality improvements. While few studies have examined relationships between long-term exposures and mortality, all have found positive associations with at least one pollutant metric; however, the results are not entirely consistent. In addition, significant uncertainties remain among these studies regarding the appropriate assumptions for exposure assessment.

PREVIOUS WORK: Researchers from the California Department of Health Services, the Office of Environmental Health Hazard Assessment, and the University of Southern California have embarked on an ARB-funded investigation of the California Teachers' Study (CTS), a prospective examination of the disease and mortality experience of over 100,000 current and former female public school teachers and administrators. Many members of this study population are at risk for developing and dying from cardiopulmonary diseases by virtue of their older age and post-menopausal status. To date, investigators have analyzed the relationships of long-term exposure to ozone on total and cardiopulmonary mortality, and anticipate completing basic analyses of the effects of exposure to several other pollutants and traffic metrics. As part of this effort, state-wide pollutant datasets dating back to at least 1988 have been created, including a historical reconstruction of PM2.5 developed under a related ARB contract.

OBJECTIVE: The objective is to examine the following research questions not addressed in the originally funded efforts: (1) What time period and duration of exposure (e.g., the most recent month or year, aggregation of the most recent three years, exposure from five to 10 years ago, and so forth) have the strongest associations with cardiopulmonary mortality? (2) What are the relative contributions of shorter-term versus longer-term exposures? (3) What are the impacts of varying distance assumptions when assigning exposures from fixed-site monitors or from GIS-generated traffic metrics? (4) What impacts, if any, do these alternative exposure metrics have on risk estimates for other outcomes not examined in the initial effort, such as cancer and nonmalignant respiratory disease? (5) Are associations altered when examining only never-smokers? (6) How are the effect estimates affected by alternative risk models that incorporate additional determinants of mortality, including ecological covariates? (7) Can any particularly susceptible subgroups be identified through stratified analysis? and (8) What do flexible modeling techniques, such as nonparametric smoothing, suggest regarding the shape(s) of the exposure-response functions?

DESCRIPTION: The current study team, under contract to ARB, is providing basic estimates of the effects of long-term exposure to PM10, PM2.5, ozone and other pollutant metrics on mortality and on the incidence of myocardial infarction and stroke. Investigators have developed initial estimates of exposure, linked to participants' geocoded residential addresses, that are more precise than those used in previous long-term cohort studies in

the U.S. However, this is a very rich data set which can and should be more fully explored -- this cohort does not have many of the confounders present in most other long-term studies of air pollution (i.e., these participants are all of the same gender, have similar levels of educational attainment, and have low smoking rates and [relative to other cohorts] low occupational respiratory exposures). Given the potential importance of the results of these analyses, it is crucial that multiple sensitivity analyses, which are not funded under the current agreement with ARB, be conducted. Uncertainties in exposure assessment are often raised by critics of studies such as this. Therefore, this issue will be explored and others that may affect the quantitative risk estimates, providing a full sense of the variability and reliability of these estimates.

BENEFITS: This effort would involve the analysis of existing datasets (including the health, pollution and traffic data) that have taken significant efforts to create, and would leverage the infrastructure of a large ongoing study. Since investigators have pollutant data for every month since 1988, the analysis would be the first to fully explore the relevant time periods of exposure to gaseous and particulate pollutants in relation to mortality outcomes, as well as the impacts of shorter- versus longer-term exposures. In addition, it is important to examine the sensitivity of the results to numerous alternative exposure assumptions. The results would be important in the next reviews of the ambient standards for particulate and gaseous pollutants in California and at the federal level, and may also affect quantitative estimates of the health and economic benefits of pollution control.

COST: $175,000 (potential cofunding from the South Coast Air Quality Management District to augment the budget.)

TITLE: Data Validation and Support of Continuous Monitoring at the Fresno Supersite as part of FACES

PROBLEM: Continuous and integrated measurements of particle size and chemistry are taken at the Fresno First Street monitoring station to evaluate new instrumentation, annual variability and trends, and health effects in conjunction with the Fresno Asthmatic Children's Environmental Study (FACES) conducted by the University of Califorina, Berkeley. FACES was funded by the ARB as part of the ARB's multi-year efforts to establish clean air targets that protect the health of all Californian's, including sensitive individuals and those living in disadvantage communities. The FACES project will continue with National Institute of Health funding.

PREVIOUS WORK: The Fresno Supersite was established in 1999 by the California Air Resources Board (ARB) and the U.S. Environmental Protection Agency (EPA) to better understand the measurement, sources, and health effects of suspended particulate matter (PM). It served as the main anchor site for instrument evaluation as well as improvement and monitoring activities related to the Central California Regional PM10/PM2.5 Air Quality Study (CRPAQS) and the Central California Ozone Study (CCOS) through the winter of 2001. Since that time, data from the site has also supported the FACES project.

OBJECTIVE: The objectives is to provide Level 1A validated continuous data in CCAQS (Central California Air Quality Studies) format and submit to the CCAQS database and to the FACES investigators. The ARB's Monitoring and Laboratory Division has committed to provide continuing data support with basic, field-level, quality assurance.

DESCRIPTION: The following tasks will be performed to keep the Fresno Supersite in operation through December 2007 in order to assist ARB in researching the health and welfare effects of PM exposure and for evaluating long term particulate trends at the Fresno Supersite:

1. Provide Level 1A validated continuous data in CCAQS format and submit the validated data to the ARB's CCAQS database. As part of this task, DRI will:
    a. Download and screen daily data and provide feedback and troubleshooting to the on-site technician for instrument failures.
    b. Perform quality assurance, through Level 1A, on data from selected continuous instruments at the Fresno Supersite and other related studies. This validation includes the following steps: 1) verify instrument operation based on data and check sheets from field technician; 2) remove values for instrument downtime and performance tests; 3) make adjustments for calibration deviations; 4) plot data and review graphically; 5) investigate extreme values; 6) perform internal comparisons between collocated instruments; 7) assign appropriate data qualification flags; 8) when applicable, apply additional tests including jump tests and standard deviation test.
    c. Convert the data to the CCAQS format and submit it to ARB withinsix months from the end of the sampling quarter.

2. Perform emergency instrument repair to supersite instruments. Emergency repairs will be coordinated with the on-site technician.

Other projects, such as the remaining U.S. EPA Supersite sponsorship, and internal DRI support will result in the following related tasks being completed:

3. Assist ARB with source characterization of data collected at the Fresno Supersite by analyzing new and archived Fresno filters and source samples by thermal desorption gas chromatographic mass spectrometry (TD-GC/MS).
4. Evaluate the size distribution of data including fine and ultrafine PM as well as coarse PM (PM10-PM2.5).
5. Evaluate new methods and technologies in continuous PM sampling.
6. Provide, as part of the data validation and analysis, presentations of results during project meetings
7. Publish results in peer-reviewed journals and cover page charges where applicable.
8. Visit to Fresno Supersite by Principal Investigator on a quarterly basis to identify if there are any deficiencies that need to be remedied.

BENEFITS: This project will provide validated data in coordination with the ARB MLD in support of the continuation of the FACES project. It will also provide the ARB with much needed validated data from Fresno that will be available for additional long-term studies in the San Joaquin Valley.

COST: $150,000 (for Tasks 1 and 2) Tasks 3 through 8 will be completed with EPA and in-house DRI cofunding in the context of other projects and internal research and development sponsorship

TITLE: Relationship between Exposure to Ambient Air-Borne Particulate Matter and the Risk of Neurological Disease

PROBLEM: It is well-known that exposure to ambient levels of air-borne particulate matter (PM) can contribute to severe adverse health effects including asthma, lung diseases, cardiovascular disorders and cancer. However, much less attention has been paid to its influence on the central nervous system. Whether or not cumulative exposure to air pollution induces neural dysfunction, including progressive brain damage, is still poorly understood.

PREVIOUS WORK: In recent years there has been growing interest in the role of PM as a potential environmental factor in affecting cells of the central nervous system, based primarily on evidence from animal studies. For example, studies have demonstrated that ultrafine particles, a component of vehicular exhaust, could enter the brain through the olfactory-nerve pathway and cause inflammatory as well as other pathologies in aged rats (Obersdörster et al.; Elder et al., 2004). Also, Veronesi et al, (2005) found that when mice inhaled PM in concentrations that induced oxidative stress, dopaminergic cells of the central nervous system were affected. Specifically, they noticed that the cells of the substantia nigra compacta were reduced by 29 percent in those exposed to PM compared to uncontaminated air exposed control mice. Block et al. (2004) also examined the potential of particles, specifically diesel particles, to cause neurotoxicity and found that toxicity involved an oxidative process as well as phagocytosis. It has been hypothesized that even the cardiovascular effects that have been associated with ultrafine particles are in part due to the direct effects of ultrafine particles on the autonomic nervous system through sensory nerves in the respiratory tract (Oberdörster et al. 2005). While previous study point to a possible oxidant process, the specific mechanisms of neurotoxicity for ambient particles is unknown. Studies using animal and cellular models may offer new insight into the mechanism, while epidemiological investigation using existing databases may provide more information on the potential of air pollution to have measurable neurotoxicological effects.

OBJECTIVE: The objective is to study the effect of ambient particulate matter air pollution on the central nervous system.

DESCRIPTION: The specifics of the study have not been fully developed, however the study will likely be mainly toxicological, possibly using animal models or cell culture studies, or epidemiological in approach using existing databases.

BENEFITS: Completion of this project will contribute to understanding whether air pollution is associated with neurological diseases. If there is an association, this finding could contribute to setting limits for air pollution and thus significantly contribute to the overall health of Californians.

COST: $400,000

TITLE: Development and Use of a Mobile Facility for Animal Inhalation Studies to Particulate Matter from Various Sources

PROBLEM: The Southern California Particle Center (SCPC) has developed an impressive capability to address toxic particulate matter (PM) components and their adverse health effects. However, in spite of considerable progress in assessing aerosol samples, toxic components and mechanisms of injury, there has been apaucity of *in vivo* animal studies coming from Southern California, which is one of the most natural laboratories in the world to study PM adverse health effects. One of the major reasons for the inability to translate major *in vitro* discoveries about PM toxic components and biological mechanisms of injury into health effects is the lack of a state-of-the-art animal exposure facility. In particular, the contractor lacks a mobile PM collection and animal exposure facility that can be used to study PM health effects in conditions such as asthma and atherosclerosis. Currently, the SCPC has to make contractual arrangements with an investigator in Michigan to bring a mobile animal laboratory to Los Angeles for a limited number of weeks of the year. Otherwise SCPC investigators have to rely on an outdated transportable trailer that does not contain an animal vivarium or state-of-the-art PM exposure capabilities. Without access to a facility that can collect data at various locations and various seasons throughout the year, it is not possible to extrapolate seasonal, site-specific, source/receptor, and atmospheric data into *in vivo* health outcomes.

Numerous epidemiological and toxicological studies have found associations between measured PM mass and adverse health outcomes. However, prevailing scientific opinion asserts that, when considering plausible biological mechanisms of injury, PM mass is probably only a surrogate measure for other physical or chemical PM properties that form the actual basis for adverse health effect outcomes. An alternative approach to determine PM toxicity is to directly measure the relative toxic potential of PM from different sources, sites, and seasons, under real-world exposure conditions. While the potential sources of PM to the atmosphere may be numerous, the major contributors to PM mass at a given location usually number <10 (Schauer and Cass, 2000). A narrow the search is needed for critical chemical components by determining which PM sources are the most harmful under *in vivo* exposure conditions. This information will allow for more effective regulatory strategies with respect to source control, more targeted air quality standards, and ultimately, reductions in population exposure. Furthermore, once the most health relevant PM sources are identified, the list of hazardous particle characteristics can be narrowed down, thereby making more targeted mechanistic investigations of PM health effects possible.

PREVIOUS WORK: The U.S. EPA has recently awarded 5 PM centers, one of which is the SCPC. A major thrust of the SCPC activities is to determine the physical and chemical properties of PM emitted from different PM sources, including secondary formation, to evaluate how PM exposure and toxicity vary with respect to location, season, and particle size, and to assess their relative toxicity through *in vitro* studies. A major finding has been the demonstration of the role of oxidative stress and defining discrete biological stages of PM injury in tissue culture cells. Implementation of these findings to *in vivo* research is likely to define the basis of inflammatory injury and disease susceptibility in models such as asthma and atherosclerosis. However, due to

the focus on mechanistic studies, insufficient funds for *in vivo* research, and lack of animal exposure facilities, very limited animal inhalation exposure studies have been proposed by the SCPC. If, however, the scope of the animal studies can be expanded, the strength of the ongoing studies in the SCPC will be considerably augmented to the benefit of ARB, the EPA and the Particle Center.

OBJECTIVE: The objective is to develop a facility to conduct animal inhalation studies of various PM sources at a variety of different sites and during different seasons. The facility will be self-supported, including a vivarium, and deployed concurrently to the same field locations where *in vitro* PM sampling will be performed by the SCPC. The *in vivo* data will considerably strengthen *in vitro* mechanistic studies, including the elucidation of PM characteristics (e.g., size and composition), deposition, clearance and transport that cannot be addressed by *in vitro* toxicity studies. Advanced chemical analysis and source apportionment techniques will provide a quantitative characterization of the PM as well as the source contributions at each sampling site. In addition, state-of-the-art technologies will provide a method to measure the toxicity of PM components based on their chemistry and volatility

DESCRIPTION: The facility will consist of the exposure chambers for animal inhalation studies, a vivarium for animal storage, space for fine, coarse and ultrafine particle concentrators, an air sampling and monitoring unit and the pump and blower compartment. In addition, an array of state-of-the-art aerosol instrumentation will be deployed to provide detailed information about the physico-chemical characteristics of PM and co-pollutants during the exposure studies. All aerosol instruments, including the particle concentrators, are already available at the SCPC. Funds requested through this program will be used for the: (i) construction of the facility, (ii) personnel, (iii) administration to carry out the inhalation studies, as well as for (iv) the actual execution of *in-vivo* and *in-vitro* assessments. The entire facility will be enclosed in a trailer and will be transported, initially to USC and later to other locations within the greater Los Angeles basin, where there are marked differences in toxic air components. CARB will be asked to negotiate access to sites that they control in the Los Angeles basin and to make a facility available or rent a site at which the trailer can be parked when it is not in use. Inhalation exposure sites will be selected such that they are significantly influenced by the following PM sources: *Diesel traffic; Gasoline traffic, including cold-start conditions; Secondary Formation; Road and Brake Dust; Aircraft and Airport Activities; Ships and Port Activities; Residential Wood Combustion.*

Due to the time that it will take to construct and test the trailer, in the first two years of the program the animal studies will be limited to the assessment of (i) *ultrafine vs fine*, as well as (ii)*semivolatile vs non-volatile (refractory)* PM at the USC exposure site in downtown Los Angeles. The principal study model will be the investigation of atherosclerotic lesion development in genetically susceptible (e.g., ApoE and LDL-receptor knockout) mice. Depending on vehicle type, age and ambient conditions, between 70-90% of the particles by number and 10-30percent by mass may consist of more volatile materials than others. The exposure and health implications of these findings have not yet been investigated. Considering that the majority of people's exposure during commute will be dominated by these particles based on particle

number, it would be useful to know whether the non-volatile or semi-volatile material is more toxic.

Beyond the first two years of study, attention will be directed to animal exposures at alternative exposure sites such as: (i) The 710 (heavy duty) vs the 110 (light duty) freeways, or Caldecott tunnel, bores 1 vs 2: this will help to differentiate between the effects of gasoline and diesel particles; (ii) airport and seaport emissions will be sampled in the areas immediately downwind of the LAX airport and the harbor of San Pedro; (iii) inland receptor areas: samples heavily impacted by secondary particle formation, atmospheric aging and transport of toxic principles will be assessed at sites such as Riverside. Tests for the effect of season, temperature and relative humidity on particle formation and toxicity during winter and summer months at the same locations will also be conducted. For each sampling campaign, exposures to coarse, fine and ultrafine particle size ranges will be conducted separately. This will help to distinguish sources of PM (such as road dust) as well as to determine the most toxic particle size fractions. The proposed facility will also enable us to conduct for the first time both *in vitro* and *in vivo* CAP studies along well-defined air trajectories in the LA Basin during photochemical episodes, thereby making it possible to investigate the effects of atmospheric aging and secondary PM formation on PM toxicity. Towards that goal, the trailer will be deployed in 3 distinct areas in the LA Basin (i.e., a source, intermediate, receptor sites) over the course of the *same day (3 hrs in each site)* and animal inhalation as well as *in vitro* toxicity samples will be collected in each of these sites for several weeks during the photochemically active summer months.

BENEFITS: This project will provide much-needed insight into the source-exposure-response continuum outlined by the National Research Council by developing fundamental understanding on the links between specific sources and in vivo adverse toxicological outcomes associated with exposure to PM. The information generated by this project will serve as the basis for linking emissions to local air quality and ultimately to health effects. These data on which PM sources are the most toxic, combined with detailed chemical and physical characterization of PM from these sources will allow for a narrower, more focused effort in identifying the biological mechanisms of PM health effects. This project affords considerable leveraging upon recently completed and ongoing EPA-funded Supersite and PM Center initiatives as well as ARB sponsored research. It could also attract funding from sources outside ARB to conduct complimentary studies.

COST: $800,000 for the first two years of the project in order to get the trailer constructed and perform limited studies at the USC site. Beyond that, the work proposed at alternative locations and seasons will require $800,000 support for years 3-4. The administration of the trailer will be done from the University of California, Los Angeles.

TITLE: Satellite Measurements to Improve California's Models for Ozone and Particulate Matter

PROBLEM: Air quality models are traditionally limited to comparisons with data on an episode basis because of the high cost of the calculations and the data collection. Eight hour standards for ozone and PM based on seasonal exposures are not well served by the short duration emission inventories created for these episodes. In addition, communities directly exposed to primary pollutants in or near industrial and port areas are not always the same as those exposed to the secondary pollutants that traditionally are the metric by the models are evaluated. Further, most comparisons between model and data are focused on ozone and PM mass with considerably less attention (because the data is not as widely available) to the distribution of ozone precursors or to the composition of PM. This limits the accuracy of emissions inventories for NO_x, VOC and particle precursors and results in a modeling system that is tuned to the locations where violations of state standards are currently most frequent—possibly at the expense of accurate predictive capabilities in regions that are not now in violation but might become so in the near future. Observations of total column NO_2, CO, H2CO, CHOCHO and aerosol are now available in some cases with global daily coverage at resolution as small as 13x24 km. However, these data have mostly been used as constraints on global models examining continental scale emissions and they have seen little use in regional and urban air quality monitoring.

PREVIOUS WORK: There have been extensive efforts in making and obtaining measurements of nitrogen oxides for the purpose of improving the mechanisms that are the basis of air quality models and have been directly involved in efforts to use aircraft and ground based measurements to evaluate the retrieval of tropospheric NO_2 column amounts from the OMI and SCIAMACHY satellite based instruments. Researchers have performed 3-D modeling of the effects of climate on air quality in northern and central California (JGR submitted). Recently (GRL. in press), researchers have used measurements from SCIAMACHY to examine the detailed mechanism of NO_x emissions associated with urea fertilizer, using the daily time resolution of the satellite measurements to compare to a process based mechanism. Work in progress shows that there is a strong correlation and near one to one correspondence between observations of NO_2 in California as collected by ARB and those from the SCIAMACHY satellite instrument.

OBJECTIVE: The objective is to develop the capability for routine application of inverse modeling techniques in combination with satellite measurements from SCIAMACHY and OMI to improving the retrospective and predictive capabilities of models applied to ozone. The initial product of this project will be a NOx emissions inventory for the time period 2003-2005 developed using NO_2 observations from SCIAMACHY and OMI as constraints. The new inventory will combine prior knowledge of the timing of emissions during each day with column amounts to produce an inventory that represents each month, with day of and day of week resolution. For example, Figure 1 shows the strong day of week difference of column NO_2 during a couple of months observation over northern California. Note that while the resolution of 13x24 km of the new OMI satellite is larger than the ideal, the grid spacing is higher resolution than one could typically achieve by interpolating between sites in the current observational network. Also, the

pixels are not exactly in the same location each day and the atmospheric transport patterns are not identical day to day providing further opportunity to achieve higher effective resolution through clever schemes for inversion of the observations. Subsequent research will include direct and simultaneous inversion of the NO_2, H2CO, CO, CHOCHO and aerosol measurements that are now or can soon be expected to be available. Our inversion strategy will permit the chemical data to improve both the representation of sources and sinks in the model but also to directly feedback on the model transport.

DESCRIPTION: There will be a five year effort with the first two years devoted to deriving a complete annual NO_x emission inventory for the entire state and to developing capabilities for direct inverse modeling within the California domain. Subsequent years will be used to evaluate trends in NO_x emissions, to using the inverse model to understand the strengths and weakness of the model transport and chemistry and for extension to other species observed from space.

BENEFITS: This program will provide useful analyses of immediate value for use in air quality attainment strategies for 8-hour ozone and PM.

COST: $350,000

TITLE: A Universal Land Use Regression for Predicting Ambient Air Pollution Concentrations in California

PROBLEM: Accurate exposure assessment to air pollutants is one of the key challenges in environmental epidemiology. Many of the most common exposure assessment techniques have serious limitations. The expense of air monitoring, for example, generally precludes measurement at subject addresses, air dispersion modeling requires extensive (and often unavailable) data inputs, and kriging regional monitors fail to adequately capture small-scale variation such as the local effects of high-traffic intersections.

PREVIOUS WORK: Recent research has led to accurate local predictions using a procedure known as land use regression. In San Diego and Alameda County, California; New York City, New York; and Toronto, Montreal and Hamilton, Canada, it has been demonstrated that nitrogen dioxide *validation locations withheld from the modeling* can be predicted, on average, to within approximately 16 percent and that particulate matter (New York City) can be predicted to within 7 percent using solely a small set of monitors and geographic data on land use, population and traffic.

In addition to producing successful predictions in a variety of environments, recent efforts involving land use regression have uncovered significant consistency in both the strongest variables involved in the modeling and in their parameter values. This consistency in outcomes from different areas encourages explicit comparison of parameter values and the amount of variation explained by variables from region to region to assess the potential of a more "universal" model – one that could be adapted to local data availability and applied in areas with limited monitoring.

Comparisons involved nitrogen dioxide sampling in several locations at several different time periods. The San Diego data collected by the Environmental Health Investigations Branch in October 2003 was used as well as four sets of samples collected by the Environmental Health Investigations Branch (EHIB) or the Office of Environmental Health Hazard Assesment (OEHHA) in Alameda County (April 2002, May 2002, November 2004, May 2005). Finally, nitrogen dioxide sampling conducted in and around New York City between 1999 and 2001 was included.

A set of seven consistently strong variables (total traffic, truck traffic, length of road, industrial land use, residential land use, total population and total housing units), that could be consistently measured at all locations ,were selected. For each of these seven variables, at each monitoring location, a GIS was used to calculate their values at five different buffer distances (40, 100, 300, 500, 1000 meters). Researchers then regressed each of these buffer/variable combinations against NO_2 levels for each set of samples. The parameter values, standard errors and variance explained were recorded and these results were analyzed themselves and included in a meta-analysis. It was determined that even though air dispersion patterns, sources of air pollutants and land use differ significantly from region to region, a comparison of land use regression results from San Diego; Alameda County, California; and New York City suggests that similar variables with similar parameter values predict nitrogen dioxide well.

Although the actual NO_2 values vary seasonally, these differences follow a consistent pattern and could be accounted for in a universal model. Researchers found that the EHIB monitoring in November, for example, tended to be approximately 6 ppb higher than the monitoring in May, but that the difference was consistent from monitor to monitor and did not vary substantially geographically. These results suggest that a universal land use regression model could be built using existing air monitoring data and could be used in epidemiologic research where monitoring data is unavailable.

OBJECTIVE: The objective is to develop a universal land use regression model for predicting NO_2 and PM2.5 concentrations for use in burden of illness and epidemiologic investigations across California.

DESCRIPTION: The California studies discussed above generally relied on geographically and temporally limited monitoring conducted by EHIB and OEHHA. The monitoring plans were specifically designed to answer epidemiologic questions and did not necessarily include a wide variety of different scales. Monitoring by the California Air Resources Board provides a unique combination of high numbers of monitors with a monitoring plan that covers a wide range of scales. With monitoring at the micro, middle, neighborhood, urban and regional scale and high numbers of monitors – more than 100 for NO_2 and approximately 75 PM2.5 monitors (in 2005) – ARB data would enable the implementation of large scale land use regression that could be applied statewide.

A calculation of the traffic and land use variables discussed above at all ARB monitoring sites for NO_2 and PM2.5. This would include total traffic, truck traffic, road length, industrial land use, residential land use, population and housing units at five different buffer distances. Then a land use regression model will be built using these variables to predict NO_2 and PM2.5. Next, investigators will cross-validate the universal model against the EHIB, OEHHA, and newly collected monitoring data collected as part of a CARB-funded project in Los Angeles. The local cross validations will be used to explore how well the universal model predicts in different urban areas of California and across seasons.

BENEFITS: After development, validation and peer review of the models, a data set that predicts small-area variations across all of California will be delivered. The original data will be posted on the CARB website for use by other investigators. Efor the cities and towns of state based on a 100 m lattice of points will be available. Original data will also be available for other investigators to calibrate specialized models for predicting exposures in epidemiological studies. This information will be used to enhance exposure profiles in numerous epidemiologic studies, may be linked to other information such as the California Health Information Survey, and will serve as a basis for exposure in burden of illness studies.

COST: $250,000

TITLE: Flux Measurements of Biogenic Precursors to Ozone and Particulate Matter in the Central Valley

PROBLEM: Ozone and aerosol simulations focused on the Central Valley are critical for State Implementation Plan development for ozone and particulate matter (PM). Model simulations are sensitive to emission sources, deposition/sinks, chemical reactions, and meteorology. Biogenic volatile organic compounds (BVOCs) participate in ozone and aerosol formation, and comprise a substantial fraction of ARB's VOC emission inventories. Also, as regulatory controls are extended to agriculture, there is a renewed focus on crop biogenic emissions. While inputs to the ARB's BVOC emission inventory model have been evaluated using field measurements, modeled emissions have not been evaluated using in-situ micrometeorological flux measurements for important valley floor crop environments. Enclosure and landscape-scale BVOC flux measurements are both critical for emission model performance evaluation, and for reducing uncertainties in emission inventories. In addition, recent field measurements suggest that fast reacting terpene species may be underestimated by 80 percent (Kurpius and Goldstein, 2003), and no measurements of emissions from crops are available to evaluate this potential emission for modeling purposes.

PREVIOUS WORK: The summer 2000 Central California Ozone Study, the California Regional Particulate Air Quality Study, and the 1990 San Joaquin Valley Air Quality Study focused on intensive monitoring of high pollution episodes. By design, these studies represent peak events rather than the range of ozone and PM climatology, and do not address emission inventory and emission model development. ARB sponsored several studies to identify critical data deficiencies in BVOC inventory development, and then proceeded to systematically address those needs. ARB-sponsored studies have included measuring branch-level BVOC emissions for selected plant species, developing leaf mass estimation methods for trees found in urban landscapes, developing leaf mass and leaf area data for oaks in natural landscapes, and validating vegetation maps and satellite-derived remote sensing land surface data in 35 locations in California. ARB BVOC emission model outputs have been evaluated using BVOC emission measurements from Blodgett Experimental Forest, an upper-elevation Ponderosa Pine plantation in the Sierra Nevada Mountain range, but no such measurements have been performed in dominant valley floor environments such as croplands.

OBJECTIVE: The objective is to use in-situ measurements of BVOC emissions, micrometeorology and atmospheric chemical reactions within selected agricultural landscapes over growing seasons to evaluate BVOC emission model performance and improve the representation of emissions and atmospheric processes. Crops cultivated on the valley floor likely comprise a large source of monoterpenes, sesquiterpenes, and other compounds, but their emission potentials have not been measured extensively, and no measurements have been made with the most modern equipment available today. Enclosure measurements from a range of crop plants that are prominent in the valley, followed by canopy scale measurements at several sites would comprise a focused evaluation of biogenic emission potential from crops suitable for advancing emission inventory models.

Specific objectives include:

(1) High frequency, continuous, micrometeorological and enclosure-based techniques will be used to measure BVOC emissions, ozone deposition, ambient VOCs, and atmospheric chemical reactions above selected agricultural landscapes. Techniques include gas chromatography, proton-transfer reaction mass spectroscopy (PTR-MS), eddy covariance and relaxed eddy accumulation. Measurements will also permit the speciation of monoterpenes and oxygenated VOCs emitted by crops, of which little is known.
(2) Measure atmospheric concentrations of biogenic chemicals and their oxidation products at multiple sites. Locations will provide opportunities to measure ozone and PM precursor exchange with dominant lower elevation and valley floor crops.

DESCRIPTION: A phased two-year field study is proposed. In the first year, BVOC emissions at the branch or whole plant scale will be characterized for key crops that dominate farming practices in the valley. From these data, two sites will be selected from which to conduct landscape-scale, micrometeorological BVOC flux measurements on the most critical crop types based on emission potential and landscape coverage data. In the second year, landscape-scale flux measurements will be performed at two selected sites. Vegetation metrics utilized in BVOC emission models (plant species composition and dominance, canopy area, leaf area index, leaf mass density, etc.) will be collected simultaneous with the measurements. Continuous ambient speciated hydrocarbon measurements during the field campaigns will also be used to assess the anthropogenic and biogenic contribution to total observed VOCs, at different times of the day, at the selected locations.

An extensive set of chemicals will be measured at each site including ozone, CO, and hydrocarbons including biogenic and anthropogenic compounds, and speciated aldehydes and ketones. Chemical species and micrometeorological variables will be measured continuously at high temporal resolution (tens of minutes, hourly).

Observations will describe temporally and spatially varying emission rates and chemical processes for important Central Valley agricultural landscapes, and as functions of vegetation community composition, growing season, and meteorological conditions. Measured landscape-scale BVOC emission rates from crops will be used for developing needed emission models for dominant agricultural crops. Further analyses may permit development of emission algorithms for less well understood but abundant Oxygenated Volitile Organic Compound (OVOCs), such as oxygenated compounds. Measurements of oxygenated species will provide additional means for evaluating chemical processes leading to ozone and PM formation.

BENEFITS: This project will provide useful data for BVOC emission model evaluation and development, and will help reduce uncertainty in BVOC emission inventories for the Central Valley. Data analyses can test underlying air quality modeling assumptions regarding emission inventories and oxidation of fast reacting biogenic compounds.

COST: $400,000

TITLE: Deployment of a Novel Aerosol Mobility/Mass Spectrometer for Quantitative Chemical Analysis of Organic Aerosols from Mobile Sources

PROBLEM: Understanding the physiological mechanisms responsible for the observed correlations between particulate matter and morbidity and mortality requires better instrumentation for in-situ characterization of ambient aerosol. In general, real-time instrumentation to determine the physical properties of an aerosol, including mass, size distribution, volatility, and hygroscopicity, are reasonably well-established. By contrast, real-time chemical analysis of aerosols is a relatively young field that only began taking shape in the late 1990s with the development of laser ablation-based single-particle mass spectrometers. Presently, deployable methods for aerosol chemical analysis fall short of providing the quantitative and comprehensive speciation data that may be obtained through filter extraction in the lab. This is especially true for organic molecules, which tend to fragment upon particle laser ablation, or electron beam ionization of the molecules desorbed from the particle. This is unfortunate since semi-volatile organics present in the condensed phase may only be definitively analyzed in situ. Thus there is a need for an instrument that can quantitatively identify the organic content of fine and ultrafine particles.

PREVIOUS WORK: Historically, chemical analysis of particulate matter involves drawing an aerosol sample through a filter, or using an inertial impactor to sample aerosol particles in a size-selective manner. Such methods are still in use today since they provide the most comprehensive and quantitative chemical information. Two major drawbacks of these so-called bulk techniques are that they provide data that are temporally averaged over a long sampling period (typically hours), and that important volatile or semi-volatile organic species are lost from the substrate prior to analysis. The need for rapid chemical analysis of aerosol particles led to the development of single-particle mass spectrometers, including PALMS (Murphy and coworkers), ATOFMS (Prather and coworkers), and RSMS-II (Wexler and coworkers). These instruments are all deployable and have been used to acquire a large amount data from field experiments. Despite a lack of quantitation afforded by such instruments due to size and composition biases inherent to the one-step ablation/ionization process, these instruments represent the only way to analyze individual fine and ultrafine aerosol particles in real time. The current archetype for quantitative analysis of particle ensembles is the Aerodyne AMS instrument, which has been included in countless field campaigns around the world within the last five years. A beneficial feature of the AMS, compared to single-particle instruments, is its ability to provide quantitative mass data for non-refractory chemical species. However, even the AMS suffers from fragmentation of organics due to the relatively hard ionization induced by the electron beam. The purpose of the instrument deployment proposed here is to provide supplementary in-situ quantitative analysis targeting *intact* organic molecules present within the fine and ultrafine size fractions of the ambient aerosol. Thus the focus here is on soft ionization of the parent molecules, and subsequent measurement of molecular *shape* as well as mass, in order to facilitate a more definitive identification.

OBJECTIVE: The objective is to deploy the aerosol mobility/mass spectrometer in collaboration with ongoing field measurements through the Southern California PM

Center. The deployment will target light and heavy duty freeways, the Los Angeles shipping port, and LAX airport.

DESCRIPTION: The proposed work applies the deployment of novel instrumentation in order to gain a better understanding of the formation, evolution, and health effects of organic aerosols in the Los Angeles basin. The instrument combines the well-established methods of electrostatic aerosol classification, thermal desorption/chemical ionization, and ion mobility/mass spectrometry. The latter has not yet been applied to analysis of aerosols, but is commonly used for analysis of large biological molecules. The primary goal of the proposed instrument design is to provide an additional means for compound identification, in series with the high-resolution mass spectrometer. In this case, the mobility of the desorbed ions through a counterflow of a drift gas will be determined in addition to the mass of the ions. The instrument operates as follows. Ambient aerosol is passed through a conventional Polonium-210 neutralizer to provide the aerosol with an equilibrium charge distribution. The aerosol is then forced through a critical orifice and into a low-pressure electrostatic classifier that collects essentially mono-sized particles onto a heating element for subsequent thermal desorption.

The size of the collected aerosol depends on the applied voltage and may vary between 10 nanometers and several hundred nanometers in diameter. The desorbed molecules are carried by a Nitrogen sheath flow into a chemical ionization region, where a radioactive source (most likely Am-241) initiates the gas phase ionization reactions. The gas phase positive ion chemistry is actually driven by the trace amount water present in the flow leading to H+(H2O)*n* ions and a clustering reactions. These ions are robust, long-lived, and low-energy species. These newly formed ions are gated into an ion mobility drift cell, allowing for mobility separation of the ions. A fraction of the ions are allowed to pass through a pinhole at the end of the drift cell, and are focused into a high-resolution orthogonal-extraction reflectron mass spectrometer (Ionwerks Inc., Houston), allowing for a time-of-flight mass spectrum of the ions. The resulting data set will provide a *size*-resolved, *chemically-speciated*, and *quantitative* description of the aerosol in *real time*. The instrument may also resolve volatility of the compounds if the temperature of heating element is ramped slowly. The instrument has been designed, and is now nearing completion. It will be completed and calibrated under EPA funding, so this ARB proposal focuses exclusively on the field deployment of the instrument in collaboration with the Southern California PM center at the University of Southern California.

One of the more interesting recent observations within the Los Angeles basin is the existence of a highly concentrated ultrafine aerosol immediately downwind of both light-duty vehicle [Kuhn *et al.*, 2005] and heavy-duty vehicle [Zhu *et al.*, 2002] freeways. The concentration appears to decrease sharply with downwind distance, suggesting that the particles are evaporating, rather than coagulating [Zhang *et al.*, 2004]. This makes in-situ analysis the only viable option for determining the chemical composition of these organic particles, which may pose a health risk to those who live near freeways [Zhu *et al.*, 2005]. A similar observation has recently been made in the vicinity of LAX, where peak concentrations in excess of 600,000 particles/cm3 were observed by two condensation particle counters [Biswas *et al.*, 2005]. These peaks correspond to aircraft

landings and far exceed the peak concentrations observed near freeways. Since this is a new result, no chemical analysis is available yet, but it is clear from the excessive concentrations that further scrutiny into the chemistry and potential health effects associated with these events is warranted.

BENEFITS: Aerosol mobility/mass spectrometry represents the only way to identify and quanitify organic compounds in fine and ultrafine aerosols in situ. Such composition measurements can be correlated with *in vivo* and *in vitro* toxicity experiments in order to understand the health effects of aerosols emitted from mobile sources. This is especially relevant to those who live in the vicinity of freeways, shipping ports, and airports. The resulting data sets on organic aerosols from mobile sources will aid in urban airshed model development. Successful deployment of the instrument will also result in new methodology for future investigations of indoor air pollution, global radiative effects of aerosols, and cloud formation, focusing on organics.

COST: $240,000

TITLE: Characterization of Source-Specific Contributions to Air Pollution by Measurements of Isotope Ratios and Marker Compounds

PROBLEM: Elevated levels of pollutants in ambient air can increase adverse health effects such as mortality, cancer, and hospital admission and consequently take a significant toll in Californians' lives. To obtain cleaner air quality, pollutant loads need to be significantly curtailed by restricting emissions especially from anthropogenic sources. It is important to know the contribution of pollutants from different sources to the total burden of ambient air pollution in order to develop efficient management strategies. Though many studies investigated sources of pollutants using numerous tools such as source-specific markers and isotopic signatures, few have combined these tools as cross validation techniques.

PREVIOUS WORK: Carbon isotope ratio (C14/C12) has been successfully applied to determine the contribution of fossil fuels to the burden of atmospheric particulate matter and a specific class of pollutants such as polycyclic aromatic hydrocarbons (Bench et al., 2004). Source-specific marker compounds such as levoglucosan and cholesterol, and benzothiazole also have been used for source apportionment (Kleeman et al., 1999). One study conducted in Japan measured carbon isotopes in size-resolved particles (Endo et al., 2004). This study found higher fraction of modern carbon than expected in fine particles (<1.1 μm). Carbon isotope ratios in different fractions of PM (water-soluble and water-insoluble organic carbon and elemental carbon) have not been measured.

OBJECTIVE: The objective is to identify the contribution of fossil fuel combustion, wood burning, meat cooking, and natural direct input to the burden of size-resolved carbonaceous PM and volatile organic compounds (VOCs).

DESCRIPTION: Field samples will be collected to investigate the geographical differences and temporal changes in contribution of pollutant sources. Sampling will take place at two urban sites (Los Angeles and Fresno) and one remote site for a year. Bulk particles (PM10) and VOCs will be collected once a month. Separation of PM10 into three fractions (e.g., water-soluble and water-insoluble organic carbon and elemental carbon) for isotope measurement will be conducted every two months. Size-resolved particles will be collected four times to measure isotope ratios and marker compounds. Compound-specific isotope ratios of polycyclic aromatic hydrocarbons in bulk particles will be measured four times to investigate seasonal variation.

Studies of isotope analysis of PM from remote and suburban sites in the summer (assume little home fireplace use) found Carbon-14 levels very near contemporary biogenic material, suggesting that the majority of particle mass is from biogenic sources. In the absence of forest fires, living trees/plants must be out-gassing compounds that are sorbed onto particles. It is unknown whether the particles collected are strictly fossil vs. biogenic carbon or a small fossil core with a biogenic coating. The fossil core formed during combustion will not be particularly volatile while the biogenic coating was deposited in the aerosol phase. Separate volatile and non-volatile components of size-

resolved PM from each site will be used to test the hypothesis that fossil nanoparticles are serving as nucleation sites for the generation of PM. These data can provide information regarding sources and particle growth mechanisms.

Carbon 14 measurement can distinguish PM from fossil fuels versus all other contemporary carbon sources such as wood burning, meat cooking, and direct emission from plants and animals. The contribution of each contemporary carbon source to the total burden of carbons will be determined using source-specific markers. Levoglucosan and cholesterol will be used to identify the contribution of PM from wood burning and meat charbroiling, respectively. Compound-specific isotope measurement can provide accurate information regarding sources of pollutants such as polycyclic aromatic hydrocarbons. As a supplementary work, benzothiazoles (tire-specific markers) will also be measured to quantify the contribution of tires to atmospheric PM and trace metals such as zinc especially in urban areas (Reddy and Quinn, 1997). Carbon 14 measurements will be conducted using accelerated mass spectrometry (AMS) at Lawrence Livermore National Lab. Concentrations of levoglucosan will be determined using a gas chromatograph equipped with a mass selective detector (GC-MS).

BENEFITS: The data collected will significantly reduce uncertainties associated with estimating PM and VOC emission inventories from indirect measurements and assist in validating models. More accurate information will allow the state of California to develop more efficient air quality control strategies and management options.

COST: $427,000

TITLE: Assessing Near-Field Exposures from Distributed Combustion Sources

PROBLEM: Much air pollution exposure is caused by pollutant release from distributed combustion sources that emit in close proximity to people. Examples include motor vehicles (gasoline and diesel), fireplaces, and off-road diesel engines. Near-field exposures, defined here to be those occurring within 100 m of the source, are not well characterized by routine monitoring data, since monitoring sites are selected to be away from the direct influence sources. Yet people are often quite close to these sources and time spent in proximity may contribute significantly to the total exposure burden. For developing effective policies that mitigate excessive exposures, the near-field exposure burden must be quantified. Gaussian plume models are ineffective in the near field, and models based on computational fluid dynamics are expensive and unproven as near-field exposure-assessment tools.

PREVIOUS WORK: The concept of intake fraction was developed in recent years to quantify the source-to receptor relationship for emission sources. It has been used to characterize cumulative population exposure to major ambient sources, such as primary motor vehicle emissions and combustion-based, electricity generation units. The metric has also been applied to study the self-pollution of school buses owing to the entrainment of exhaust. In this case, the near-field exposure of children constituted a major portion of the overall exposure impact of the buses. Several studies have also characterized pollutant concentrations owing to motor vehicles in the near vicinity of roadways. With a few possible exceptions, these studies have not characterized the source-to-receptor relationship in a way that facilitates generalizing from the particular circumstances of each study. Intake fractions from indoor releases have also been assessed. Overall, major gaps remain in our understanding of near-field exposure impacts across the array of potentially important sources.

OBJECTIVE: The objective is to characterize the near-field components of intake fraction attributable to certain important distributed combustion sources. In doing so, improve the base of knowledge for assessing the near-field exposure impacts of sources that emit close to people.

DESCRIPTION: Experiments will be conducted using sulfur hexafluoride or another suitable tracer gas. The basic experimental approach entails controlled release of the tracer gas over a short period (~ minute) from a source of interest. An array of pump-and-bag samplers will be deployed to collect time-integrated air samples in the near-field region around the source. This experiment would include both indoor measurements and outdoor measurements as appropriate. So, for example, to investigate residential wood combustion, the tracer gas would be released into the chimney of an operating fireplace and measure tracer gas concentrations in that home, plus in the homes of nearby residents. The incremental intake fraction associated with each monitoring site would be estimated by (mass collected/mass released) $\times$ (air volume breathed by occupants during sampling period/air volume sampled). The total near-field intake fraction would be determined by summing the contributions for all near-field exposures. Seventy-five experiments (total) would be conducted investigating three source classes, to be selected by the researchers in consultation with ARB. Sources

could include motor vehicle emissions in a street canyon, residential wood smoke, and a distributed electricity generation unit in an urban area.

BENEFITS: This project would generate important new data quantifying near-field exposures as consequence of important combustion processes that occur close to people. The results would illuminate the importance of the near-field effect as a component of the overall exposure burden of major air pollution sources. To the extent that the near-field exposures are important, the results would inform efforts to prioritize control strategies so as to efficiently minimize exposures. The results would also be important in informing environmental justice concerns owing to the near proximity of certain population groups to air pollution sources.

COST: $250,000

TITLE: An Observational Investigation of Offshore Ship Emissions of CO, NO_X, and SO_X from Continuous Observations at a Coastal Site

PROBLEM: Carbon monoxide (CO) is a trace gas of immense importance in mediating the oxidative capacity of the background atmosphere. NO_X is central to atmospheric chemistry because it too modulates ozone and free radical abundances. SO_X is an important precursor to aerosols, and emissions from ship traffic have been minimal. Because of the inherent non-linearity of atmospheric photochemistry and transport, the initial conditions of any air quality model are extremely important to the accuracy of the results. In order to accurately predict air quality throughout California and efficiently regulate pollution sources, it is necessary to better understand the nature and magnitude of emissions of these compounds from the coastal oceans directly upwind of our domain.

PREVIOUS WORK: Recently, ship emissions have been identified as having the potential to affect air quality in many high traffic coastal regions [Corbett & Fischbeck, 1997; Capaldo et al., 1999]. Initial observations of continuous, high-rate CO concentrations made by our group at Bodega Bay have indicated considerable onshore advection of pollutant plumes from coastal shipping traffic. While efforts have been made to quantify offshore emissions of NO_x and SO_x using bottom-up estimates of fuel consumption and vessel activity, many uncertainties in these techniques persist [Corbett & Koehler, 2003], and there has been few, if any, direct observational support for the estimates. Furthermore, unpublished data from Professor Kleeman's group at the University of California, Davis indicate a substantial amount of sulfate aerosols at Bodega Bay.

OBJECTIVE: The proposed project is aimed at supporting continued and expanded monitoring operations at Bodega Bay for the purpose of quantifying emissions of CO, NO_x, and SO_x from offshore shipping channels. Careful analysis of the dimensions and sum of these pollutant plumes will help characterize the regional pollutant sources from offshore shipping.

DESCRIPTION: Investigators will operate a one second CO instrument at Bodega Bay, but to augment the research station with commercial trace level instruments modified for improved sensitivity and temporal resolution and establish bulk statistics of this compound's onshore flux. Moreover, after establishing the amounts of these compounds contained in the spikes above background levels, investigators will scale them and compare them to the ratios expected from standard diesel emission indices. Also their cumulative emissions can be quantified and compared to available emission inventories. Shipping traffic data will be collected to carefully inventory the expected emissions for comparison with observed values.

BENEFITS: The proposed work will provide a very sound, observationally based estimate of the magnitude of marine shipping sources, which have traditionally not been included in air quality models. This data analysis will allow for an improved understanding of the background state of our atmospheric environment, and will consequently improve our ability to most efficiently regulate terrestrial sources. These activities are in direct alignment with the key research priorities of CARB in improving

emission inventories, in this case in the context of the complex and highly trafficked coastal environment. The work therefore benefits Californians by paving the way for effective protection of their prodigious natural resources, as well as their agricultural and health standards.

COST: $50,000

TITLE: Laboratory and Field Studies of the Atmospheric Chemistry of Aromatic and Polycyclic Aromatic Compounds and the Role of NO_2 in their Product Distributions

PROBLEM: Aromatic and polycyclic aromatic compounds (PACs) are emitted from combustion sources such as vehicle exhaust. Many aromatic hydrocarbons and PACs, as well as their atmospheric transformation products, are known to be toxic and/or carcinogenic. Risk assessments must consider the health implications of both the directly emitted aromatics and their products produced in the atmosphere. Presently the details of the atmospherically important hydroxyl (OH) radical-initiated reactions of aromatics and PACs are not well understood. Key questions remain concerning the NO_2 concentrations at which the OH-aromatic and OH-PAC adducts react dominantly with NO_2 *versus* dominantly with oxygen and how this affects the products produced. While it appears that the OH-monocyclic aromatic adducts react with oxygen under atmospheric conditions, to date glyoxal and methylglyoxal yields have mostly been obtained at elevated NO_2 concentrations and data are needed at realistic ambient NO_2 concentrations. Whether the OH-PAC adducts react with oxygen or with NO_2 in the atmosphere is presently not known and this has implications for formation of nitro-PACs from PACs. A more complete understanding of the processes controlling nitro-PAC formation in the atmosphere is required before the impact of changes in NO_x emissions on nitro-PAC formation can be reliably assessed.

PREVIOUS WORK: Researchers at Air Pollution Research Center at the University of California, Riverside have made significant contributions to the current status of knowledge of aromatic and PAC atmospheric chemistry. They have previously shown the importance of ambient nitro-PAC formation from radical-initiated atmospheric reactions and that the isomers formed from these reactions are often distinct from those nitro-PAC in direct emissions. Solid phase micro-extraction (SPME) techniques and gas chromatography/mass spectrometry (GC/MS) have recently been used to identify dicarbonyls formed from the OH radical reactions with both monocyclic aromatic hydrocarbons and alkylnaphthalenes. The proposed work is an extension of CARB-funded research, which will provide a more complete picture of the products formed from atmospheric reactions of monocyclic aromatic hydrocarbons and their yields and the formation routes to nitro-PACs in the atmosphere and the role of NO_2 in their formation.

OBJECTIVES: The objectives of the project are to:

1) Elucidate the formation mechanisms of nitro-PACs in the atmosphere by studying in the laboratory the formation of nitro-PAC from the radical-initiated reactions of PACs as a function of NO_2 and verify the mechanisms through ambient sampling of PACs and nitro-PACs.
2) Determine the glyoxal and methylglyoxal formation yields under atmospheric conditions for the OH radical-initiated reactions of toluene, the xylenes and the trimethylbenzenes, by measuring their yields in the laboratory as a function of NO_2 concentration.

DESCRIPTION: Recent developments using Solid Phase Microextraction (with and without on-fiber derivatization) sampling in combination with positive and negative chemical ionization GC/MS analysis have resulted in improved sensitivity for nitro-PACs and the ability to quantify glyoxal and methylglyoxal as their oxime derivatives. It is anticipated that SPME sampling techniques combined with negative ion chemical ionization GC/MS analysis will allow rapid nitro-PAC identification and quantification as a function of NO_2. Therefore, investigators will use a large-volume environmental chambers to: (a) investigate the formation of nitronaphthalenes and nitrobiphenyls from the OH radical-initiated reactions of naphthalene and biphenyl as a function of NO_2 concentration and (b) to measure glyoxal and methyglyoxal formation yields from a series of monocyclic aromatic hydrocarbons as a function of NO_2 concentration.

Field studies measuring nitro-aromatics (*m*-nitrotoluene, nitronaphthalenes, methylnitronaphthalenes, 3-nitrobiphenyl, 2-nitrofluoranthene and 2-nitropyrene, and potentially 2- and 3-nitrobenzanthrone and nitrotriphenylenes) and their aromatic precursors will be conducted at selected locations and times. If the laboratory studies show different involvement of NO_2 in the reaction pathways of monocyclic aromatics in comparison with the PACs, ambient measurements should confirm these differences. Analyses will be made by GC/MS utilizing well-established procedures. Negative ion chemical ionization will be employed to provide the requisite sensitivity for the nitro-PAC analyses.

BENEFITS: Elucidation of the formation mechanism for nitro-PACs will allow a better understanding of the impact of control strategies for NO_x emissions on the ambient formation of toxic nitro-PACs. Knowledge of the products and their yields from the atmospherically important reactions of monocyclic aromatic hydrocarbons will improve computer models for predicting urban and regional ozone pollution.

COST: $300,000

TITLE: On-Road Motor Vehicle Emissions Measurements including Ammonia and Sulfur Dioxide

PROBLEM: There is very little information on ammonia emissions from real vehicles on the road. Ammonia is a major component of airborne PM2.5 and there are few other ammonia sources in the LA basin. Dynamometer studies at the University of California, Riverside have shown that ammonia emissions vary with load and with the tier of emission control. Sulfur dioxide emissions, especially from diesel vehicles, are a potential indicator of misfueling.

PREVIOUS WORK: There has been one published study of on-road ammonia emissions measured by means of on-road remote sensing (Baum et al 2000) which observed a relatively small number of vehicles. Researchers have now developed a UV based on-road remote emissions sensor which reliably gives not only carbon monoxide (CO), hydro-carbon (HC), carbon dioxide (CO_2) and nitric oxide (NO) fuel-based mass emissions readings from passing light duty vehicles but also provides the same quality of data for ammonia and sulfur dioxide. An emission inventory for the LA basin about to be published by Huai et al. predicts that ammonia emissions are currently dominated by the ammonia emissions from older cars measured only in a single 1993 tunnel study (Fraser and Cass 1998).

OBJECTIVE: The objective is to monitor all the above pollutants from approximately 60,000 light duty vehicles, 20,000 each in three regions of California, the Los Angeles basin, the central valley and the Bay area. The results, when combined with fuel sales data, will provide a fuel-based emission inventory, and will investigate if there are any differences between the three regions in terms of emissions and in terms of potential misfueling.

DESCRIPTION: The FEAT 3000 is the University of Denver's routine on-road emissions monitor. It has been used in California for the IMRC in 1999 at several sites, and for the CRC every two years at a single site, the intersection of LaBrea Blvd. and I-10 in Los Angeles. The instrumentation and the normally available data including speed and acceleration and vehicle make and model year are fully described in CRC E-23 reports available on the web at www.feat.biochem.du.edu. The new features which have been added include new optics and a wider UV detector array which allow SO_2 and NH3 to be monitored simultaneously with the routine pollutants. This development was described by Burgard et al at the April 2005 Coordinating Research Council (CRC) Meeting in San Diego. It is possible to include a unit which monitors NO_2 along with CO, HC and CO_2 if ARB decides that on-road NO_2 emissions would be a desirable addition.

In operation, a mobile van sits at the roadside during daylight hours for about one week at each location. Returns to the La Brea site in LA, returns to the IMRC interchange ramp (101N to 880N) in San Jose and a suitably chosen site in the central valley. The techniques or research methods to be employed are identical to those used in two recent studies in the Denver area and in Tulsa OK which will be reported at CRC 2006 in San Diego by Burgard et al. Other than the addition of the two new pollutant channels they are identical to those used in the CRC E-23 studies.

Tasks to be achieved include location of a suitable central valley site, apply to California Department of Transportation for permits for all sites, ensure that all calibration gases are available and certified by appropriate authorities, carry out the studies, read license plates, match plates for make and model year with California Department of Motor Vehicles and report the findings.

BENEFITS: New knowledge of the current mobile-source ammonia and sulfur dioxide emissions inventory. An indication as to whether these emissions vary from region to region within California.

COST: $95,000 (additional funds are required to include the addition of NO_2 capability is useful, or there is a desire to add the same study goals but applied to HDDV emissions.)

TITLE: Secondary Port Truck Activity Study

PROBLEM: The Ports of Los Angeles and Long Beach are together the third largest container port in the world. Every day at these ports freight is transferred from ocean-going vessels to trucks and rail facilities for overland transport. Containers may be transported from ocean-going vessels to on-dock rail directly, or transported by local drayage (port) trucks to near- or off-dock rail facilities. These splits were used for development of the port truck emissions inventory for the Goods Movement Emissions Reduction Plan (GMERP). For the GMERP, ARB staff estimated the fraction of containers moved by truck regionally versus outside of the South Coast region or outside of California. Some of these containers were assumed to be transloaded (repackaged from 2 TEU to 3 TEU containers. The fact that a large portion of containers (35-50% of all inbound containers) are likely handled by a distribution center for truck transport either locally within the South Coast or regionally to out of state destinations is important, and implies significant truck activity at distribution centers. Almost nothing is known about these secondary truck trips, such as where these truck trips are generated, where these truck trips terminate, what types of trucks perform these trips, and what fraction of total truck emissions at these centers are generated by movement of international (import and export) goods in California. This study would answer these questions.

ARB is beginning a process to evaluate the potential impacts of distribution centers. This study could augment the Board's effort by providing additional data and documentation to help identify distribution centers that service international containers and estimate activity from trucks, transportation refrigeration units, and cargo handling equipment that operate these facilities.

PREVIOUS WORK: The Ports of Los Angeles and Long Beach developed baseline emissions inventories in 2004, representing truck emissions within terminals, on port property, and outside of the port out to South Coast Air Quality Management District boundaries in the base year 2001. The process of updating these emissions inventories has just started and will be completed in 2006. In 2005-2006, ARB staff developed an emissions inventory representing secondary truck trips related to international goods movement for the Goods Movement Emissions Reduction Plan, which was developed from data generated by the Southern California Association of Governments, the Ports, and other agencies.

While these studies have been effective in estimating vehicle miles traveled (VMT) associated with secondary truck trips, they were not designed to assess emissions associated with the transfer of goods at distribution centers, and the potential localized impacts which may be caused by Particulate Matter (PM) emissions in areas such as the Inland Empire where distribution centers are located.

OBJECTIVE: The objective of this research will be to characterize the fleet of trucks that make secondary trips related to the movement of international containerized goods in the South Coast, identify distribution center facilities that service these containerized goods, and quantify emissions associated with those truck trips, and activity of trucks and other equipment operating at distribution centers.

DESCRIPTION: This research will identify distribution centers that service local and regional container movements by truck, including truck and rail transloads. A survey will be conducted that identifies inbound and outbound trip origin, destination, and vehicle characteristics of trucks servicing a representative sample of these distribution centers; and a second survey will be conducted to identify on-facility truck, TRU, cargo handling, and other equipment emissions at each surveyed facility. Survey data will be used to estimate emissions associated with secondary trips and emissions associated with distribution centers servicing the ports of Los Angeles and Long Beach. A report will be generated summarizing these results and highlighting potential methods for emissions reduction.

Specific tasks are estimated as follows:

1. Conduct an origin/destination survey of trucks servicing the ports of Los Angeles and Long Beach to identify distribution centers to which containers would be delivered.
2. Select a geographically and trip-representative sample of distribution centers for further study.
3. Conduct an origin/destination survey of trucks entering and exiting each distribution center. Include vehicle characteristics in survey.
4. Conduct a survey of truck, transport refrigeration unit, and cargo handling equipment activity at each distribution center.
5. Estimate emissions and health risk at each surveyed distribution center.
6. Extrapolate emissions from sampled to non-sampled distribution centers to estimate total activity and emissions.
7. Estimate VMT and emissions associated with secondary international container truck trips in California.
8. Develop a final report summarizing results.

BENEFITS: Evaluating secondary port truck trips would improve the Board's understanding of the impact of goods movement emissions on the statewide inventory as a whole. Studying these impacts would also improve the Board's- understanding of the community-level impacts of distribution centers on local air quality. Ultimately, a greater understanding of secondary port truck trips will lead to development of improved emissions models and control strategies to meet air quality goals.

COST: $150,000

TITLE: Development of the UCB Particle Monitor for California Applications in Epidemiology and Environmental Justice

PROBLEM: Although epidemiological studies using Particulate Matter (PM) measurements at ambient monitoring stations routinely show consistent effects for important health endpoints, there is also recognition that actual human exposures sometimes differ substantially in temporal and spatial distribution from what these stations show. To better understand the relationship of particle exposures and ill-health and to better target control measures to address exposure, there is need for technologies to monitor particle levels in a wide range of locations, preferably with high temporal resolution. In addition, there is a need for particle monitors simple, rugged, reliable, and inexpensive enough for use by community groups interested in environmental justice and other applications.

PREVIOUS WORK: Currently, there are ambient station technologies, however, are not up to these tasks, principally because of capital cost, but also because they tend to require frequent attention by highly trained technicians and special housing for protection from the elements and security. Moving such devices around by truck only addresses part of the need for characterizing particle levels in space and time and cannot do so economically over large areas and long time spans.

There are smaller and cheaper instruments available, generally designed for the occupational market, that could partly fill this need. One class of such devices relies on light-scattering chambers combined with data logging, to give high temporal resolution. These devices are fairly robust, although they are not designed for continuous long-term unattended deployment. As with any light-scattering device, there are some limitations in their ability to accurately determine particle mass, but the principal constraint still remains cost and need for attention. Their retail cost is about $4,000 each at present and even if purchased in large numbers, the likely per unit cost still makes them prohibitively expensive for most applications. Their durability in this intended use is also questionable, largely because they must rely on a pump to draw air through a size-cut device. Such pumps require field calibration, and the most durable ones currently cost several hundred dollars each and necessitate connection to power lines.

OBJECTIVE: The objective is to adapt and test a low-cost datalogging particle monitor using commercial smoke-alarm sensors developed by the University of California, Berkeley (UCB) for third-world use in California conditions 1) to facilitate measurements by community environmental justice groups and large-scale particle epidemiologic studies, 2) monitor high-particle environments such as street canyons, wood-burning neighborhoods, and vegetation fire events, and 3) improve its capabilities to monitor real time particle size distribution at typical California ambient levels.

DESCRIPTION: UCB has developed and tested a small, smart, fast, and cheap particle monitor, called the UCB monitor. They have built about two hundred and have been using them for more than 2 years in a number of developing countries in their research and as part of training for non-research community pollution work. As part of this project they will extend its utility to three categories of applications in California
The three categories of applications in California will be:

1) Environmental justice and epidemiologic applications requiring good temporal and spatial resolution of PM changes, but not requiring highly accurate estimates of absolute mass concentrations below 50 $\mu g/m^3$:

2) High particle environments (>50 $\mu g/m^3$ PM2.5): Although annual mean outdoor levels of PM in California are will below 50 $\mu g/m^3$ PM2.5, there are important micro-environments with higher levels. These include

- vehicle tunnels and street canyons,
- neighborhoods with strong sources, e.g., wood-burning fireplaces/stoves,
- indoor locations with environmental tobacco smoke or other particles from indoor sources,
- vegetation (forest, grass, crop waste) fire plumes.

An additional application could be as an emissions monitor for such sources as fireplaces, woodstoves, and other relatively low-temperature small-scale combustion devices.

Based on the past extensive development of the UCB for third-world high-particle environments, the contractor could fairly directly develop models that would meet most of the criteria above for determining absolute concentrations at high temporal and spatial resolution in such high-particle settings in California. The choice of which settings would depend on ARB priorities.

The current device would require relatively little further sensor and electronic development to be tested in these applications, of course in conjunction with standard devices for validation. New cases, power arrangements, wireless communication technology, and data handling/analysis methods could also be developed for these applications.

3) Development of advanced capabilities: To be able to reliably measure

- absolute mass concentrations below 50 $\mu g/m^3$,
- particle number,
- continuous PM size distribution.

BENEFITS: Low-cost easy to deploy monitoring technologies continues to be of high interest, particularly with respect to characterizing community exposure. This project will provide a monitor that is small, quiet, micro-power battery-operated for non-intrusiveness, easily placed, capable of long deployment, low maintenance, and inexpensive so that it can be operated in various environments. The monitor would be capable of providing data that is timely, manageable, accurate for PM2.5 and below.

COST: $250,000 (potential cofunding from the California Energy Commission to augment the budget)

TITLE: Evaluation of Existing Air Pollution Control Technologies for Use in Controlling Exhaust Emissions from Ocean-Going Vessels at Sea

PROBLEM: The exhaust from ocean-going vessels (OGVs) contains high levels of particulate matter (PM), nitrogen oxides (NO_X) and sulfur oxides (SO_X). These emissions impact California's onshore air quality, particularly for communities near major ports and shipping lanes. While the impacts of OGV emissions are significant, there are few OGVs with emission control devices because they are subject to relatively little air pollution control. In addition, the use of emission controls on OGVs is constrained by the limited space onboard vessels, and the use of high sulfur fuels that deactivates some catalysts.

PREVIOUS WORK: Existing technology has been refined for many years to control the emissions used on stationary power plants and most mobile sources. At least in theory, many of these technologies can be used to control emissions from OGVs. For example, the large diesel engines used to propel OGVs are very similar in design to diesel engines used in many stationary power plants, and in some cases they burn similar heavy fuel oils. Therefore, the more advanced control equipment on stationary power plants could be used to control OGV engines if practical constraints can be overcome. One manufacturer (Advanced Cleanup Technologies, Inc.) is currently constructing a system that attempts to adapt existing control equipment to marine and locomotive applications. The system, called AMECS (Advanced Maritime Emissions Control System) and a similar one called ALECS (Advanced Locomotive Emissions Control System), utilizes existing scrubber technology and selective catalytic reduction technology adapted for locomotive and marine applications. This system is designed to remove a substantial amount of PM, SO_X, and NO_X, and is scheduled to be tested on locomotive engines in July, 2006, at the Roseville Railyard, then relocated to control emissions from marine auxiliary engines at the Port of Long Beach. If successful, this system may be a candidate for controlling emissions from the larger propulsion engines on OGVs. Another system referred to as a "seawater scrubber" is manufactured by a Canadian company (Marine Exhaust Solutions). This system is designed to reduce SO_X and PM emissions, and is currently being tested in sea trials. Another technology that has been used in some marine and stationary power plant applications is water/fuel emulsions, which controls peak combustion chamber temperatures and NO_X.

OBJECTIVE: The objective is to identify the most promising emission control technologies for OGVs considering all possible technologies, especially those not currently used on marine vessels. The ultimate goal is to incorporate these technologies on OGVs to reduce PM, SO_X, and NO_X emissions.

DESCRIPTION: Under the proposed research project, the contractor will review the full spectrum of existing emission control technologies for large diesel engines, regardless of current application, and evaluate their potential for use in controlling OGV emissions at sea. The advantages and disadvantages of each technology will be discussed, along with a description of the cost, pollutants controlled, manufacturers of the technology and current applications (marine or non-marine). A special emphasis will be placed on controls that are not currently used in marine applications, such as those used on stationary power plants. The potential to incorporate technologies on OGVs as retrofits,

as well as incorporating them in new vessel designs will be considered. This contract is considered to be an initial step, with the intention that subsequent contracts would specify the development of detailed engineering drawings and designs that could be used to incorporate the most promising control technologies in actual vessels (either as retrofits or new builds). A final step would be the actual construction and emissions testing of the systems.

BENEFITS: Successful completion of this contract will help to focus future emission control projects for OGVs on the most promising control technologies for reducing PM, SO_X, and NO_X, and may identify some new possibilities previously overlooked.

COST: $150,000

TITLE: Update ARB's Solvent Cleaning Emissions Inventory

PROBLEM: Solvent cleaning is one of the top five non-mobile sources of volatile organic compound (VOC) emissions in California. However, ARB's current solvent cleaning emissions inventory is based on data that are more than ten years old and no longer reflect current technology. During the past ten years, the types of solvents being used have changed significantly, due to the designation of acetone as an exempt compound, the banning of ozone-depleting substances, and changes in regulations. Many districts need to update their solvent cleaning rules to obtain additional VOC emission reductions and meet State Implementation Plan (SIP) commitments, but they don't have the up-to-date inventory information that is needed to accurately calculate those reductions. In addition, solvent cleaning is often conducted by small businesses that do not have air permits and are located near residential areas, particularly in environmental justice communities. ARB needs improved data, including speciation profiles, to assess exposure in these communities. ARB also needs more accurate information and speciation profiles to pursue innovative approaches for achieving additional emission reductions, such as reactivity-based measures.

PREVIOUS WORK: At the 14th Annual Emission Inventory Conference, a paper was presented titled "Solvent Mass Balance Approach For Estimating VOC Emissions From Eleven NonPoint Solvent Source Categories" by D.L. Jones, et.al. This paper focuses on national regulations and it directs states/local agencies to assess the effects of local regulations. In California, the Department of Toxic Substances Control and the Institute for Research and Technical Assistance (IRTA) have performed some field studies to convert businesses to low-VOC solvents, but these studies are not extensive enough to provide the data that is needed to update the statewide inventory.

OBJECTIVE: The objective is to update ARB's solvent cleaning emissions inventory and speciation profiles to reflect current solvent cleaning materials and technologies.

DESCRIPTION: Complete the following activities:

- Conduct field surveys for a variety of businesses that conduct solvent cleaning.
- Identify the types and quantities of solvent cleaning materials being used and the associated technology employed (e.g. heated dip tanks, ultrasonic units, enclosed power washers, vapor degreasers, hand-wipe cleaning, etc.)
- Develop emission factors for the various solvent cleaning technologies, including speciation of the ingredients contained in the solvent cleaning materials.
- Update ARB's statewide emissions inventory and speciation profiles for solvent cleaning.

BENEFITS: This project will provide information that can be used to identify additional opportunities to achieve VOC emission reductions from solvent cleaning operations, thereby improving air quality. It will also provide ARB with the ability to update the solvent cleaning emissions inventory to reflect changes in photochemical reactivity and toxicity, which in turn allows ARB to better assess the impact of solvent cleaning emissions on communities.

COST: $200,000

TITLE: An Assessment of Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California

PROBLEM: The Legislature passed Assembly Bill 1007 (AB 1007) that requires the Air Resources Board (ARB) and the California Energy Commission to develop a plan to increase the use of alternative fuels in California. Alternative fuels can reduce California's dependence on imported oil and reduce air pollution. Also, the Governor established aggressive greenhouse emission reduction targets for which the ARB has identified potential emission reduction strategies using alternative fuels such as biodiesel. Biodiesel is an alternative diesel fuel that has the potential to reduce greenhouse gas emissions, other pollutants, and can reduce our use of petroleum-based fuels. However, knowledge gaps exist and further research is needed in characterizing the impact biodiesel has on oxides of nitrogen emissions, the effect various feedstocks have on emissions, and the effect biodiesel has on emissions from on-road and off-road diesel engines. This research is needed to facilitate biodiesel lifecycle analyses and to determine the potential benefits and disbenefits of biodiesel. This research would also assist in the development of biodiesel fuel specifications, if necessary.

PREVIOUS WORK: The U.S. EPA published a draft technical report that evaluates the impact of biodiesel on pre-1997 engines. Most of the studies cited in the report were on soy based biodiesel and its effect on criteria pollutants. A U.S. EPA Tier 1 emissions study on criteria and toxic emissions and a tier 2 health effects study were conducted as part of the US EPA fuel registration process. Again, these studies were limited to soy based biodiesel. Also, a Montreal transit bus study evaluated both criteria and toxic emissions. National Renewable Energy Laboratory (NREL) is currently conducting a study on newer engines. Most of these studies are limited in their direct application to California because soy based biodiesel may not be the major feedstock used in California and because exhaust emissions from diesel engines fueled with biodiesel were not compared to engines fueled with CARB diesel.

OBJECTIVE: The objective of the proposed biodiesel research is to fill knowledge gaps to provide the necessary data to facilitate life cycle assessments needed for programs implementing greenhouse gas emissions reductions and the evaluations required under AB1007.

DESCRIPTION: The proposed research would evaluate biodiesel blends (B5 and greater) and neat biodiesel (B100). Low blend levels would likely represent a reasonable economic and technical scenario where biodiesel could be mass marketed in California in the near future. Higher biodiesel blends and B100 would represent possible niche markets or broader scenarios in later years when domestic production has matured. Research would be conducted to evaluate biodiesel feedstock emission impacts from on-road and off-road post-1997 engines and engines with aftertreatment. A key area of research would be on the impact biodiesel use has on NOx emissions.

Three biodiesel feedstocks would be used for the study. Emissions testing would be conducted on heavy-duty chassis and engine dynamometers. A limited number of on-road and off-road engines and vehicles would be tested. This could include current

model engines, 2007 compliant engines, and a hybrid vehicle. It may be possible to collaborate with NREL, since NREL is conducting a B20 study on new technology engines. This would allow the incorporation of engines and B20, a blend of biodiesel that is gaining national acceptance, into this study. This would be accomplished by testing a limited number of additional engines using B4 at NREL in exchange for testing an equal number of engines using B20 in our evaluation. Since B20 is a well-studied fuel, it would serve as a biodiesel baseline as well as a reference for comparison to other studies.

Also, this study would benefit from participating with the College of Engineering –Center for Environmental Research and Technology (CE-CERT) because of their expertise in biodiesel emissions testing and state of the art testing facility. Incorporating CE-CERT into this study could be accomplished by providing additional monetary funds to augment current programs focused on emissions studies on on-road engines using biodiesel. Off-road testing would be conducted at ARB's Stockton test laboratory.

Chemical analysis and limited biological testing would be conducted. Chemical species include greenhouse gases, criteria pollutants, toxic air contaminants, and reactive organics. Specific classes of compounds would include aromatics, hydrocarbons, carbonyl compounds, inorganic and organic chlorine compounds, and metals. Fuels analysis would also be conducted to evaluate the need for biodiesel fuel specifications such as for stability, cold flow, and other key parameters. Some of the toxic analyses would be conducted by ARB.

BENEFITS: Californians would benefit because this study would help ARB programs by quantifying the air quality and greenhouse impacts of biodiesel that would in turn help in developing a plan for alternative fuel use in CA. This would ultimately reduce our dependence on petroleum-based fuels, improve air quality, and aid in mitigating our waste disposal problem.

COST: $150,000 (ARB is seeking additional funds for this project to increase the budget to $650,000)

TITLE: Engine Lubricating Oil Impacts on Mobile Source PM Emissions

PROBLEM: Engine lubricating oil is a significant contributor to the formation of mobile source particulate matter (PM) emissions, including nanoparticle emissions. This is true of engines burning gasoline, diesel fuel, and natural gas. As fuels become cleaner and emission control systems become more effective and durable, the contribution of the lubricant becomes increasingly significant. Studies have shown that high PM-emitting engines (oil burners) are the most toxic in terms of potency per unit mass of emitted material.

PREVIOUS WORK: Toxicity studies have concluded that lubricant-derived PM yields a mutagenic response. The Gasoline/Diesel PM Split Study has demonstrated that PM from spark-ignition vehicles is a significant contributor to ambient PM levels in the SoCAB, but the exact role of lubricating oil on normal and high-emitting vehicles of various technologies has not been resolved. Recognizing this knowledge gap and the potential benefits to air quality and human health, the National Renewable Energy Laboratory (NREL), South Coast Air Quality Management District (SCAQMD), and the California Air Resources Board (ARB) have expressed mutual interest in a study to characterize the potential for reformulated lubricants to reduce PM emissions from in-use mobile sources, both from new vehicles and from the much larger in-use vehicle fleet (by using reformulated lubricants in old vehicles). As a first step and at the request of CARB, NREL wrote a white paper that summarized recent literature on the role of lube oil on engine emissions, and the paper has been reviewed by ARB and SCAQMD staff. The document summarizes results from previous studies and describes a program plan to investigate the role of lubricating oil on vehicle emissions. The following is a summary of the major findings and recommendations from this literature review that are detailed more fully in the white paper:

- The literature suggests that various lubricant properties affect PM emissions. The strongest correlations with PM are lubricant volatility and ash content.
- Synthetic lube oils (poly-alpha olefin, PAO) yield lower PM emissions as well as improved fuel economy.
- The age of the engine oil (miles since oil change) may have a significant impact on PM emissions, as certain combustion byproducts are entrained in the lube oil and eventually emitted along with the lube oil in the particle phase.
- The mechanisms by which lubricant impacts PM are clearly different in spark-ignited engines and in diesel engines. A test plan should be mindful of this difference.
- Especially in spark-ignited engines, the selection of test cycle is critically important – for "normal" emitters, PM emissions tend to be limited to cold starts, rapid accelerations, and high speed events.
- Test temperature appears to have a significant influence on emissions, with the highest PM levels emitted during cold-cold start conditions (especially in spark-ignited engines).
- PM emission rates and associated health effects tend to be significantly different in "high-emitters". A test plan should include newer vehicles as well as the

malmaintained "smokers" that may contribute disproportionately to emission inventories.
- Careful attention should be given to chemical speciation of the measured exhaust and the parent materials (fuel and lubricant). The selected test methods should be evaluated in terms of the potential for artifact formation or loss of exhaust PM, especially when unusually long sampling times are used.

OBJECTIVES: The objectives are to characterize the significance of lube oil in PM formation and to determine whether lube oil can be formulated to reduce in-use PM emissions from mobile sources, if it is demonstrated that lube oil is the largest contributor to PM from mobile sources.

DESCRIPTION: Investigators will:
- Chemically and physically characterize the PM emissions (including ultrafine particles) from gasoline, diesel, and CNG vehicles under a variety of scenarios (30°F and 72°F under a variety of engine operating conditions, including off-cycle operations), to understand/evaluate the source(s) of the PM and to understand whether the PM is derived from fuel, lube oil, or engine wear;
- Provided that lube oil is the most important source of PM, through chemical analysis attempt to understand the source of that PM from the lube oil;
- Work with engine oil and additive companies to formulate variety of fluids that do not include precursors to particle formation; and
- Perform additional emissions testing on same type of fleet of SI and CI vehicles to see whether PM can be reduced.

BENEFITS: Studies from California have shown that directly-emitted PM from mobile sources may be the most significant single contributor to ambient fine PM levels. Reformulated lubricating oils may provide a significant PM emissions benefit to new and existing vehicles under a variety of operating conditions.

COST: $100,000 for CARB
This project represents co-funding from a consortium of sponsors: Department of Energy, National Renewable Energy Laboratory ($200,000), and the South Coast Air Quality Management District ($100,000) and the California Energy Commission ($100,000).

TITLE: Diesel Engine Crankcase Blow-By and Diesel High PM Emitters: Determination of Contributions to Ambient Particulate Matter and Potential Health Effects

PROBLEM: Diesel engine crankcase blow-by is a ubiquitous source of diesel engine (DE) Particulate Matter (PM) emissions since nearly all heavy-duty diesel engines are equipped with 'road draft tubes' that vent crankcase emissions directly to the atmosphere. DE crankcase blow-by is estimated to account for up to ten percent (or more) of the total PM contribution from current DEs, but DE crankcase emissions have not been routinely measured because of a lack of test procedures. If this ten percent value is correct, then on a per-vehicle basis, DE crankcase blow-by emissions could rival the emissions contribution from high PM emitting light-duty gasoline vehicles (LDGVs, ~50-300 mg/mile). DE high PM emitters are recognized to exist, but to date have not received the same scrutiny accorded to light-duty gasoline vehicle (LDGV) high PM emitters.

Chemical Mass Balance (CMB) modeling results from the National Renewable Energy Laboratory (NREL) "gas-diesel split" project (2005) appear to indicate that smoking light-duty gasoline vehicles (LDGVs) could be significant contributors to ambient PM in the South Coast Air Basin (SoCAB). However, source profiles from neither DE crankcase blow-by emissions nor DE high PM emitters were included in this project. There is reason to suspect that DE high PM emitters and DE blow-by may chemically resemble LDGV high PM emitters (i.e., have lots of organic carbon), and hence the CMB results could be "mis-attributing" all of this organic carbon OC to LDGVs. Combined with the observation that on-road and off-road DEs are estimated to account for about 73 percent of the mobile source PM emissions inventory in the SoCAB (this figure rises to about 84 percent if two-stroke gasoline engines are included), this raises questions regarding veracity of these results since this suggests that a very small number of high PM emitting LDGVs overwhelm the much larger emissions contribution estimated to be from DE (and gasoline two-stroke) emissions sources.

In addition to their impact on the air burden for any particular region, there is also reason to suspect that diesel engine crankcase blow-by may be particularly toxic since used engine oil is known to cause adverse health effects (e.g., skin cancer in mice), and crankcase blow-by is essentially lubricating oil vapors. High PM emitting LDGVs and high PM emitting light- and medium duty diesel engines have both been shown to cause adverse health effects, but this has not been systematically studied for high PM emitting heavy-heavy-duty diesel engines (HHDDEs), and not for HHDDE crankcase blow-by.

PREVIOUS WORK: In September 2003, the Donaldson Company, Inc. obtained a US EPA Environmental Technologies Verification (ETV) Program verification for their Series 6100 Diesel Oxidation Catalyst Muffler and Spiracle Closed Crankcase Filtration System for HHDDEs. In demonstrating the emissions reduction potential for the Spiracle Filtration System, the emissions data set revealed that the baseline (uncontrolled) crankcase emissions were between 16-23 percent as great as hot start exhaust PM emissions under engine dynamometer FTP test cycle conditions. In the context of the Coordinating Research Council (CRC) project E-66, the principal investigator has

estimated that crankcase blow-by could account for up to 10 percent or more of the PM emissions contribution from in-use HHDDEs.

Previous SoCAB and San Joaquin Valley CMB studies (Schauer, et al., 1996, 2000) indicate that diesel engines could be the major mobile source PM contributors, while the Northern Front Range Air Quality Study indicated that LDGVs could be the major mobile source contributors in Denver, Colorado. The recently completed NREL "gas-diesel split" project indicated that LDGVs could be the largest mobile source PM contributor in the SoCAB, or that diesel engines could be the major source contributor (i.e., the two methods used in the study produced conflicting results, which are themselves in conflict with results from previous studies). The LDGV and LD-MD diesel vehicle toxicity study by Seagrave et al. (2002), indicated that high PM emitting gasoline and diesel vehicles have increased toxicity compared to either normally emitting gasoline or normally emitting diesel vehicles.

OBJECTIVE: The objective are to determine the influence of diesel engine blow-by and high PM emitter source profiles on CMB modeling results and investigate the toxicity of these emissions. These data could also be used to update the heavy-heavy-duty diesel engine/vehicle emissions inventory to include blow-by and high PM emitters.

DESCRIPTION: A test fleet of in-use heavy-heavy-duty diesel trucks (HHDDTs) would be procured and chassis dynamometer emissions tested over a variety of driving cycles, including the ARB 5-mode HHDDT test cycle and the HDV UDDS. The test fleet would include old, high mileage, high PM emitting HHDDTs, late model, high PM emitting HHDDTs, and late model, low PM emitting HHDDTs. High PM emitters would include both engines that are being mis-fueled, as well as engines that are burning oil. Both tailpipe as well as crankcase emissions would be sampled. Gaseous, semi-volatile, and PM emissions samples would be collected for subsequent detailed chemical analyses. CMB modeling runs would then be performed utilizing these new source profiles, and compared against the recent CMB results for the SoCAB. Toxicity would be inferred based on the speciation profiles. In addition to sample collection for immediate chemical analyses, additional samples would be collected that would be archived for possible toxicity analyses should the chemical speciation results indicate the further health effects (i.e., toxicity) studies are warranted.

BENEFITS: The results of this project would provide a more complete picture of the emissions contribution of these not-well-characterized, but potentially important, PM emissions sources. The results from this project could also shed light on the gasoline versus diesel PM emissions contribution question.

COST: $350,000

TITLE: Life Cycle Analysis of the California Air Resources Board's Climate Change Reduction Strategies.

PROBLEM: The State of California has a stated goal of reducing greenhouse gas (GHG) emissions, which cause global warming. The targets for reductions are to return to 2000 emission levels by 2010, 1990 levels by 2020, and 20 percent of 1990 levels by 2050 (i.e., an 80% reduction from 1990 levels). The blueprint for meeting the goals for 2010 and 2020 has been presented in a recent report by Climate Action Team (CAT) to the Governor[1].

The report contains two tables listing individual strategies and their expected GHG emission reductions. The first table (Table 5-1, pages 36-37) contains strategies already under way, such as those being established by the Pavley bill (AB1493), strategies that are already well developed. The second table (Table 5-2, pages 41-42) contains additional strategies necessary to meet the reduction targets. These strategies have only recently been identified, and have not yet been fully developed. The second table includes nine additional strategies that will need to be fully developed by ARB.

These nine strategies need to be further evaluated before they can be implemented. ARB staff has estimated the technical feasibility and expected emission reductions of these proposed strategies. However, further analysis needs to be performed to determine the life cycle emissions of the proposed strategies. For example, the use of a low-GWP (global warming potential) refrigerant will reduce overall global warming in the first instance simply because each unit of emitted gas will warm the planet less. It is however possible that the use of such a refrigerant would require new equipment that is more energy intensive to produce, and hence overall global warming reductions will be less than first calculated. These types of life cycle issues have not yet been resolved.

PREVIOUS WORK: ARB staff has developed 'workplans' for each of these strategies as they were developed to be included in the above mentioned CAT report to the Governor. The 2-5 page workplans contain further detail and a description of the strategy and the assumptions made in the emission reduction strategies. No work has been done so far to calculate the life cycle global warming emissions.

OBJECTIVE: The objective is to develop an algorithm for quantifying the life cycle emission effects of any measure that ARB staff may propose to meet the California GHG emission-reduction goals.

DESCRIPTION: First, the proposed project will need to include an extensive literature review of currently available methodologies and models to determine life cycle global warming emissions. Second any improvements deemed necessary must be made to current methodologies for calculating life cycle emissions.

BENEFITS: At the end of the project, the State will have a current model for calculating life cycle emissions that can be used in future work to meet the California global warming emission reduction goals.

COST: $200,000
TITLE: Improving the California Inventory for HFC Use and Emissions from Commercial Refrigeration

PROBLEM: The State of California has a stated goal of reducing greenhouse gas (GHG) emissions which cause global warming. The targets for reductions are to return to 2000 emission levels by 2010, 1990 levels by 2020, and 20 percent of 1990 levels by 2050 (i.e., an 80 percent reduction from 1990 levels). An important element in reaching these reductions is reducing HFC emissions from commercial refrigeration.

HFC's used in refrigeration are potent GHGs, with global warming potentials ranging from 140 to 3,800. These refrigerants are used in commercial refrigeration in increasingly large quantities as substitutes for ozone-depleting substances (mainly CFCs) that are being phased out in accordance with the Montreal Protocol. As such they have become a significant component of the overall GHG emissions in California.

Commercial refrigeration has been identified as the second largest emitter of HFCs from refrigeration and air conditioning in the United States by the US EPA. However, very little is known about the extent of use and emissions in California specifically. In order to quantify the California-specific HFC emissions from commercial refrigeration, additional work is needed to create inventories. This includes quantifying the populations of commercial systems by the type of HFC, the application, the emissions rate, the technical feasibility and cost of using low-Global Warming Potention (GWP) refrigerants, and the rate of turnover of these systems. Once these inventories have been completed, the State is in a position to tailor a specific strategy to reduce emissions from these sources.

PREVIOUS WORK: ARB staff is not aware of any "bottom up" California-specific work that has been done to quantify the use and emissions from commercial refrigeration. The US EPA has developed a model, The Vintaging Model, which estimates the use and emissions nationally. Unfortunately the model cannot be used to infer California specific-emissions and is essentially a 'black box'. The model relies on unpublished information that has been classified as 'Confidential Business Information', or CBI. Inquiries into the inputs to this model are unavailable as "public disclosure of the inputs to the Vintaging Model would jeopardize the security of the CBI that has been entrusted to the EPA."

OBJECTIVE: The objective of the project will be to quantify the populations of commercial systems by the type of HFC used, the application, the emissions rate, and the turnover rate to develop a baseline inventory for California. A secondary objective will be to quantify possible emissions reductions from such populations, may it be through leak reductions or from using low-GWP refrigerants.

DESCRIPTION: The proposed project would develop a detailed bottom-up inventory for commercial refrigeration, concentrating on retail food refrigeration. ARB will be seeking

a methodology to assemble this inventory. It will have to include an assembly of current knowledge, including gathering information from the EPA, trade groups and associations. It is possible surveying of existing facilities will be needed as well.
BENEFITS: The development of these inventories is necessary to improvement and subsequent development of reduction strategies for GHG emissions from commercial refrigeration.

COST: $150,000

TITLE: Emissions of HFC-134a from Auto Dismantling and Recycling

PROBLEM: U.S. EPA regulations require that any HFC-134a remaining in the vehicle's air conditioning system be removed and recycled prior to vehicle dismantling at wrecking yards. However, there is anecdotal evidence which suggests that recovery does not occur in accordance with EPA's regulations. EPA does not aggressively enforce these regulations, and some auto wreckers have told the ARB staff that there is almost no market for the recovered HFC-134a or readily available person or operation to accept HFC-134a that is removed. As a result, the staff suspects that much of this refrigerant is not recovered and is emitted to the air during auto-wrecking operations. The extent to which HFC-134a is recovered in accordance with EPA regulations, and hence the emissions, is unknown. Because these so-called "end-of-life" emissions can negate some or all of the benefits of regulations which reduce servicing-related emissions, and in order to assess the feasibility of regulations which would be applicable to the auto dismantling industry, it is essential to have accurate estimates of end-of-life emissions.

PREVIOUS WORK: ARB staff conducted a small survey of auto wreckers in 2004 to estimate the amount of HFC-134a recovered during vehicle dismantling. The responses to this survey were very limited. In addition, the quality of the survey data was in some cases suspect. A more comprehensive survey or study is needed to better assess the extent of "end-of-life" emissions.

OBJECTIVE: The objective of this study would be to obtain an accurate estimate of "end-of-life" emissions of HFC-134a which occur when vehicles are dismantled.

DESCRIPTION: The most likely approach for obtaining the necessary emission estimates would be to conduct a comprehensive survey of HFC-134a recovery practices at auto dismantlers, possibly in cooperation with the auto dismantler's trade association (California Auto Dismantler's Association). Included in this survey would be a requirement that auto dismantlers provide to the ARB data on the amount of HFC-134a remaining in each car that passes through their operations.

BENEFITS: An accurate estimate of "end-of-life" HFC-134a emissions would allow an accurate assessment of the effectiveness and feasibility of regulations designed to reduce HFC-134a emissions during servicing operations and of regulations designed to reduce emissions from auto dismantling operations.

COST: $150,000

TITLE: HFC-134a Refrigerant Use by Non-Light-Duty Vehicles

PROBLEM: Motor vehicles use HFC-134 as the working refrigerant in their air conditioning systems. As part of the support for the climate-change regulations adopted by the Board in 2005, the ARB staff estimated the emissions of HFC-134a from light-duty vehicle air conditioning systems in California. The staff has not attempted to estimate HFC emissions from other categories of vehicles, for which there is little information available. To support any new regulatory proposals to reduce emissions of HFCs from all motor vehicles in California, estimates are needed for the emissions of HFC-134a from vehicles other than light-duty vehicles.

PREVIOUS WORK: The U.S. EPA has estimated national emissions of HFC-134a from all motor vehicles (including non-light duty) air conditioning systems, but these estimates were made using a proprietary model that is not accessible (free of substantial cost) to the ARB staff. Thus, the inputs, assumptions, and calculation methodology used in the model can not be independently verified and modified to produce emission estimates specific to California. Also, it isn't clear that vehicle categories (i.e., light, medium, heavy) can be disaggregated within the model to estimate emissions by category.

OBJECTIVE: The objective of this project would be to develop an emissions inventory of HFC-134a from non-light duty motor vehicle air conditioning systems. Ideally, the emission estimates would be broken down into several vehicle categories (medium-duty vehicles, heavy-duty vehicles, transit buses, etc.)

DESCRIPTION: There are probably a few ways to develop the necessary emission estimates. One approach would be to survey heavy-duty truck operators (possibly by way of the California Trucking Association) on the frequencies air conditioning system recharges and the amounts refrigerant recharged. A representative survey sample would permit extrapolation to the entire heavy-duty vehicle population. Transit buses could be similarly surveyed. It is possible that the emission estimates could be made also by surveying the producers and distributors of the HFC-134a, who might have data on how much refrigerant is distributed to shops that service heavy-duty vehicle air conditioning systems.

BENEFITS: This project would provide estimates of emissions of HFC-134a from air conditioning systems on vehicles other than light-duty vehicles. Such estimates are needed to estimate the possible emission reductions.

COST: $150,000

TITLE: Evaluation of the Potential Impact of Emissions of HFC-134a from Non-Professional Servicing of Motor Vehicle Air Conditioning Systems

PROBLEM: In order to save money, many individuals choose not to have their vehicle's air conditioning (AC) system serviced by professional, certified automotive air conditioning technicians. Instead, these individuals recharge the systems themselves using small cans of HFC-134a purchased in auto-parts stores. This practice has the potential to release significant amounts of HFC-134a to the air. Emissions can result from incorrect recharging techniques and procedures on the part of these non-professionals, and from the discarding of partially full cans following recharging. Even if the individual attempts to transfer all of the can's HFC-134a into the air conditioner, some small amount, referred to as the "heel," will inevitably remain in the can and will be released during can disposal.

The amount of refrigerant emitted to the air from non-professional operations has not been quantified accurately. Upper bounds for this HFC-134a emissions source have been made by Delphi Corporation on the basis of US EPA estimates of total amount of HFC-134a sold for motor vehicle recharging and from industry data for professional air conditioning service. This difference, which is attributed to the non-professional do-it-yourself (DIY) user, amounts to approximately 40 million pounds of HFC-134a per year, nationwide. In order to improve these estimates for California, much better data is needed on: 1) the number of small cans of HFC-134a for retail sale to non-professionals, 2) the amount of HFC-134a in the can "heel", 3) the amount of refrigerant that is discarded. This information would allow for a better evaluation of the potential extent of the small can problem.

PREVIOUS WORK: ARB staff is not aware of any experimental data showing how much HFC-134a is emitted from the recharging of motor vehicle air conditioners by non-professionals, or the amount of HFC-134a remaining in small cans after recharging by non-professionals. The estimates of emissions from small cans have been made on the basis of assumed can heels. The US EPA is considering sponsoring a study to estimate the amount of HFC-134a that remains in small cans when they are disposed of by non-professionals following system recharges. ARB staff were invited to be part of a project stakeholder advisory group. Thus, results from EPA's study will complement the proposed California-specific investigation.

OBJECTIVE: The objective of this project is to obtain experimental data to support an estimate of the potential impact of emissions of HFC-134a from non-professional servicing of motor vehicle air conditioning systems. Included in this work is the collection of data on the number of small cans sold in the state, the can heel, and the amount of HFC-134a in small cans that is not transferred to a vehicle AC system due to improper recharging techniques.

DESCRIPTION: A series of experiments could be designed and conducted in which vehicles with varying levels of air conditioning refrigerant levels were recharged using small cans by non-professional individuals who perform their own system recharging.

Estimates of leakage during recharging could be made by evacuating the systems following recharge in these experiments, and comparing the amount of HFC-134a recovered with the original amount in the small cans. Can heels could be determined by measuring the amount of HFC-134a remaining in the can after recharges that are determined to completely fill the system. The likelihood of using any remaining HFC-134a in the can could be assessed on the basis of the amount remaining. Can heels would be determined on the basis of when the amount of refrigerant remaining in the cans was judged small enough to warrant can disposal. Estimates of the number of cans sold will be made by contacting manufacturers of small cans and suppliers of small cans of HFC-134a.

BENEFITS: The results of this study would allow ARB to refine its estimates of emissions of HFC-134a from motor vehicle air conditioning systems by including estimates of emissions that occur from the recharging of systems by non-professionals. A more accurate and refined emissions estimate would allow the ARB staff to better assess the need for and feasibility of further HFC-134a control measures, including regulations directed at non-professional recharging operations.

COST: $150,000

TITLE: Impact of Climate Change on the Frequency and Intensity of Low-Level Temperature Inversions in California

PROBLEM: Meteorology plays a dominant role in the determination of air pollution concentrations in California. Measurements show that large scale meteorological patterns such as El Niño events can significantly change the frequency and severity of air pollution episodes. El Niño events change meteorological patterns for about one year, and they typically occur every five to seven years. In contrast, climate change refers to a sustained shift in meteorological patterns that occurs over a longer time period. It is expected that climate change will significantly affect meteorological patterns in California over the next decade and longer. The implications of climate change on air quality problems in California are largely undetermined.

Low-level atmospheric temperature inversions (where temperature increases with height) inhibit vertical movement of air and can thereby increase the concentrations of pollutants near the ground. As the climate and regional circulation patterns change, the frequency and intensity of low-level temperature inversions will be impacted in an unknown manner. A variation in the frequency or intensity of these low-level inversions would likely have a significant impact on air quality in California.

PREVIOUS WORK: Previous studies have examined the effect of climate on regional air quality in the central and eastern portions of the United States (Hogrefe et al., 2004; Mickley et al., 2004). These studies used output from Global Climate Models (GCMs) to study the frequency of large scale weather patterns that promote the formation of air pollution events. The GCM output can also be dynamically downscaled using regional meteorological models to simulate air pollution formation with regional air quality models. The results of these previous studies predict that the frequency of summer ozone air pollution events will increase in the future due to altered climate and increased background concentrations of ozone.

OBJECTIVE: To better understand how the frequency and intensity of low-level temperature inversions might vary or change in California in a changing climate. This knowledge could then be used to produce a more accurate estimate of climate-induced changes in air quality in California during the next few decades.

DESCRIPTION: Analysis of low-level inversions during the approximately five decade historical period can be used to project the frequency and intensity of low level inversions from climate simulations and their impact on air quality over the next century as predicted by different models using different greenhouse gas emission scenarios.

Part I. The first part of this project would examine historical climate records from the past 50 years to characterize and better understand the variability of low-level inversions in California. The approach is based on statistical analyses and case studies. This would first entail cataloging the occurrence of low-level inversions and then diagnosing the circulation patterns, both large-scale and regional, that cause or are associated with them. Local meteorological variables (such as surface wind speed,

stability, relative humidity, offshore sea surface temperature) and seasonal difference would also be examined. Associated with this effort is the need to recognize low-level inversions from the measures that are available from global circulation models (GCMs). For the historical period, these measures might be extracted from "observed" large scale atmospheric structure via one of the reanalysis model datasets. The results from the first part of the study would be used to recognize the occurrence of low-level inversions, and address whether warmer periods in the observed record are associated with more inversions or more intense inversions. Once this cataloging of the circulation patterns and mixed layer variables is completed, the project would focus on determining how these circulation patterns and mixed layer variables are influenced by inter-annual to decadal climate modes such as the El Niño-Southern Oscillation.

Part II. The second part of the project would use the results of Part I to project the frequency and intensity of low-level inversions in future climate scenarios. Here, results from GCM runs would be examined to determine the frequency and intensity of low-level inversions over the next century. Multiple runs from different ensemble members (if available), and different climate GCMs would be used to help assign a statistical significance to the results. Additionally, model runs produced with different greenhouse gas emission scenarios would be used to estimate the possible range of low-level inversion variability. Are GCM results consistent across spring, summer, fall and winter seasons? Is the change in inversion characteristics directly related to the changes in temperature (warming) or are other circulation measures involved as a fundamental determinant?

BENEFITS: Some of the key air pollutants (ozone, secondary particulate matter) depend on temperature or upon the vertical gradient of temperature (e.g. inversion strength) in the lower atmosphere. Virtually all climate model projections indicate that California's climate will warm as greenhouse gases continue to accumulate in the atmosphere. Based upon recent runs over a variety of models and greenhouse gas emissions scenarios, potential warming over California during the 21st century would range from about 2°C to 5°C (change of temperatures in 2100 relative to recent 1961-1990 historical climatology). Because the magnitude of these changes may rival or exceed the magnitude of natural year-to-year climate variability in California, these changes could have significant consequences on the production and buildup of air pollutants in California's air basins. Thus, a better understanding of future changes in low level inversions and the associated atmospheric structure is crucial to preparing for regional air quality problems in California over the next several decades.

COST: $250,000

TITLE: Economic Impacts and Benefits of Climate Change Control Strategies

PROBLEM: The strategies to reduce climate change emissions would impact the California economy positively and negatively. Experience indicates that because most climate change strategies strive for efficiency improvements, the economy would benefit because more products and services are produced from less resources for the benefit of the consumer. More efficiency implies increased income which when invested or spent creates jobs. However, some economic sectors such as petroleum would realize negative impacts. Less fuel consumption would lead to lower profits and jobs for the petroleum sector. Experience with economic modeling and analysis shows that the positive impacts on the economy outweigh the negative. To fully understand and estimate the impacts economic model updates and improvements are needed. This research would address the economic modeling needs.

PREVIOUS WORK: ARB has used Environmental Dynamic Revenue Analysis Model (E-DRAM) for several years to evaluate statewide economic impacts of major regulations and plans. E-DRAM, computable general equilibrium (CGE) model, is the work of Professor Peter Berck of the Department of Agricultural and Resource Economics (ARE) at UC Berkeley. He created the model for the California Department of Finance to analyze tax policies. ARB subsequently has funded further development of the model ARB used E-DRAM to assess the economic impact of State Implementation Plans, reformulated gasoline regulations, the petroleum dependency study with the California Energy Commission, the AB 1493 motor vehicle climate change regulations, and the Climate Action Team plan for Cal/EPA. Professor David Roland-Holst, also at ARE, has developed the Berkeley Energy And Resources (BEAR) model, a follow-on to E-DRAM. BEAR follows dynamic response of the economy to shocks, whereas E-DRAM shows only a snapshot of the final post-shock equilibrium. Both E-DRAM and BEAR share a Social Accounting Matrix (SAM) based on industrial data from 2003. REMI is another model, capable of county-level aggregation, used by some states and many local governments but not by the State of California.

OBJECTIVE: The objective is to improve ARB's in-house capability to model the economic impact of climate change control strategies.

DESCRIPTION: The contractor will develop a CGE model of the California economy with these features:

- Integrate E-DRAM and the BEAR model,
- Improve the resolution of the SAM by
    - Breaking out the Transportation sector into Ports, Ships, Rail, Trucks, Goods Movement between ports and destinations outside of California
    - Breaking out Solar Electricity, Ethanol, Renewable Electricity Generation
- Develop a SAM based on industry data for 2006 or 2007,
- Project a SAM for 2010 and 2020 based on trends likely to influence growth of different sectors,

- Scrutinize and if possible improve the trade elasticities assigned to industrial sectors, and
- Deliver the model and input files in a human-readable and editable form, such as GMS (GAMS files) or XLS (Microsoft Excel files); in other words, not an executable compiled from contractor-held source code.

BENEFITS: This project will enhance ARB's in-house ability to model economic impact of major regulations and plans. This benefit is not limited to climate change control strategies. State Implementation Plans and major regulations would benefit as well. ARB is gradually improving the sophistication of its economic analysis. The next logical step is to continue to improve E-DRAM and to capture the new features built into the BEAR model.

COST: $250,000

TITLE: Conduct Tropospheric Ozone Model Simulations to Reproduce Observed Long Term Trends in Background Ozone Levels

PROBLEM: Current models have difficulty reproducing the observed trends in background tropospheric ozone over the 20th century and over the past few decades. This inability raises questions as to our understanding of the natural sources of ozone precursors and their possible perturbation by human activity. The precursor gases to tropospheric ozone - nitrogen oxides (NO_X), volatile organic compounds (VOCs), and carbon monoxide (CO) number- through related chemistry influence hydroxyl (OH) radical concentrations (key atmospheric oxidants) and hence the lifetime of methane, another major greenhouse gas. In turn, methane is a major precursor for the tropospheric ozone background. Methane has shown variable trends over the past decades that are poorly understood and could provide important information on its sources.

PREVIOUS WORK: A number of studies have used global chemical transport models and future emission scenarios to predict future ozone concentrations. Zeng and Pyle (2003) predict climate change increases tropospheric ozone due to enhanced stratosphere-troposphere exchange. The effect of changes in both climate and emissions has also been considered in a number of model simulations [e.g., Brasseur et al., 1998; Grewe et al., 1999, 2001; Johnson et al., 1999, 2001; Stevenson et al., 2000; Grenfell et al., 2003]. A directed study of the eastern U.S. (Hogrefe et al., 2004) found that, around 2050, climate change would be the most important factor leading to increases in the upper quartile of 8-hour average surface ozone concentrations, whereas projected changes in anthropogenic emissions would cause increases only half as large. Tropospheric ozone is formed by photochemical reactions involving emissions of methane and pollutants and is the third most important greenhouse gas after carbon dioxide and methane. One of the poorly understood feedbacks of potential importance is atmospheric chemistry feedback, due to chemical interactions affecting ozone concentrations.

There are two direct ties between background ozone and California issues. It will be almost impossible to achieve the ozone targets in California if background ozone concentrations continue to rise. Recent ARB funded studies also suggest that background ozone may promote the formation of PM nitrate during winter stagnation episodes. Background ozone strongly contributes to the nighttime formation of particulate nitrate through the formation of N_2O_5 in the upper atmosphere during the evening hours. This increased nitrate production compensates for the partitioning of nitric acid back to the vapor phase as temperatures are raised. California currently has the highest PM concentrations in the country, with PM nitrate forming a major component during the most severe episodes. Any change in background ozone that encourages nitrate formation is a direct California issue.

OBJECTIVE: The objectives of are to better understand the factors controlling the concentrations and trends of tropospheric ozone, and its impact on future air pollution events in California.

DESCRIPTION: Trends in tropospheric ozone (the third-most influential anthropogenic greenhouse gas) are not well determined and are driven by a mix of emissions, including regional pollutants and CH_4. Satellite data recently obtained and to become available for the first time for methane, tropospheric ozone, and tropospheric aerosols will be analyzed and interpreted in the context of global models and assimilation systems. The results will also form part of a detailed global survey of past and future trends for tropospheric ozone and its precursor species. The focus of this work will be on areas most likely to impact California's air quality.

Existing climate model results will be evaluated by exploiting new/improved observational data such as satellite and aircraft, as well as surface observations of tropospheric composition and underlying processes. Using regional air quality models, a detailed perturbation analysis will be carried out to study the effect of meteorology and background concentrations on ozone and PM2.5 concentrations during present-day and future air pollution events. A limited number of global climate model (GCM) runs may be performed to provide the inputs necessary for the California regional air quality modeling.

BENEFITS There are two direct ties between background ozone and California issues. It will be almost impossible to achieve the ozone targets in California if background ozone concentrations continue to rise. Background ozone concentrations are also predicted to increase in the future, leading to increased PM2.5 concentrations in California's air basins. This project will provide major advances on this problem by exploiting observational data of tropospheric composition and underlying processes to improve global ozone models. This project will also improve the ability of global modeling to reproduce observed long-term trends in background tropospheric ozone, and its impact on future air pollution events in California.

COST: $ 300,000

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CALIFORNIA REGULATIONS FOR NEW 1997 AND LATER OFF-HIGHWAY RECREATIONAL VEHICLES AND ENGINES

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the California regulations and test procedures for new 1997 and later off-highway recreational vehicles and engines (OHRV). The amendments would add evaporative emission standards and revise the riding seasons for OHRVs that do not meet California's exhaust emission standards. On the whole, the amendments will lead to additional emission reductions and more efficient enforcement of the OHRV regulation. This notice summarizes the proposed regulatory amendments. The staff report presents the proposed amendments in greater detail.

DATE: July 20, 2006

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., July 20, 2006, and may continue at 8:30 a.m., July 21, 2006. This item may not be considered until July 21, 2006. Please consult the agenda for the meeting, which will be available at least 10 days before July 20, 2006, to determine the day on which this item will be considered.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed adoption of amendments to sections 2411, 2412, 2413 and 2415, title 13, California Code of Regulations (CCR), and to the following document incorporated by reference therein: "California Exhaust Emission Standards and Test Procedures for 1997 and Later Off-Highway Recreational Vehicles and Engines," as last amended October 22, 1999.

Background:

Health and Safety Code sections 43013 and 43018 direct ARB to achieve the maximum feasible and cost-effective emission reductions from all mobile source categories, including off-highway vehicles and off-highway motorcycles, through the setting of emission control and other requirements.

The Board first adopted the OHRV regulation (sections 2410-2414, title 13, CCR, and the documents incorporated by reference therein) in January 1994. The primary goal of the regulation was to control a significant source of ozone-forming emissions. To that end, the regulation implemented exhaust emissions standards for a segment of off-road vehicles that, prior to 1994, were not subject to any emission control measures. Specifically, the Board adopted exhaust emission standards for off-road motorcycles and all-terrain vehicles (ATV), as well as required the use of zero-emission (e.g., "electric") golf carts at golf courses located in nonattainment areas for ozone.

Soon after the standards went into effect, California motorcycle dealers and off-road enthusiast associations (i.e., consumers) began to voice their concerns about the OHRV regulation. Specifically, their interrelated concerns were two-fold: 1) many of the popular-selling two-stroke/competition OHRVs were not modified by their manufacturers to meet the new emission standards and thus were no longer eligible for off-highway registration, so most consumers would not buy them; and 2) of the compliant OHRVs that were available, none possessed performance characteristics that were satisfactorily similar to the two-stroke/competition models, which a large segment of consumers desired. Moreover, some manufacturers chose to produce no emission-compliant OHRVs; and thus, their dealers were negatively impacted economically.

To address these unintended outcomes, a committee of stakeholders was formed. Comprising the committee were: the California Motorcycle Dealers Association; off-road enthusiast groups and associations, including the American Motorcyclist Association; several OHRV manufacturers; public land agency managers from the California State Parks, the Bureau of Land Management, and the United States Forest Service; representatives from the Department of Motor Vehicles' (DMV) registration policy unit; and ARB staff. The committee held several meetings over the course of approximately a year and a half and considered various strategies to accommodate the concerns of the dealers and off-road enthusiasts. The goal was to develop a solution that would provide relief to the dealers and off-road enthusiasts, while still achieving meaningful emission reductions. The solution that was ultimately chosen accomplished this objective and was approved by the Board at the December 10, 1998 public hearing.

The two main elements of the 1998 rulemaking were: 1) the creation of a new form of off-highway vehicle registration, specifically for noncomplying OHRVs; and 2) a schedule of dates for OHRV riding areas, known as the "riding seasons" (section 2415, title 13, CCR), during which ambient ozone was low and non-complying OHRVs could be ridden. Together, these measures provided for the limited use of noncomplying OHRVs, without significantly impacting ambient air quality levels for ozone.

On July 24, 2003, the OHRV regulation was amended a second time. The amendments reflected a delay in riding season enforcement by the land management agencies, due to the inconsistent registration of these vehicles. The inconsistent registrations were caused by manufacturers not correctly following the regulatory requirements for identifying noncomplying OHRVs in the vehicle identification number, and a delay in the implementation of the appropriate computer programming for DMV to accurately process the off-highway vehicle registrations. At the time of the 2003 amendments, both of these problems had been largely resolved.

Description of the Proposed Regulatory Action: Staff proposes amendments to California's existing OHRV regulations to add evaporative emission standards for new OHRVs, and to revise the riding seasons for OHRVs that do not meet California's exhaust emission standards. Staff also proposes that the Board insert into section 2413, title 13, CCR, the specific language related to the labeling requirements for OHRVs, which was previously incorporated by reference and contained in a separate document, and amend the ATV category to better describe ATVs and to allow certain types of utility vehicles to certify to the ATV standards.

The proposed evaporative emissions standards are identical to those adopted by the United States Environmental Protection Agency (U.S. EPA) in 2002. Adoption of the standards will allow ARB to conduct its own enforcement action if it determines that the standards are not being met. The adoption will also ensure that ARB's OHRV program will continue to be at least as stringent as the federal program in future model years.

Staff proposes that the Board update the current listing of the riding areas designated for off-highway motorcycle and ATV usage. More specifically, staff proposes to modify the riding seasons for noncomplying or "Red Sticker" vehicles to reflect current air quality data and to address concerns that have been voiced regarding how to simplify compliance for both riders and enforcement personnel.

Staff is also proposing that the Board reclassify certain types of utility vehicles. The reclassification would include changes to definitions, emissions standards, and test procedures for the vehicles in question. Instead of certifying under California's large off-road spark-ignition regulation, manufacturers would certify these vehicles under the OHRV regulation. However, the vehicles subject to this reclassification would not be eligible for emissions noncompliant (i.e., red sticker) registration. Because these utility vehicles use engines that are also used in OHRVs (in particular ATVs), the proposal would reduce the cost of demonstrating the engine's compliance under two different regulatory categories that use different procedures. It is possible that manufacturers of utility vehicles and others covered by California's large off-road spark-ignition regulation, but not specifically identified by staff, may likewise seek such reclassification, and the Board may consider such reclassifications under this proposal.

In addition, staff proposes that the Board add label specifications directly to the regulatory language of section 2413, title 13, CCR. The label specifications to be added are currently in a separate document that is incorporated by reference.

A full description of the proposed amendments is presented in the "Staff Report: Initial Statement of Reasons," as described below.

COMPARABLE FEDERAL REGULATIONS

In November 2002, U.S. EPA finalized its own regulation for OHRVs, which contains standards for both evaporative and exhaust emissions (40 CFR Part 1051). The amendments proposed here are designed to harmonize with the federal evaporative standards; California's exhaust emissions standards for OHRVs remain more stringent than U.S. EPA's exhaust emission standards.

BENEFITS OF THE PROPOSAL

By 2020, the proposal would provide a reduction of approximately 4.5 tons per day of ozone-forming hydrocarbon emissions, due to the implementation of evaporative controls.

The proposal would benefit manufacturers by providing California and federal regulatory consistency for both OHRV evaporative emissions standards and for eligible utility vehicles certifying to ATV standards. In addition, through the revision of the riding seasons, the staff's proposal will simplify compliance for OHRV users and improve enforceability by the public land managers.

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 a summary of the economic and environmental impacts of the proposal. The report is entitled: "Staff Report: Initial Statement Of Reasons For Proposed Rulemaking — Public Hearing To Consider Amendments To The California Regulations For New 1997 And Later Off-Highway Recreational Vehicles And Engines."

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 the 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, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing on July 20, 2006.

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 the ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Mr. Scott Rowland, at (626) 575-6676 or

srowland@arb.ca.gov, or Mr. Andrew Spencer, at (626) 575-6675 or aspencer@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, and Alexa Malik, Regulations Coordinator, (916) 322-4011. 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 Internet site for this rulemaking at www.arb.ca.gov/regact/ohrv2006/ohrv2006.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 will 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 part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary costs or savings to state or local agencies.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

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 determined that the proposed regulatory action will 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 title 1, CCR, section 4, that the proposed regulatory action will not affect small businesses because there will be no

incremental cost, or an insignificant cost, associated with staff's proposal in addition to those already needed to comply with the federal regulation.

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. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the Staff Report.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail 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, July 19, 2006**, 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

Facsimile submittal: (916) 322-3928

The Board requests but does not require that 30 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 Health and Safety Code sections 39600, 39601, 43013, 43018, 43101, 43105 and 43107, and in Vehicle Code sections 38020 and 38390. This action is proposed to implement, interpret, and make specific Health and Safety Code sections 43013, 43018, 43101, 43102, 43104, 43105, 43107, and Vehicle Code sections 38020 and 38390.

HEARING PROCEDURES

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

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 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 the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

Date: May 23, 2006

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 Web –site at www.arb.ca.gov.

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR RULEMAKING

PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CALIFORNIA REGULATIONS FOR NEW 1997 AND LATER OFF-HIGHWAY RECREATIONAL VEHICLES AND ENGINES

Date of Release: **June 2, 2006**
Scheduled for Consideration: **July 20, 2006**

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 AMENDMENTS TO THE CALIFORNIA REGULATIONS FOR NEW 1997 AND LATER OFF-HIGHWAY RECREATIONAL VEHICLES AND ENGINES

Date of Release: **June 2, 2006**
Scheduled for Consideration: **July 20, 2006**

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Attachment A: Proposed Regulatory Amendments

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Executive Summary

In 1994, the Air Resources Board (ARB or Board) approved the off-highway recreational vehicle (OHRV) regulation. This rulemaking established exhaust emission standards for off-road motorcycles and all-terrain vehicles (ATV), in an effort to reduce ozone. The regulated pollutants were hydrocarbons (HC) and carbon monoxide (CO).

The OHRV regulation has been amended twice since its adoption. In 1998, amendments were made to reduce the impact on dealers and off-road enthusiasts resulting from the limited number of vehicles meeting the emission standards. Vehicles not meeting the standards became eligible for recreational use on public lands, but only at times and places unlikely to impact ozone levels. Although this was initially implemented in 1998, inaccurate registrations necessitated a second amendment to the regulation. In 2003, the Board approved additional amendments that recognized a delay in full enforcement of the riding season restrictions.

In 2002, the United States Environmental Protection Agency (U.S. EPA) promulgated a federal regulation that established similar OHRV exhaust standards but also included evaporative emission standards. The federal exhaust standards are not as stringent as California's, even though oxides of nitrogen (NO_x) are also regulated, and they do not establish riding season restrictions. Moreover, even less stringent standards apply to small displacement OHRV engines.

In this rulemaking, staff is proposing the following:

- Harmonize with U.S. EPA evaporative emission standards
- Harmonize with U.S. EPA on which utility vehicles may certify using the ATV test procedures
- Insert in the regulatory text proper the labeling requirements that are currently incorporated by reference
- Revise the riding seasons for noncomplying OHRVs

The proposed evaporative emissions standards will reduce reactive organic gases statewide by approximately 4.5 tons per day in 2020. Because the federal and California evaporative emission requirements would be the same, industry will not incur additional costs due to California's requirements.

Allowing certain utility vehicles to certify using the ATV test method will reduce industry's compliance cost. However, the exhaust emission standards for these vehicles are more stringent than the current California or federal ATV standards, which will assure that emission reductions are not compromised.

Inserting the labeling requirements (with which industry is already familiar) will clarify that these requirements, despite being sunsetted for on-road motorcycles in a 2002 rulemaking, continue to apply to OHRVs.

Lastly, revising the riding seasons to coincide with current periods of clean air will allow more riding opportunities for owners of non-emission controlled OHRVs, and other changes will simplify enforcement by public land agency personnel.

The staff recommends the Board approve the proposed amendments.

I. INTRODUCTION

The California Clean Air Act, codified in the Health and Safety Code, requires the Air Resources Board (ARB or the Board) to regulate emissions from certain off-road or non-vehicular engines and other non-vehicular sources (sections 43013 and 43018, Health and Safety Code). This legislation specifically mandates that ARB adopt measures to reduce emissions from off-highway vehicles and off-highway motorcycles. The off-highway motorcycles and all-terrain vehicles (ATVs) subject to this proposal are referred to hereafter under the general term "off-highway recreational vehicles," or OHRVs.

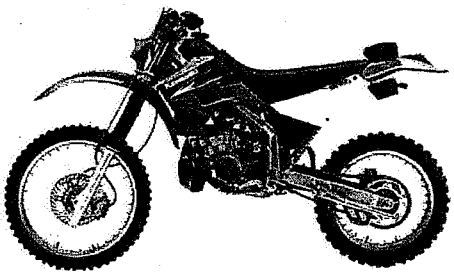
The regulatory proposal contains amendments that will lead to additional emission reductions and more efficient enforcement of the OHRV regulation. The proposed amendments include evaporative emission standards, revision of the riding seasons and locations for OHRVs that do not meet California's exhaust emission standards, and addition of exhaust and evaporative standards for a new subcategory – recreational utility vehicles. Following a synopsis of previous regulatory activity, the proposed amendments to the OHRV regulation are discussed in greater detail.

II. BACKGROUND

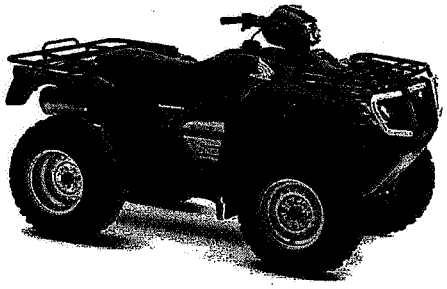
A) Description of Category and Emissions Inventory

Off-road motorcycles and ATVs comprise the majority of vehicles in the OHRV category. Both are powered by two-stroke or four-stroke engines and are used primarily on trails and other types of terrain by off-road enthusiasts. Examples of each are shown below:

OHRVs



Off-Road Motorcycle



All-Terrain Vehicle (ATV)

The exhaust from uncontrolled OHRVs is high in hydrocarbons (HC), which are reactive organic gases (ROG) that form ozone. Table 1, below, shows the ROG, carbon monoxide (CO) and oxides of nitrogen (NO_x) emissions inventory for the category.

Table 1.

Statewide Emissions Inventory[1]
Annual Average
(*tons per day*)

Year	Population	ROG	CO	NO_x
1992	300,000	37.1	85.8	0.4
2005	644,000	28.8	86.6	1.1
CHANGE	+344,000	–8.3	+0.8	+0.7

Despite the fact that the OHRV population has more than doubled over the past 14 years, ROG emissions are continuing to decrease. The reduction in ROG emissions is due to the OHRV exhaust emission standards that the Board adopted in 1994, which are discussed in the next section. The minor increase in NO_x emissions is due to leaner calibrations and a shift from two-stroke to four-stroke technology, steps taken by OHRV manufacturers to reduce ROG emissions. The NO_x increase is more than offset by the greater reductions in ROG emissions achieved.

B) California Regulatory Activity

1) Initial Rulemaking

The Board first adopted the OHRV regulation (sections 2410-2414, title 13, California Code of Regulations (CCR), and the documents incorporated by reference therein) in January 1994. The primary goal of the regulation was to control a significant source of ozone-forming emissions. To that end, the regulation implemented exhaust emissions standards for a segment of off-road vehicles that, prior to 1994, were not subject to any emission control requirements. Specifically, the Board adopted exhaust emission standards for off-road motorcycles and ATVs. Table 2, below, shows the exhaust emission standards that the Board adopted for OHRVs, based on a transient, chassis dynamometer test.

[1] Data for 1992 emissions inventory obtained from 1994 ISOR for the OHRV regulation.
Data for 2005 emissions inventory obtained from ARB's OFFROAD Model.
Source of population: Department of Motor Vehicles registration records.

Table 2.

1997 and Later OHRVs
Exhaust Emission Standards
(*grams per kilometer – g/km*)

Vehicle Type	**Engine Displacement**	**HC** (g/km)	**CO** (g/km)
Motorcycle or ATV	ALL	1.2	15

Source: Section 2412, Title 13, CCR

Many off-road motorcycle manufacturers also make on-road motorcycles, and thus had testing equipment that had been used to certify the on-road motorcycles for many years readily available for off-road motorcycle certification testing. However, many ATV manufacturers did not have comparable testing equipment at their disposal that could properly accommodate ATVs for chassis-based testing. Therefore, the Board agreed to allow industry to certify ATVs to comparable standards using a steady-state engine-based test. Table 3 shows these standards.

Table 3.

Alternate 1997 and Later ATVs
Exhaust Emission Standards
(*grams per kilowatt-hour – g/kW-hr*)

Vehicle Type	**Engine Displacement** (cc: cubic centimeters)	**HC+NO_x** (g/kW-hr)	**CO** (g/kW-hr)
ATV	225 cc and greater	13.4	400
	Less than 225 cc	16.1	400

Source: Sections 2403 and 2412, Title 13, CCR

The effective dates for demonstrating compliance with California's exhaust emission standards were: January 1, 1997, for engine displacements greater than 90 cubic centimeters; and January 1, 1999, for engine displacements equal to or less than 90 cubic centimeters. Generally speaking, these dates coincide with the 1998 and 2000 model years, respectively. Because industry was otherwise amenable to the 1994 rulemaking, staff was confident that the manufacturers would use the three to five years of lead-time to produce a variety of emission-controlled off-road motorcycle and ATV models for the California market.

Due to limitations on the Board's authority, competition vehicles (predominantly off-road motorcycles) also remained eligible for sale in California. However, staff took measures to assure that the usage of these uncontrolled vehicles would be

restricted. Specifically, "competition/racing vehicles" were defined in the OHRV regulation as those vehicles that operated exclusively on closed courses in sanctioned racing events. Additionally, staff collaborated with the California Department of Motor Vehicles (DMV) before and after the rulemaking to make amendments to the procedure by which OHRV registration was issued.

2) Activity following the initial rulemaking

At the time of the regulation's adoption, staff estimated that the emissions inventory for ROG would decrease from 37 to 4 tons per day by 2010. This reduction was predicated on two main assumptions: 1) that manufacturers would convert their product lines from uncontrolled OHRVs to emission compliant models; and 2) that the OHRV fleet population would remain relatively constant. Unfortunately, the transition to compliant models did not materialize as originally anticipated. Additionally, the population increased significantly. Therefore, as of 2005, and as noted above in Table 1, the regulation has reduced average annual ROG emissions to only 28 tons per day. The following discussion provides a more detailed explanation for the reasons behind this discrepancy, which requires an understanding of California's longstanding program for off-highway recreation.

California's off-highway recreation program dates back to the Chappie-Z'berg Off-Highway Motor Vehicle Law of 1971 (section 38000 et seq., California Vehicle Code (CVC)). Since then, many areas on public lands have been designated for OHRV use. The majority of these locations are managed by the California State Parks, the Bureau of Land Management (BLM), or the United States Forest Service (U.S. Forest Service), although there are riding areas under the jurisdiction of other local authorities. California law requires off-highway registration for all OHRVs that are used on public lands. The program is supported by vehicle registration fees ($25). Registration must be renewed every two years. Proof of current registration is issued in the form of a self-adhesive sticker that is affixed to the OHRV. Because it is the dominant color (top and bottom sections), this registration sticker is commonly known as the "Green Sticker."

Emissions Compliant
Off-Highway Vehicle Registration

"Green Sticker"

With the 1997 implementation date of the OHRV regulation fast approaching and no noticeable changes in the OHRV manufacturer's product lines, California dealers and off-road enthusiast associations began to voice their concerns to ARB staff. Specifically, their interrelated concerns were two-fold: 1) the popular-selling two-stroke/competition OHRVs did not meet the exhaust emission standards and thus they were no longer eligible for off-highway registration, so most off-road enthusiasts would not buy them; and, 2) of the few emission compliant OHRVs that were available, none possessed performance characteristics that were satisfactorily similar to the two-stroke/competition models, which a large segment of the off-road enthusiasts desired. Moreover, some manufacturers had no emission compliant OHRVs available; thus, many dealers would lose business.

To address these unintended situations, a committee of stakeholders was formed. Comprising the committee were: the California Motorcycle Dealers Association; off-road enthusiast groups and associations, including the American Motorcyclist Association; several OHRV manufacturers; public land agency managers from the California State Parks, BLM, and the U.S. Forest Service; representatives from DMV's registration policy unit; and ARB staff.

The committee held several meetings over the course of approximately a year and a half. During the course of these meetings, it became apparent that the successful implementation of the adopted regulations was being impeded principally because of a lack of compliant motorcycles. Also during this time, staff became aware that many off-highway registrations were being issued inappropriately, as reported by public land personnel. These factors forced staff to abandon an "administrative" solution and instead pursue a regulatory solution. The committee considered various strategies to accommodate the concerns of the dealers and off-road enthusiasts, while still achieving meaningful emission reductions. The solution that was ultimately chosen accomplished this objective and was approved by the Board at the December 10, 1998 Public Hearing.

The two main elements of the 1998 rulemaking were: 1) a schedule of dates for the land agencies' OHRV riding areas, known as the "riding seasons," during which ambient ozone was low and noncomplying OHRVs could be ridden; and 2) the creation of a new form of off-highway vehicle registration. Together these measures provided for the limited use of noncomplying OHRVs, as explained below.

Because air quality in California varies, the dates of the riding areas also vary. In riding areas within air basins that are in "attainment" with the State's ambient air quality standard for ozone, both the emission compliant and noncompliant OHRVs may operate year-round. In riding areas within "nonattainment" air basins for ozone, only the emission compliant OHRVs may operate year-round. The noncompliant OHRVs are subject to riding seasons determined by analyzing historical data for ozone exceedances and considering meteorological conditions,

such as prevailing wind patterns. The intent of this provision is to allow the noncompliant OHRVs to operate when ozone levels are predictably below ambient air quality standards. [The complete list of riding areas and riding seasons is contained in section 2415, title 13, CCR.]

To enable enforcement of the riding seasons, a second off-highway registration sticker specifically for the registration of noncompliant OHRVs was created with the collaboration of DMV. Because of its color scheme, it is commonly referred to as the "Red Sticker."

Emissions Noncompliant
Off-Highway Vehicle Registration

"Red Sticker"

Registration with the Red Sticker is identical to the Green Sticker in terms of registration/renewal fees and renewal periods (two years). The difference is that the Red Sticker identifies an OHRV as noncompliant with California's emission standards. This distinction is necessary to enforce the riding seasons. The riding seasons specify where and when these noncompliant vehicles may be used on designated public lands.

On July 24, 2003, the OHRV regulation was again amended to reflect the delay in riding season enforcement by the land management agencies, due to inconsistent registrations of newer vehicles. Specifically, registrations were issued inconsistently because many manufacturers incorrectly identified their noncomplying OHRVs, and there was a delay in the DMV implementation of the appropriate computer programming to process off-highway vehicle registrations. At the time of the 2003 amendments, both of these problems had been largely resolved.

Thus, the OHRV regulation as it exists today balances the needs of dealers and off-road enthusiasts with the need for emissions reductions for public health. The success of the OHRV regulation is partly reflected in the fact that air quality has not suffered and, in fact, has improved in a number of areas.

C) Federal Regulatory Activity

In 2002, the United States Environmental Protection Agency (U.S. EPA) promulgated a federal regulation for nonroad recreational vehicles and engines. Included in this regulation were exhaust and evaporative emission standards for off-road motorcycles and ATVs.

1) Exhaust Emissions

Table 4, below, highlights the differences between California and federal exhaust emission standards applicable when using the chassis-based test method.

Table 4.

California and Federal Exhaust Emission Standards
When Using the Chassis Test
(*grams per kilometer – g/km*)

Vehicle Type	**California or Federal**	**Engine Displacement** (cubic centimeters)	**HC** (g/km)	**HC+NO_x** (g/km)	**CO** (g/km)
Motorcycle	California	ALL	1.2	—	15
	Federal	70 cc and greater	—	2.0	25
ATV	California	ALL	1.2	—	15
	Federal	100 cc and greater	---	1.5	35

Sources: Section 2412, Title 13, CCR; and the 2002: Federal Register Notice: "Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines"

Note that California has standards for HC and CO, whereas the federal standards are for HC+NO_x and CO. Because the engines used in OHRVs emit much more HC than NO_x, as corroborated by the emissions inventory in Table 1 above, California's HC standard is considered more stringent than the federal HC+NO_x standards. California's CO standard is also more stringent than the federal CO standards.

Table 5, below, highlights the differences in exhaust emission standards for the alternative set of standards that apply when using an engine test.

Table 5.

California and Federal Exhaust Emission Standards Comparison
Optional (Engine-Based) Test
(*grams per kilowatt-hour – g/kW-hr*)

Vehicle Type	**California or Federal**	**Engine Displacement** (cubic centimeters)	**$HC+NO_x$** (g/kW-hr)	**CO** (g/kW-hr)
Motorcycle	California	N/A	N/A	N/A
	Federal	Less than 70 cc	25.0	610
Large ATV	California	225 cc and greater	13.4	400
	Federal	225 cc and greater	13.4	400
Small ATV	California	Less than 225 cc	16.1	400
	Federal	100ccc – 225 cc	16.1	400
	Federal	Less than 100 cc	25.0	500

Sources: Sections 2403 and 2412, Title 13, CCR; and the 2002: Federal Register Notice: "Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines"

U.S. EPA allows smaller off-road motorcycles (<70cc) to comply using the steady-state test engine-based standards. California does not allow manufacturers to use the alternative test and standards for off-road motorcycles because: 1) it believes the transient chassis test better represents actual operation, 2) motorcycles are currently being certified using this test method, and 3) four-stroke engines are widely available for these smaller motorcycles which can easily meet the chassis-based standards.

Both California and U.S. EPA allow any size ATV to comply with the alternative engine-based standards and nearly all manufacturers elect to do so, primarily for cost reasons. However, U.S. EPA requires less stringent exhaust emission standards for ATVs with engine displacements less than 100 cc. The standards they have adopted are the same as the standards for non-handheld small off-road engines (SORE). These standards are not needed because a full line of small ATVs meeting the more stringent California standards is available.

2) Evaporative Emissions

The recent federal regulation contains evaporative emission standards aimed at controlling losses due to permeation from fuel tanks and hoses. California has no comparable standards. Compared to uncontrolled levels, the federal regulation requires an 85-percent reduction in plastic fuel tank permeation and a 95-percent reduction in fuel system hose permeation. The standards, which will take effect in 2008, are shown in Table 6 below.

Table 6.

Federal Evaporative Emission Standards
(*grams per meter-squared per day – g/m^2/day*)

Emission Component	Standard
Fuel Tank Permeation	1.5 g/m^2/day
Fuel Hose Permeation	15.0 g/m^2/day

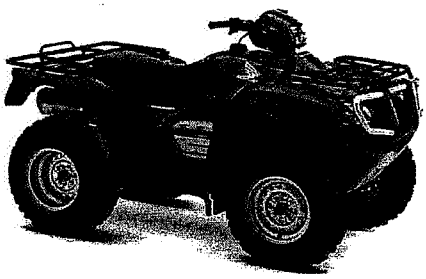
Source: 2002: Federal Register Notice: "Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines"

3) "ATV-like" Utility Vehicles

Utility vehicles are typically small, low-speed off-road vehicles, commonly seen on college campuses carrying miscellaneous supplies and equipment. In California, these vehicles are required to comply with requirements based on the horsepower of the engine. Vehicles with engines less than 25 horsepower are certified based on meeting the SORE regulation, while those above 25 horsepower are certified based on meeting the large spark-ignition (LSI) engines regulation. Historically, these vehicles generally have not used ATV or off-road motorcycle engines and have not been characterized as "ATV-like" vehicles. However, a recent trend has emerged with the introduction of utility vehicles which *are* more "ATV-like," as in the example described below.

In the federal regulation, these utility vehicles now certify according to the same standards and test procedures as ATVs. Differences between these vehicles and traditional ATVs include bench or bucket seats versus straddled seating, a steering wheel versus handlebars, and heavier cargo carrying capacities. The images below illustrate some of the more obvious distinctions between ATVs and certain ATV-like utility vehicles. Staff is proposing to partially align with the new federal definitions to accommodate these vehicles.

ATV and Utility Vehicle Comparison



All-Terrain Vehicle (ATV)

ATV-Like Utility Vehicle

III. SUMMARY OF RECOMMENDED ACTION

A) Applicability

The regulatory proposal is primarily directed at off-road motorcycles and ATVs, although certain types of utility vehicles are also affected.

B) Evaporative Emission Standards

The proposed evaporative emission standards control permeation losses from fuel tanks and fuel hoses, and would apply to new 2008 and subsequent OHRVs. By adopting these standards and test procedures, California would harmonize with the federal requirements, allowing ARB to enforce the standards and requirements. The proposed evaporative standards and the associated temperatures for evaporative testing are as follows in Table 7:

Table 7.

Proposed Evaporative Emission Standards
(*grams per meter-squared per day – g/m^2/day*)

Emission Component	Standard	Test Temperature
Fuel Tank Permeation	1.5 g/m^2/day	28° C (82° F)
Fuel Hose Permeation	15.0 g/m^2/day	23° C (73° F)

Several technologies are available to manufacturers to control evaporative permeation losses. As outlined in U.S. EPA's Final Regulatory Support Document, these technologies include barrier platelets, sulfonation treatment, fluorination treatment, and barrier fuel hose. A discussion of the cost of these technologies is presented in Part IV of this report.

C) ATVs and ATV-Like Utility Vehicles

Since the time the Board first adopted the OHRV regulation, ATVs have evolved into much larger and specialized vehicles, with features that no longer meet the existing ATV definition. Some of the features found on new ATVs include:

- seating for two persons (i.e., the operator plus one passenger)
- cargo capacities that exceed 350 pounds
- vehicles with six wheels
- unladen vehicle weight in excess of 600 pounds.

Staff proposes to revise the ATV definition into three categories, or classes, that include these new features and better distinguish today's ATVs.

Class I: ATVs designed to travel on four or more low-pressure tires, having a seat designed to be straddled by the operator and handlebars for steering controls, and intended for use by a single operator and no other passengers.

Class II: The same features as Class I ATVs, but having straddle seating for one operator and one passenger.

Class III: An off-road utility vehicle that has four or more wheels, has bench or bucket seating for two or more persons, is designed for operation over rough terrain, has either a rear payload 350 pounds or more or seating for six or more passengers, has an engine displacement less than or equal to one liter, maximum brake power less than or equal to 30 kilowatts, and is capable of speeds over 25 miles per hour.

With the creation of these three ATV "Classes," staff proposes amending the definition of "Off-Highway Recreational Vehicle Engines" or "Engines" in section 2411, title 13, CCR, to remove unnecessary language within it. Manufacturers have questioned whether the existing language exempts certain ATV-like utility vehicles from the LSI regulation. However, those utility vehicles are proposed for coverage under the new ATV Class III definition; therefore, the phrase "*...but not limited to use in...*" is no longer at issue. Removing it and adding the Class III definition will clarify the applicability of the OHRV regulation.

Since the promulgation of the federal regulation, some utility vehicle manufacturers have asked California to harmonize with the federal requirements, which require utility vehicles meeting the Class III definition (above) to certify to

the federal ATV standards. In California, utility vehicles have been required to comply with exhaust emission standards for LSI engines, or the exhaust standards for small engines typically used in lawn and garden equipment (i.e., SORE). Table 8, below, shows the exhaust emission standards for both; note that the federal ATV standard for $HC+NO_x$ is less stringent than the California LSI/SORE standard.

Table 8.

Utility Vehicle Exhaust Emission Standards
(*grams per kilowatt-hour – g/kW-hr*)

Vehicle Type	**California or Federal**	**Engine Displacement** (cubic centimeters)	**$HC+NO_x$** (g/kW-hr)	**CO** (g/kW-hr)
Utility Vehicle	California LSI/SORE	Less than 1 liter	12.0	549
	Federal ATV	Less than 1 liter	13.4	400

Because many of the utility vehicles that are eligible to certify to the federal ATV standards use the same engines that are installed in ATVs, and recognizing the cost to manufacturers of testing an otherwise identical engine according to two different test procedures, staff proposes harmonizing insofar as allowing Cass III utility vehicles to certify using the ATV test procedure. The proposal would also harmonize California's less stringent CO standard with that of U.S. EPA's (i.e., 400 g/kW-hr). However, because of the potential loss of emission reductions if compliance with the less stringent federal standard for $HC+NO_x$ were allowed, staff proposes to maintain the more stringent California standard, as shown in Table 9, below.

Table 9.

2007 and Later: ATV Class III
Exhaust Emission Standards
(*grams per kilowatt-hour – g/kW-hr*)

Vehicle Type	**Engine Displacement** (*cubic centimeters*)	**$HC+NO_x$** (*g/kW-hr*)	**CO** (*g/kW-hr*)
ATV Class III	Less than 1 liter	12.0	400

Additionally, the staff proposal makes off-highway vehicles meeting the ATV Class III definition ineligible for emissions noncompliant certification or Red Sticker registration. Unlike off-road motorcycles, the federal regulation does not

make exemptions for the sale of competition ATVs to the general public; and by 2007, the federal regulation will require all ATVs to meet exhaust emission standards. Because manufacturers are already complying with the proposed levels using four-stroke technologies, California has little reason to explore a less protective noncompliant certification option for this category. Moreover, noncompliant certification is unnecessary since these vehicles are already meeting LSI emission standards.

D) Labeling Requirements

Dating back to the initial 1994 OHRV rulemaking, the labeling requirements for OHRVs were specified in section 2413, title 13, CCR. These requirements are based on, and reference, the labeling requirements applicable to on-road motorcycles, contained in section 1965, title 13, CCR, and the incorporated document entitled: "California Motor Vehicle Emission Control and Smog Index Label Specifications."

At a December 12, 2002 Public Hearing, the Board approved revisions to section 1965 and the incorporated "Specifications" as they relate to on-road motorcycles. Specifically, since 2004, on-road motorcycles have been following the federal labeling requirements. Many manufacturers of on-road motorcycles also manufacture OHRVs. Although the incorporated documents remained in effect for OHRVs and manufacturers have continued to comply, industry had uncertainty about the applicability of the "Specifications" document for the OHRV labeling requirements. The staff's proposal would insert into section 2413 the labeling requirements that were previously contained in the "Specifications" and incorporated by reference.

E) Adjustments to Riding Seasons

The 1998 rulemaking made provisions for the Executive Officer to periodically review the riding season schedule and make adjustments and revisions, if warranted. Since riding seasons became effective, staff has received feedback from both the land agencies and off-road enthusiasts. One common theme throughout has been the desire for a more uniform schedule of dates, particularly for those areas that are near other areas or between areas that are connected by common trails. With this in mind, staff has analyzed recent ozone data and revised the riding season schedule accordingly. Although changes to the riding seasons can be made by the Executive Officer with proper notice, staff has opted to include this amendment with this rulemaking.

The majority of riding areas are under the jurisdiction of the U.S. Forest Service. Because of the numerous connecting and adjacent riding areas, these riding seasons are proposed for consolidation for each particular ranger district, with each district having one riding season that applies throughout. For the most part, riding areas under the jurisdiction of the California State Parks or BLM do not

connect with other areas. However, in cases where they do, the proposed riding seasons are uniform between neighboring areas, as in the case of Hungry Valley (State Parks) and the Mt. Pinos Ranger District (U.S. Forest Service). Similar efforts at making uniform riding areas are proposed for western Imperial County, where State Parks and BLM riding areas are in close proximity.

Although none of the proposed riding season changes were due to the reclassification of an air basin's ozone status from nonattainment to attainment, there are a few additional areas staff proposes be amended to year-round status. Some of these riding areas were not known to staff and were located in an attainment area, such as riding areas in the Nevada City and American River Ranger Districts. Others are existing riding areas whose actual location has been clarified to be either in an attainment area, like Mammoth Bar, or to be located at or near the California-Arizona or California-Nevada border and with which the year-round riding season would not impact air quality, such as riding areas in the Imperial Sand Dunes. Also, to address a misinterpretation of the riding season program, the regulatory language has been amended to clarify that riding in these public lands is limited to only those areas that are designated for OHRV usage.

Lastly, within section 2415, the Governor's Executive Order (W144-97) review provision has been deleted both because it expired by operation of law and because the 2003 OHRV rulemaking fulfilled its requirement.

IV. AIR QUALITY, ENVIRONMENTAL AND ECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE

A) Air Quality Benefits

A summary of the benefits from the regulatory proposal is shown in Table 10, below. The emission reductions were determined by assuming the same amount of permeation control that the federal regulation requires. By 2020, the proposal would provide a reduction of 4.5 tons per day of reactive organic gases.

Table 10.

Statewide Evaporative Emission Benefits
Reactive Organic Gases
(*tons per day*)

Year	Vehicle Type	Baseline	Controlled	Benefit
2010	Motorcycle	8.62	7.50	1.18
	ATV	6.38	5.73	0.65
TOTAL	—	15.00	13.23	**1.83**
2020	Motorcycle	11.33	8.61	2.72

	ATV	8.34	6.60	1.74
TOTAL	—	19.67	15.21	**4.46**

No other emission benefits are expected as a result of staff's other proposed amendments. That is, including the utility vehicles that qualify as Class III ATVs into this regulation at the proposed standards will preserve expected exhaust emission reductions from these vehicles.

The revisions to the riding seasons result in more riding opportunities for off-road enthusiasts; therefore, there will be a minor ROG increase to the emissions inventory. However, because these additional riding opportunities occur when ozone levels are expected to be below the ambient air quality standards, the increase will not significantly impact nonattainment air basins.

B) CEQA Analysis

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Because the 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 the ARB Staff Report or Technical Document in lieu of preparing an environmental impact report or negative declaration. In addition, the 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 regulations.

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 regulations.

The staff's proposal lists additional riding opportunities for noncomplying OHRVs, which could theoretically present the opportunity for more emissions in certain locations. However, statewide, and particularly in nonattainment areas, the proposed revisions to the riding seasons will make enforcement of the riding restrictions more efficient than before, and in some cases will allow for enforcement to reduce emissions in areas currently used for riding with no restrictions. Together, this will reduce incidences of inappropriate usage of noncomplying OHRVs during periods of high ozone levels and more than offset any potential local emission increases. Also, any potential increases in emissions will be further offset by the reductions from the proposed evaporative standards. Additionally, the regulatory clarification that riding is to be done *only*

in designated riding areas protects other media that would be otherwise impacted by inappropriate OHRV use.

Because this regulatory proposal identifies no new potentially significant environmental effects, it would not have any significant or potentially significant negative effects on the environment. Therefore no alternatives or mitigation measures are proposed to avoid or reduce any significant effects on the environment.

C) Costs to Industry

Because of its harmonizing aspects, the staff proposal is not expected to impose costs on industry. Although the California standards will be more stringent than the federal standards for the utility vehicles that meet the proposed ATV Class III classification, the proposal provides manufacturers a harmonized test method for demonstrating compliance. Moreover the California standards are at levels they are currently meeting. Therefore, the proposal will likely result in savings for the manufacturers, not costs.

California's harmonization with the evaporative standards would not impose additional costs above the costs to comply with the federal regulation, which would apply in California in the absence of an ARB requirement. Therefore, staff believes that the regulatory proposal would have no noticeable impact on business competitiveness, California employment, or on business creation, elimination, and expansion.

Table 11, below, contains U.S. EPA's analysis of the incremental costs for OHRV manufacturers to meet the federal evaporative emission standards.

Table 11.

Permeation Control Technologies and Incremental Costs

Technology Option	**Off-Road Motorcycles** *3 gallon tank* *1.5 feet hose*	**ATVs** *4 gallon tank* *1 foot hose*
Barrier Platelets	$1.20	$1.50
Sulfonation Treatment	$1.20	$1.20
Shipping/Handling	$0.22	$0.30
Fluorination	$2.42	$3.23
Shipping/Handling	$0.22	$0.30
Barrier Fuel Hose	$1.16	$0.77
Hose Clamps	$0.52	$0.52

The costs industry would incur to maintain a separate line of OHRVs for California with uncontrolled fuel system components would exceed the incremental costs listed above because it would involve additional labor to remove and replace the low-permeation tanks and hoses on "American-bound" product, as well as the effort to manage the accurate distribution of an uncontrolled, "California-only" product.

D) Costs to State Agencies

Staff believes there would be no real incremental cost increase associated with adopting the federal evaporative standards as the California standards. Any ARB compliance testing performed would be done with existing resources. Accordingly, the proposed requirements are not expected to result in an overall increase in costs for state and local agencies. The revisions to the riding seasons may result in cost savings because the more uniform riding season schedule is expected to simplify enforcement duties for land agency personnel.

E) Cost-Effectiveness

The cost-effectiveness of the federal evaporative emission standard was determined by U.S. EPA to be about $0.11 per pound of ozone precursors reduced, which compares favorably with the cost-effectiveness of California mobile source and motor vehicle fuels regulations adopted over the past decade. Compared to the existing California OHRV regulation for exhaust emissions, which was determined to be $0.03-0.35 per pound for HC and $0.03-0.31 for CO in 1994, aligning with the federal proposal for evaporative emissions is an equally cost-effective control measure.

F) Economic Impact on the Economy of the State

Because there is no cost associated with the evaporative emission standards and utility vehicle requirements, no negative impact on the economy of the state is expected. At the retail level, California dealers will not be at a disadvantage compared to the rest of the country because the evaporative requirements in this proposal are identical to the federal requirements. However, because of the revisions to the riding seasons, dealers may experience increased sales.

G) Environmental Justice

The environmental justice implications of the regulatory proposal remain unchanged from the existing regulation. OHRVs typically are not used in or near environmental justice communities. Because the Red Sticker program ensures that higher-polluting OHRVs are not used when ambient air quality exceeds the standards for ozone, all California communities share the benefits.

V. OUTREACH

Shortly after the federal regulation was promulgated in 2002, there was a noticeable increase in stakeholder activity, including numerous meetings and correspondence regarding harmonizing utility vehicles to the ATV standards in the same fashion as the federal regulation, requests to harmonize completely with the federal regulation, and recommendations to revise the riding seasons. Additional meetings between staff, industry, and off-road enthusiasts were held to identify possible solutions. These efforts lead to a Public Workshop held in El Monte on March 23, 2006. Attending were members from industry, off-road enthusiast groups, and the public land agencies. At the workshop, staff summarized the amendments that would be proposed to the Board. These amendments included adopting evaporative emission standards that harmonize with the federal standards, revising the riding season schedule for noncomplying vehicles, and inserting into title 13, CCR the labeling requirements that were previously incorporated by reference. Staff also informed industry about additional evaporative control measures for OHRVs, which staff is in the process of evaluating for a possible future regulatory action. After the workshop, staff provided interested parties with the data that was analyzed for determining the revisions to the riding seasons. Recipients were asked for their comments and suggestions.

VI. ALTERNATIVES

A) Harmonize with the federal exhaust emission standards

Staff considered harmonizing with the federal exhaust emission standards as an alternative to this proposal, but rejected it because it would increase emissions compared to the proposed amendments. Manufacturers have suggested that aligning with the federal exhaust emission standards would provide California dealers more off-road motorcycle models to sell, which would reduce the off-road enthusiasts' frustration of having to abide by riding season limitations. The following discussion will explain staff's reasons for rejecting exhaust emission harmonization as an alternative.

1) Off-Road Motorcycles

When ARB determined the exhaust emission standards for OHRVs in 1994, it first averaged the emissions from a sample of 1990 four-stroke OHRVs. A standard was then adopted that reflected emission control strategies that had proved successful with on-road motorcycles; such as more precise fuel metering, and engine and cooling modifications. A comparison of the uncontrolled

emissions, California's adopted emission standards, and the federal emission standards are shown in Table 12, below:

Table 12.

Uncontrolled and Controlled OHRV Exhaust Emissions Comparison
(*grams per kilometer – g/km*)

OHRV Emissions	**HC** (g/km)	**CO** (g/km)
1990 Uncontrolled	1.5	32.0
1994 California Standards	1.2	15.0
2002 Federal Standards	1.7*	25.0

* Assumes 0.3 g/km for NO_x emissions

Since 1997, emissions-compliant off-road motorcycles have certified to levels between 0.5 and 1.0 g/km for HC and between 5 and 12 g/km for CO. Thus, manufacturers have demonstrated that California's standards are indeed achievable, often by comfortable margins. The primary complaint against the emission-compliant off-road motorcycles is that they do not exhibit the same performance characteristics as do the two-stroke models or the high-performance, but noncomplying, four-stroke models. U.S. EPA tested a number of these uncontrolled high-performance four-strokes. The emission levels they measured are listed in Table 13, below:

Table 13.

Uncontrolled, High-Performance Four-Stroke Off-Road Motorcycles
Exhaust Emissions Comparison
(*grams per kilometer – g/km*)

Make	**Model**	**Model Year**	**Engine Displacement.**	**HC** (g/km)	**CO** g/km)	**NO_x** (g/km)
Yamaha	WR250F	2001	249 cc	1.46	26.74	0.110
Yamaha	WR450F	1999	398 cc	1.07	20.95	0.155
KTM	400EXC	2001	398 cc	1.17	28.61	0.050
Husaberg	FE501	2001	498 cc	1.30	25.81	0.163
Average				**1.25**	**25.52**	**0.109**

Source: 2002: "Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines" – U.S. EPA.

On average, the HC emissions from these motorcycles are very close to California's standards. The CO emissions are above compliance levels; however, both HC and CO are correctable with better calibrations and other improvements.

Because manufacturers have been able to produce emission-compliant models, and because the emissions from uncontrolled four-stroke models are very close to compliance levels, maintaining the existing HC emission standards remains the reasonable and environmentally-responsible emission standard for California. Although harmonizing with U.S. EPA's 2.0 g/km HC+NO_x standard would seemingly ensure that all four-stroke models would be eligible for certification, such a standard does not demonstrate an effort to reduce emissions from existing, uncontrolled four-stroke engines.

2) ATVs

Similarly, U.S. EPA tested 11 four-stroke ATVs (see Table 14, below). Although ATVs currently certify to the engine-based emission standards, the 11 ATVs were tested under the chassis-based test cycle because U.S. EPA wanted to determine whether these vehicles were capable of following the driving schedule. In their rulemaking, U.S. EPA expressed concerns about the representativeness of the existing engine-based test cycle, which they will phase-out in 2010. Efforts by industry to create a suitable, replacement engine-based test cycle are in progress; however, there is uncertainty as to the completion date of the project. In the event a replacement test cycle does not materialize, ATVs would be subject to the same chassis-based exhaust emission standards and test procedures as the off-road motorcycles.

The 1.5 g/km HC+NO_x standard in the federal regulation for ATVs is essentially equivalent to California's 1.2 g/km HC standard, but the federal 35 g/km CO standard is much less stringent. U.S. EPA agreed with industry that a stringent CO standard could make it more difficult to meet the HC+NO_x standard. However the emission data generated by U.S. EPA showed that this was not always the case. Those engines with the lowest CO emissions (highlighted in *italics*) are often the ones with the lowest HC+NO_x emissions.

Table 14.

ATV Exhaust Emissions Comparison
(*grams per kilometer – g/km*)

Make	Model	Model Year	Engine Displace-ment.	HC (g/km)	CO (g/km)	NO_x (g/km)
Kawasaki	*Bayou*	*1989*	*280 cc*	*1.17*	*14.09*	*0.640*
Honda	300EX	1997	298 cc	1.14	34.60	0.155
Polaris	Trail Boss	1998	324 cc	1.56	43.41	0.195
Yamaha	*Warrior*	*1998*	*349 cc*	*0.98*	*19.44*	*0.190*
Polaris	Sportsman	2001	499 cc	2.68	56.50	0.295
Arctic Cat	375 Auto	2001	375 cc	1.70	49.70	0.190
Yamaha	Big Bear	2001	400 cc	2.30	41.41	0.170
Honda	Rancher	2001	400 cc	1.74	33.98	0.150
Bombardier	4x4 AWD	2001	500 cc	1.62	20.70	0.740
Polaris	*Sportsman*	*2001*	*499 cc*	*1.56*	*19.21*	*0.420*
Yamaha	*Raptor*	*2001*	*660 cc*	*0.97*	*16.56*	*0.210*
Average				**1.58**	**31.78**	**0.305**

Source: 2002: "Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines" – U.S. EPA.

As argued above, staff believes that the emission standards should be set to levels that result in emission reductions, not at levels reflecting the status quo. Moreover, the standards should not be skewed unnecessarily upward because of a small number of poorly calibrated models.

3) Exhaust Emissions Inventory Analysis

Staff considered this complete harmonization alternative thoroughly, but has determined that the current exhaust emission standards in the OHRV regulation achieve more reductions of ozone-forming emissions than would be achieved with the federal standards. Moreover, there would be a significant increase in CO emissions, due to the great differences between the California and federal standards Table 15, below, compares the emissions inventory and shows the increases that would occur with the federal standards. At this time, staff has not identified an alternative that would be more effective in achieving the goal of expanding riding opportunities and product selection without harming air quality.

Table 15.

Emissions Impact of Full Harmonization with U.S. EPA Standards
(tons per day – annual)

Year	Standards	HC	CO	NO_x
2010	California	28.0	60.2	0.5
	Federal	*29.7*	*77.5*	*0.5*
INCREASE	—	**1.7**	**17.3**	—
2020	California	38.4	82.8	0.7
	Federal	*40.8*	*106.4*	*0.7*
INCREASE	—	**2.4**	**23.6**	—

Additionally, the Red Sticker program, with its riding seasons, better serves California's air quality needs than would the federal regulation. The primary intent of the OHRV regulation was to reduce ozone-forming emissions. With OHRV engines, these are primarily HC or ROG emissions. By restricting the usage of the noncomplying OHRVs during the summer months, when ozone levels are highest, significant ROG emission reductions are achieved.

Bearing in mind that OHRVs are most often used on weekends, staff conducted a statewide analysis comparing the summer weekend day emissions inventory for 2010, as shown in Table 16, below. Staff's analysis was done on a statewide basis because data regarding the number of OHRVs operating at each riding area is not available. Thus, the analysis slightly overestimates the benefits of the Red Sticker program, as it assumes that noncomplying OHRVs would not be operated, even at those riding areas that allow year-round riding. However, the directional effect of the program is clear.

Table 16.

2010 Summer Weekend Day Impact of Red Sticker Program
(tons per day)

Scenario	ROG	CO	NO_x
Unlimited Riding	39.44	129.49	1.52
Restricted Riding	2.76	70.17	1.51
Emission Reductions	**36.68**	**59.32**	**0.01**
Percent Reductions	**93%**	**46%**	**<1%**

What can be gleaned from this analysis is that in riding areas with restrictions on noncomplying OHRVs, the ROG emissions are reduced very significantly during periods of high ozone. These emissions reductions would be forfeit if California harmonizes with the federal program.

B) Propose more stringent exhaust emission standards

This proposal is focused on addressing near term issues and assuring that California realizes the full benefits of the recently adopted federal evaporative emission standards. Staff has not completed an evaluation on the feasibility or viability of more stringent exhaust or evaporative emission standards for OHRVs, and thus has not proposed more stringent requirements as part of this proposal.

Staff intends to do further evaluation of more stringent standards in the near future. Upcoming State Implementation Plan revisions are expected to reaffirm the need for additional emission reductions. OHRVs do not utilize catalytic converters, a technology used on nearly all other spark ignited engines. In addition, the evaporative emission requirements adopted by U.S. EPA do not include control of diurnal emissions, and thus there is the potential for further evaporative emission reductions. Based on staff's evaluation, additional requirements for OHRVs and other similar vehicles and/or engines may be proposed in the future.

C) "No action" alternative

If no action were taken to amend the OHRV regulation, ARB would not be able to enforce the evaporative emission standards in California if noncompliance was determined. Additionally, by not revising the riding seasons, enforcement of the riding restrictions in the Red Sticker program would continue to be unnecessarily burdensome for public land personnel in those locations where riding areas with different riding seasons have connecting trails, and the off-road enthusiasts can repeatedly travel from unrestricted to restricted riding areas.

VII. ISSUES OF CONTROVERSY

The most prominent controversy related to the OHRV regulation is the Red Sticker program, with its usage restrictions imposed upon noncomplying, high-emitting OHRVs. Since 2003, the off-road community has engaged in high-volume letter writing campaigns to the Governor and the Chair of the Board seeking a repeal of the restrictions. Understood in its proper context, however, the Red Sticker program is actually a generous compromise that has been extended by the Board. The opportunity to purchase and operate a noncomplying vehicle in California is unique to the OHRV regulation.

Had the Board not adopted the Red Sticker program, the purchase and use of noncomplying high performance motorcycles would have ceased. The only other alternative would have been to repeal the emission standards for OHRV motorcycles, with a substantial loss of the 33 tons per day of ROG emission reductions noted in the 1994 rulemaking. Staff believes repeal would be unacceptable, and that the Red Sticker program that allows operation of uncontrolled OHRVs during months without ozone pollution remains the best alternative, balancing the desires of riders and the need to reduce the health effects of air pollution in California.

VIII. SUMMARY AND CONCLUSIONS

The regulatory proposal addresses near-term issues, and will lead to improved implementation of the OHRV regulation. The addition of evaporative standards to the OHRV regulation will reduce ozone-forming emissions, as well as provide the foundation for subsequent evaporative control measures. The inclusion of eligible utility vehicles into the OHRV regulation reduces the manufacturers' testing burden without compromising emission reductions. Lastly, the revisions to the riding seasons will allow additional riding and result in a program that operates more efficiently.

Staff recommends that the Board approve this regulatory proposal. The proposal described herein would facilitate enforcement of a program in place. No alternative considered by the agency would be more effective in carrying out the purpose for which the regulations are proposed or would be as effective or less burdensome to affected private persons than the proposed alternative.

IX. REFERENCES

ARB 1994. Staff Report: "Public Hearing to Consider the Adoption of Regulations Regarding California Exhaust Emission Standards and Test Procedures for Off-Highway Recreational Vehicles and Engines"

ARB 1998. Staff Report: "Public Hearing to Consider Amendments to the California Regulations for New 1997 and Later Off-Highway Recreational Vehicles and Engines"

ARB 2003: Staff Report: "Public Hearing to Consider Amendments to the California Regulations for New 1997 and Later Off-Highway Recreational Vehicles and Engines"

U.S. EPA 2002: Federal Register Notice: "Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land Based)"

U.S. EPA 2002: "Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines"

ATTACHMENT A

PROPOSED REGULATION ORDER

Title 13 California Code of Regulations

PROPOSED REGULATION ORDER

NOTE: This document is written in a style to indicate changes from the existing provisions. All existing language is indicated by plain text. All additions to language are indicated by underlined text. All deletions to language are indicated by ~~strikeout~~. Only those portions containing the suggested modifications from existing provisions are included. All other portions remain unchanged and are indicated by the symbol "* * * * *" for reference.

Amend sections 2411, 2412, 2413, and 2415, title 13 California Code of Regulations, to read as follows:

§ 2411. Definitions.

(a) The definitions in Section 1900(b), Chapter 1, Division 3, Title 13 of the California Code of Regulations, apply with the following additions:

(1)(A) "All-Terrain Vehicle (ATV) Class I" means any ~~motorized~~ off-highway motor vehicle ~~50 inches (1270 mm) or less in overall width,~~ that has all of the following features and characteristics: designed to travel on four or more low pressure tires, having a seat designed to be straddled by the operator and handlebars for steering control, ~~and~~ intended for use by a single operator and no passengers~~. The vehicle is designed to carry not more than 350 pounds (160 kg) payload, excluding the operator~~, and is powered by an internal combustion engine. ~~Width shall be exclusive of accessories and optional equipment.~~ A golf cart is not, for purposes of this regulation, to be classified as an all-terrain vehicle.

(B) "All-Terrain Vehicle (ATV) Class II" means any off-highway motor vehicle possessing the same features and characteristics as Class I ATVs, but having straddle seating for one operator and one passenger.

(C) "All-Terrain Vehicle (ATV) Class III" means any off-highway motor vehicle that has all of the following features and characteristics: designed to travel on four or more wheels, having bench or bucket seating for two or more persons, designed for operation over rough terrain, having either a rear payload 350 pounds or more or seating for six or more passengers, having an engine displacement less than or equal to one liter, having a maximum brake power less than or equal to 30 kilowatts, and is capable of speeds over 25 miles per hour.

* * * * *

(13) "Off-Highway Recreational Vehicle Engines" or "Engines" are identified as: two-stroke or four-stroke, air-cooled, liquid-cooled, gasoline, diesel, or alternate-fuel powered engines or electric motors that are designed for powering off-road recreational vehicles and engines included in~~, but not limited to use in,~~ the following: off-road motorcycles, all-terrain vehicles, and golf carts. All engines and equipment that fall within the scope of the preemption of Section 209(e)(1)(A) of the Federal Clean Air Act, as amended, and as defined by regulation of the Environmental Protection Agency, are specifically not included within this category.

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, and 43107, Health and Safety Code.
Reference: Sections 43013, 43018, 43101, and 43107, Health and Safety Code.

§ 2412. Emission Standards and Test Procedures – New Off-Highway Recreational Vehicles and Engines.

(a) This section applies to all off-highway recreational vehicles and engines used in such vehicles produced on or after January 1, 1997.

(b) For purposes of certification in California, manufacturers must comply with the following exhaust and evaporative emissions from new off-highway recreational vehicles and engines that are sold, leased, used, or introduced into commerce in California.

(1) Exhaust emissions must not exceed:

Emission Standards

Vehicle & Model Year	*Hydro-carbon (HC)*	*Oxides of Nitrogen (NO_x)*	*Carbon Monoxide (CO)*	*Particulate Matter*[1]
Off-Road Motorcycles and All-Terrain Vehicles (Class I and Class II) with Engines Greater Than 90 cc[3] 1997 and Later (g/km)[4]	1.2[2]	—	15.0	—
Off-Road motorcycles and All Terrain Vehicles (Class I and Class II) with Engines 90 cc or Less 1999 and Later (g/km)	1.2[2]	—	15.0	—
All-Terrain Vehicle (Class I and Class II) Option 1997 and Later	Shall comply with exhaust emission standards equivalent to the off-road motorcycle and all-terrain vehicle standard using the utility test procedures set forth in CCR, Title 13, section 2403, and the incorporated document "California Exhaust Emission Standards and Test Procedures for 1995 ~~and Later~~ 2004 Small Off-Road Engines" which is hereby incorporated by reference herein.[5]			
All-Terrain Vehicles (Class III) 2007 and Later (g/kW-hr)[6]	$HC+NO_x$ 12.0		400	—
Golf Carts in Federal Ozone Non-Attainment Areas 1997 and Later	ZERO	ZERO	ZERO	ZERO
Off-Road Motorcycle and All-Terrain Vehicle (Class I and Class II) Option: 1997 and Later Vehicles with Engines Greater Than 90 cc, and 1999 and Later Vehicles with Engines 90 cc or Less	Vehicles and engines that do not meet the emissions standards noted above may be certified subject to the use restrictions described in subsection (f) below.			

1. Applicable to diesel and two-stroke spark ignited engines only.
2. Compliance with the 1.2 grams per kilometer HC standard to be applied as a "corporate average" shall be determined as provided in subsection (d). Each engine family shall have only one applicable standard.

3. Cubic centimeter.
4. Grams per kilometer.
5. Compliance with the equivalent all-terrain vehicle HC standard to be applied as a "corporate average" shall be determined as provided in subsection (d). Each engine family shall have only one applicable standard.
6. Grams per kilowatt-hour, as tested using the utility test procedures set forth in CCR, Title 13, section 2403, and the incorporated document "California Exhaust Emission Standards and Test Procedures for 1995-2004 Small Off-Road Engines".

(2) Evaporative emissions must not exceed:

Evaporative Emissions

Vehicle & Model Year	*Emission Component*	*Permeation Standard*	*Test Temperature*
Off-Road Motorcycles and All-Terrain Vehicles 2008 and Later $g/m^2/day^{(1)}$	Fuel Tank Permeation	1.5	28 °C (82 °F)
	Hose Permeation	15.0	23 °C (73 °F)

1. Grams per square meter per day.

(c)(1) The test procedures for determining certification and compliance with the standards for exhaust and evaporative emissions from new off-road motorcycles, all-terrain vehicles, and golf carts are set forth in "California Exhaust Emission Standards and Test Procedures for 1997 and Later Off-Highway Recreational Vehicles and Engines," adopted November 23, 1994, and last amended October 22, 1999, which are hereby incorporated by reference herein and which in turn incorporate by reference Subparts E and F, Part 86, and Subparts C and F, Part 1051, Title 40, Code of Federal Regulations. Manufacturers of the following are not required to perform emissions testing, but must file an application of certification and comply with the administrative requirements outlined in the procedures to certify their vehicles for sale in California:

A) Golf carts.

B) Off-road motorcycles and all-terrain vehicles, and engines used in such vehicles, as described in subsection (f) below.

(2) The test procedures for determining certification and compliance with the standards for exhaust emissions from all-terrain vehicle engines (those engines utilizing the optional standards noted in (b) above) are set forth in "California Exhaust Emission Standards and Test Procedures for

1995 ~~and Later~~ 2004 Small Off-Road Engines," adopted March 20, 1992, and last amended March 23, 1999.

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, and 43107, Health and Safety Code.
Reference: Sections 43013, 43018, 43102, 43104 and 43107, Health and Safety Code.

§ 2413. Emission Control Labels – New Off-Highway Recreational Vehicles.

(a) Purpose. The Air Resources Board recognizes that certain emissions-critical or emissions-related parts must be properly identified and maintained in order for off-highway recreational vehicles, and engines used in such vehicles, to comply with the applicable emission standards. The purpose of this section is to require off-road motorcycle and ATV engine manufacturers to attach a label (or labels) on each production vehicle (or engine) in order to provide vehicle owners and service mechanics with information necessary for the proper maintenance of these vehicles and engines in customer use.

(b) Applicability

(1) All off-road motorcycles, all-terrain vehicles, and engines used in such vehicles, except those certified according to section 2412(f), produced on or after January 1, 1997, for sale, lease, use or introduction into commerce in California, shall comply with these labeling requirements. ~~of Title 13, California Code of Regulations, Chapter 1, Article 2, Section 1965, and the incorporated "California Motor Vehicle Emission Control and Smog Index Label Specifications," adopted March 1, 1978, as last amended June 24, 1996 (as corrected September 20, 1996), and which are hereby incorporated by reference herein.~~ Any reference to motorcycles in ~~the incorporated documents~~ this section 2413 applies to off-road motorcycles, all-terrain vehicles, and engines used in such vehicles.

(2) Any off-road motorcycle, all-terrain vehicle, and engines used in such vehicles, that are exempt from exhaust emission standards pursuant to title 13 of the California Code of Regulations shall also be exempt from the requirements of this section.

(3) The responsibility for compliance with this section rests with the manufacturer who has been granted certification in order to offer these vehicles and engines for sale in California.

(c) Label Content and Location

(1) A tune-up label made of a permanent material shall be welded, riveted or otherwise permanently attached to an area on the off-road motorcycle, all-terrain vehicle, or engine in such a manner that the label will be readily visible to the average person after the engine installation.

(2) In selecting an acceptable location, the manufacturer shall consider the possibility of accidental damage (e.g., possibility of tools or sharp instruments coming in contact with the label). Each label shall be affixed in such a manner that it cannot be removed without destroying or defacing the label, and shall not be affixed to any part that is likely to be replaced during the vehicle's useful life. Labels shall not be affixed to any part that is likely to be replaced in the useful life of the vehicle.

(3) The tune-up label shall be in the English language, and use block letters and numerals, which shall be of a color that contrasts with the background color of the label.

(4) The tune-up label shall contain the following information:

(A) A label heading that shall read: "Vehicle Emission Control Information."

(B) The complete corporate name and trademark of the manufacturer.

(C) Engine family name and engine displacement (in cubic centimeters).

(D) Identification of the Exhaust Emission Control System Abbreviations may be used and shall conform to the nomenclature and abbreviations found in the Society of Automotive Engineers' document J1930, which is incorporated by reference in section 1977, title 13, CCR, entitled "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms."

(E) The tune-up specifications and adjustments recommended by the manufacturer, including, if applicable: valve lash, ignition timing, idle air fuel mixture setting procedure and value (e.g., CO, idle speed drop), and high idle speed. These specifications shall indicate the proper transmission position during tune-up and what accessories, if any, should be in operation, and what systems, if any (e.g., vacuum advance, air pump), should be disconnected during the tune-up. Any tune-up specifications of adjustment instructions that appear on labels shall be sufficiently clear and complete so as to preclude the need for a mechanic

or vehicle owner to consult other references in order to correctly perform the adjustments. The manufacturer shall include the single statement: "No other adjustments needed," in lieu of any tune-up adjustment instruction, when the manufacturer does not recommend a tune-up specification or an adjustment.

(F) Any specific fuel or engine lubricant requirements (e.g., research octane number, engine lubricant type, etc.).

(G) An unconditional statement of compliance with the appropriate model-year California regulations. For example, "This (specify off-road motorcycle, all-terrain vehicle, or engine, as applicable) conforms to California regulations applicable to (specify applicable model year) model-year new (specify off-road motorcycles, all-terrain vehicles, or engines, as applicable). The statement shall also include the phrase, "is certified to (specify applicable HC standard) HC engine family exhaust emission standard in California."

(H) Statements such as those in (G) shall not appear on labels placed on off-highway recreational vehicles or engines that do not comply with all applicable California regulations.

(5) A manufacturer may elect to use a supplemental label when the original label lacks sufficient space to include all the required information. A supplemental label shall conform to all of the specifications as the original label. The original label shall be indicated as "1 of 2" and the supplemental label shall be indicated as "2 of 2" whenever a supplemental label is utilized.

(6) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such off-highway vehicle or engine conforms to any applicable federal emission standards for new off-road motorcycles, all-terrain vehicles, or engines used in such vehicles, or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of such off-highway vehicles or engines.

(7) As used in this Section 2413(c), readily visible to the average person means that the label shall be readable from a distance of 18 inches (46 centimeters) without any obstructions from vehicle or engine parts (including all manufacturer available optional equipment) except for flexible parts (e.g., vacuum hoses, ignition wires) that can be moved out of the way without disconnection. Alternatively, information required by these specifications to be printed on the label shall be no smaller than 8 point type size (2 millimeters in height) provided that no vehicle or engine parts (including all manufacturer available optional equipment), except for flexible parts, obstruct the label.

(8) The labels and any adhesives used shall be designed to withstand, for the off-highway vehicle's total expected life, typical off-highway vehicle environmental conditions at the location where a label has been attached. Typical off-highway vehicle environmental conditions include, but are not limited to, exposure to engine fuels, lubricants and coolants (e.g., gasoline, motor oil, brake fluids, ethylene glycol), engine operating temperatures, steam cleaning, and paints or paint solvents. The manufacturer must submit, with its certification application, a statement attesting that its labels comply with this requirement.

(9) The manufacturer must obtain approval from the Executive Officer for all emission control label formats and locations prior to certification. Approval of the specific tune-up specifications and adjustments is not required; however, the format for all such specifications and adjustments, if any, is subject to review. If the Executive Officer finds that the information on the label is vague or subject to misinterpretation, or that the location does not comply with these specifications, the Executive Officer may require that the label or its location be modified accordingly.

(10) Samples of all actual production emission control labels used within an engine family shall be submitted to the Executive Officer of the state Air Resources Board within thirty days after the start of production.

(11) The Executive Officer may approve alternate label locations or may, upon request and when the Executive Officer determines warranted, waive or modify one or more of the label content requirements, provided that the intent of this section is satisfied.

(12) If the Executive Officer finds any off-road motorcycle, all-terrain vehicle, or engine manufacturer using emission control labels that are different from those approved or that do not substantially comply with the readability or durability requirements set forth in this section, the Executive Officer may invoke section 2109, title 13, California Code of Regulations.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43105, and 43107, Health and Safety Code.
Reference: Sections 43013, 43018, 43102, 43105, and 43107, Health and Safety Code.

§ 2415. California Off-Highway Vehicle Areas and Riding Seasons for Off-Highway Recreational Vehicles with Use Restrictions.

(a) The following table lists the public off-highway vehicle (OHV) areas of California designated for off-highway recreational vehicle operation, including off-highway motorcycle and ATV operation. Model year 2003 and later off-highway motorcycles and ATVs that are certified pursuant to section 2412(f) are permitted to operate in the public areas designated for OHV use noted below, only during the applicable riding seasons noted. Off-highway motorcycles and ATVs that meet the emissions standards in section 2412(b) are not subject to riding season use restrictions. This table contains the following information: OHV area managing entities, OHV area names, and the applicable riding seasons.

Table 1
OHV Areas and Their Riding Seasons for Vehicles with Use Restrictions

~~OHV Area Managing Entity~~[1]	~~OHV Area Name~~	~~Riding Season~~
~~*Department of Parks and Recreation (DPR)*~~		
	~~Carnegie~~	~~Nov 1 - Apr 30~~
	~~Clay Pit~~	~~Nov 1 - Jun 30~~
	~~Hollister Hills~~	~~Oct 1 - May 31~~
	~~Hungry Valley~~	~~Oct 1 - Apr 30~~
	~~Ocotillo Wells~~	~~Oct 15 - May 15~~
	~~Oceano Dunes~~	~~Sep 15 - May 15~~
	~~Prairie City~~	~~Oct 15 - Apr 15~~
	~~Mammoth Bar~~	~~Oct 1 - May 31~~

~~[1]The OHV area managing entities are indicated in *italics*, and the managing entity regions are indicated in regular text.~~

~~OHV Area Managing Entity~~	~~OHV Area Name~~	~~Riding Season~~
~~*Bureau of Land Management (BLM)*~~		
~~Bakersfield District Office~~		
	~~Clear Creek Management Area~~	~~Oct 1 - May 31~~
	~~Bishop Resource Area~~	~~Year-round~~
~~BLM Norcal~~		
	~~Fort Sage OHV Area~~	~~Year-round~~
	~~Samoa Dunes~~	~~Year-round~~
	~~Black Sands Beach~~	~~Year-round~~
	~~Chappie-Shasta OHV Area~~	~~Oct 1 - May 31~~
	~~South Cow Mountain Recreation Area~~	~~Year-round~~
	~~Knoxville Recreation Area~~	~~Year-round~~
~~California Desert District Office~~		
	~~Olancha Dunes~~	~~Year-round~~
	~~Spangler Hills~~	~~Oct 1 - May 31~~
	~~Jawbone Canyon/Dove Springs~~	~~Oct 1 - May 31~~
	~~Dumont Dunes~~	~~Nov 1 - Apr 30~~
	~~Stoddard Valley~~	~~Oct 1 - Apr 30~~
	~~Johnson Valley~~	~~Oct 1 - Apr 30~~
	~~Superstition Mountain~~	~~Oct 1 - May 31~~
	~~Imperial Sand Dunes (Glamis/Gecko)~~	~~Oct 1 - Apr 30~~

~~OHV Area Managing Entity~~	~~OHV Area Name~~	~~Riding Season~~
~~*Bureau of Land Management (BLM) (continued)*~~		
	~~Plaster City~~	~~Oct 1 - May 31~~
	~~Imperial Sand Dunes (Buttercup Valley)~~	~~Oct 1 - Apr 30~~
	~~Lark Canyon (McCain Valley)~~	~~Dec 1 - Jan 31~~
	~~Raser~~	~~Oct 1 - Apr 30~~
	~~Imperial Sand Dunes (Mammoth Wash)~~	~~Oct 1- Apr 30~~
	~~El Mirage/Shadow Mountains~~	~~Nov 1 - Mar 15~~
	~~Rice Valley Dunes~~	~~Year-round~~
	~~Parker Strip~~	~~Year-round~~
~~*United States Forest Service (USFS)*~~		
~~Angeles National Forest~~		
	~~Mt. Baldy Ranger District~~	~~Dec 1 - Jan 31~~
	~~Rowher Flat~~	~~Nov 1 - Mar 31~~
	~~Tujunga Ranger District~~	~~Dec 1 - Jan 31~~
	~~Littlerock~~	~~Nov 1 - Mar 31~~
~~Cleveland National Forest~~		
	~~Corral Canyon~~	~~Dec 1 - Jan 31~~
	~~Wildomar~~	~~Dec 1 - Feb 28/29[a]~~

OHV Area Managing Entity	OHV Area Name	Riding Season
United States Forest Service (USFS) (continued)		
Eldorado National Forest		
	Mace Mill - Rock Creek	Oct 15 - May 31
	Barrett Lake	Year-round
Inyo National Forest		
	Poleta	Year-round
Lake Tahoe Basin Management Unit		
	Kings Beach	Year-round
Los Padres National Forest		
	Alamo Mountain	Oct 15 - Apr 30
	Ballinger Canyon	Nov 1 - Mar 15
	Black Mountain (Pozo-LaPanza)	Oct 1 - Apr 30
	Santa Barbara Ranger District	Nov 15 - Mar 15
	Ortega Trail	Nov 15 - Mar 15
Mendocino National Forest		
	Davis Flat	Year-round
	Lake Pillsbury	Year-round
	Elk Mountain Area	Year-round

OHV Area Managing Entity	OHV Area Name	Riding Season
United States Forest Service (USFS) (continued)		
Plumas National Forest		
	Gold Lake	Year-round
	Dixie Mountain	Year-round
	Mosquito Creek/Antelope Lake/Lights Creek/ Canyon Dam	Year-round
	Deadman Springs/Snake Lake	Year-round
	Cleghorn Bar/Poker Flat/La Porte	Year-round
	Big Creek/Four Tees/French Creek/Bucks Summit	Year-round
San Bernardino National Forest		
	Lake Arrowead Area	Nov 1 - Feb 28/29[a]
	Big Bear Lake Area	Nov 1 - Feb 28/29[a]
	San Jacinto Area	Nov 1 - Feb 28/29[a]
	Lytle Creek Area	Nov 1 - Feb 28/29[a]
Sequoia National Forest		
	Tule River Ranger District	Nov 1 - Apr 30
	Frog Meadow Area	Nov 1 - Apr 30
	Kennedy Meadows	Year-round

OHV Area Managing Entity	OHV Area Name	Riding Season
United States Forest Service (USFS) (continued)		
Shasta-Trinity National Forest		
	Hayfork Area	Year-round
	McCloud Ranger District	Year-round
Sierra National Forest		
	Kings River	Nov 1 - May 31
	Shaver Lake Area	Nov 1 - May 31
	Hites Cove	Nov 1 - May 31
	Miami Creek	Nov 1 - May 31
Six Rivers National Forest		
	Smith Rivers NRA	Year-round
Stanislaus National Forest		
	Niagara Ridge Area/Herring Creek	Year-round
	Date Flat Area/Moore Creek Area	Oct 1 - May 31
	Deer Creek Area/Hull Creek Area	Oct 1 - May 31
	Corral Hollow/Spicer	Oct 1 - May 31

OHV Area Managing Entity	OHV Area Name	Riding Season
United States Forest Service (USFS) (continued)		
Tahoe National Forest		
	Foresthill OHV Area	Oct 1 - May 31
	Fordyce Jeep Trail	Oct 1 - May 31
	Truckee Ranger District	Year-round
	Prosser Hills Area	Year-round
	Downieville Ranger District	Year-round
Cities, Counties, or other Jurisdictions		
	Frank Raines Deer Creek OHV Park	Oct 1 - May 31
	La Grange ORV Park	Nov 1 - Mar 31
	Park Moabi	Year-round
	Riverfront Park ORV Area	Year-round
	County of Santa Clara Motorcycle Park	Nov 1 - Apr 30
	Black Butte Lake	Year-round

a. In leap years, February 29 is the last day of February.

Public Land Management **Ranger District:** United States Forest Service **Field Office:** Bureau of Land Management **State Vehicular Recreation Area (SVRA):** California State Parks	Riding Areas **OHV Area Name**	Riding Seasons **Beginning**	 **End**
Mc Cloud Ranger District	McCloud OHV Area	Year round	
Arcata Field Office	Samoa Dunes	Year round	
Hayfork Ranger District	Hayfork OHV Area	Year round	
Redding Field Office	Chappie-Shasta ORV Area	1-Oct	30-June
Eagle Lake Field Office	Fort Sage OHV Area	Year round	
Mt. Hough Ranger District	Mt. Hough OHV Area	Year round	
Feather River Ranger District	Feather River OHV Area	Year round	
Downieville Ranger District	Downieville OHV Area	Year round	
Beckworth Ranger District	Beckworth OHV Area	Year round	
Army Corps of Engineers	Black Butte Lake	Year round	
Upper Lake Ranger District	Upper Lake OHV Areas	Year round	
Grindstone Ranger District	Grindstone OHV Areas	Year round	
Ukiah Field Office	South Cow Mountain Recreation Area	Year round	
Ukiah Field Office	Knoxville Recreation Area	Year round	
SVRA	Clay Pit	1-Sep	30-Jun
City of Marysville	Eugene Chappie OHV Park	Year round	
SVRA	Mammoth Bar	Year round	
Nevada City Ranger District	Nevada City OHV Areas	Year round	
Truckee Ranger District	Truckee OHV Areas	Year round	
Lake Tahoe Basin Management Unit	Lake Tahoe OHV Area	Year round	
American River Ranger District	American River OHV Areas	Year round	
Georgetown Ranger District	Georgetown OHV Areas	Year round	
Placerville Ranger District	Placerville OHV Areas	Year round	
Amador Ranger District	Amador OHV Areas	Year round	

San Gabriel River Ranger District	San Gabriel River OHV Areas	1-Oct	30-Apr
Front Country Ranger District	Front Country OHV Areas	1-Oct	30-Apr
Mountain Top Ranger District	Mountain Top OHV Areas	1-Oct	30-Apr
San Jacinto Ranger District	San Jacinto OHV Areas	1-Oct	31-May
Barstow Field Office	Dumont Dunes	Year round	
Barstow Field Office	El Mirage	1-Oct	30-Apr
Barstow Field Office	Stoddard Valley	1-Sep	31-May
Barstow Field Office	Rasor	1-Sep	31-May
Barstow Field Office	Johnson Valley	1-Sep	31-May
Needles Field Office	Eastern Mojave Desert Areas	Year round	
San Bernardino County	Park Moabi	Year round	
Lake Havasu Field Office	Parker Strip	Year round	
Palm Springs Field Office	Colorado Desert Areas	1-Oct	30-Apr
Trabuco Ranger District	Trabuco OHV Areas	1-Oct	30-Apr
Descanso Ranger District	Descanso OHV Areas	1-Oct	30-Apr
El Centro Field Office	Lark Canyon	1-Oct	30-Apr
SVRA	Ocatillo Wells	1-Oct	31-May
SVRA	Heber Dunes	1-Oct	31-May
El Centro Field Office	Arroyo Salado	1-Oct	31-May
El Centro Field Office	Superstition Mountain	1-Oct	31-May
El Centro Field Office	Plaster City	1-Oct	31-May
El Centro Field Office	Imperial Dunes-Mammoth Wash	Year round	
El Centro Field Office	Imperial Dunes-Glamis/Gecko	Year round	
El Centro Field Office	Imperial Dunes-Buttercup Valley	Year round	

(b) The Executive Officer shall publish in the California Regulatory Notice Register and notify potentially affected OHV Area Managing Entities regarding revisions to Table 1 in subsection (a) at least 30 days before the revisions take effect, in the following situations:

(1) The Executive Officer may revise Table 1 in subsection (a) when there is a change in the designation (with respect to California Ambient Air Quality Standards), from ozone nonattainment to attainment, of an area in which an OHV area is located, provided that the attainment area is not identified as an upwind contributor to significant impacts to transport of ozone or ozone precursors as identified and defined in Section 70500, Title 17, California Code of Regulations.

Pacific Ranger District	Pacific OHV Areas	Year round	
SVRA	Prairie City	1-Oct	30-Apr
Calaveras Ranger District	Calaveras OHV Areas	Year round	
Summit Ranger District	Summit OHV Areas	Year round	
Mi-Wuk Ranger District	Mi-Wuk OHV Areas	1-Oct	31-May
SVRA	Carnegie	1-Oct	30-Apr
Santa Clara County	Metcalf Motorcycle Park	1-Oct	30-Apr
Stanislaus County	Stanislaus OHV Areas	1-Oct	30-Apr
Groveland Ranger District	Groveland OHV Areas	1-Oct	31-May
Bass Lake Ranger District	Bass Lake OHV Areas	1-Oct	31-May
SVRA	Hollister Hills	1-Oct	31-May
Hollister Field Office	Clear Creek Management. Area	1-Oct	31-May
High Sierra Ranger District	High Sierra OHV Areas	1-Oct	31-May
Bishop Field Office	Bishop Resource Area	Year round	
Hume Lake Ranger District	Hume Lake OHV Areas	1-Oct	31-May
SVRA	Oceano Dunes	Year round	
Santa Lucia Ranger District	Santa Lucia OHV Areas	Year round	
Kern River Ranger District	Kern River OHV Areas	1-Oct	31-May
Tule River/Hot Springs Ranger District	Tule River/Hot Springs OHV Areas	1-Oct	31-May
Ridgecrest Field Office	Olancha Dunes	Year round	
Ridgecrest Field Office	Jawbone Canyon, Dove Springs	1-Sep	31-May
Ridgecrest Field Office	Spangler Hill	1-Sep	31-May
White Mountain Ranger District	White Mountain OHV Areas	Year round	
Mt. Pinos Ranger District	Mt. Pinos OHV Areas	1-Oct	30-Apr
SVRA	Hungry Valley	1-Oct	30-Apr
Santa Barbara Ranger District	Santa Barbara OHV Areas	1-Oct	30-Apr
Ojai Ranger District	Ojai OHV Areas	1-Oct	30-Apr
Santa Clara/Mojave Rivers Ranger District	Santa Clara/Mojave Rivers OHV Areas	1-Oct	30-Apr

(2) The Executive Officer may revise Table 1 in subsection (a) to reflect changes in the physical characteristics or identity of OHV Areas, including but not limited to changes in ownership or control of listed areas, addition or deletion of areas, or changes in the geographic domain of listed areas.

~~(c) Within five years from the effective date of adoption or date of implementation, whichever comes later, the Air Resources Board, in consultation with the Secretary for Environmental Protection, shall review the provisions of this section to determine whether it should be retained, revised or repealed.~~

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, and 43107, Health and Safety Code, and sections 38020 and 38390, Vehicle Code.
Reference: Sections 43013, 43018, and 43107, Health and Safety Code~~, and Governor's Executive Order W144-97~~.

ATTACHMENT B

State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSIONS STANDARDS AND TEST PROCEDURES FOR 1997 AND LATER OFF-HIGHWAY RECREATIONAL VEHICLES AND ENGINES

Adopted: May 26, 1995
Amended: October 22, 1999
Amended: <*insert date of amendment here*>

NOTE: This document incorporates by reference, with noted modifications, sections of Subparts E and F, Part 86, Title 40, Code of Federal Regulations, and sections of Subparts B, C, F, and I, Part 1051, Title 40, Code of Federal Regulations. California provisions which replace specific federal provisions are denoted by the words "DELETE" for the federal language and "REPLACE WITH" or "ADD" for the new California language. The symbols "****" and "..." mean that the federal text that immediately follows the symbols is unchanged and incorporated by reference into the California Standards and Test Procedures. Sections of the federal regulations which are not listed are not part of the California Standards and Test Procedures.

This Document is printed in a style to indicate changes from the existing provisions. All existing language is indicated by plain type. All additions to language are indicated by underline. All deletions to language are indicated by ~~strikeout~~.

CALIFORNIA EXHAUST EMISSIONS STANDARDS AND TEST PROCEDURES FOR 1997 AND LATER OFF-HIGHWAY RECREATIONAL VEHICLES AND ENGINES

The following provisions of Subpart E and F, Part 86, Title 40, Code of Federal Regulations, as adopted or amended by the U. S. Environmental Protection Agency on the date listed are adopted and incorporated herein by this reference as the California Exhaust Emission Standards and Test Procedures for 1997 and Later Off-Highway recreational vehicles and engines, except as altered or replaced by the provisions set forth below.

PART 86, CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

Subpart E, General Provisions for Emission Regulations for 1978 and Later New Motorcycles

SOURCE: 42 FR 1126, Jan. 5, 1977, unless otherwise noted.

86.401-78 General Applicability. 42 FR 1126, Jan. 5, 1977.

DELETE

86.401-90 General Applicability. 54 FR 14539, Apr. 11, 1989.

(a) DELETE,
REPLACE WITH:
(a) This subpart applies to all 1997 and later model year off-road motorcycles, all-terrain vehicles, golf carts, and engines used in such vehicles produced on or after January 1, 1997.

(b) DELETE

(c) DELETE

86.402-78 Definitions. 49 FR 48138, Dec. 10, 1984

* * * *

"Administrator" DELETE,
REPLACE WITH:
"Administrator" means the Executive Officer of the Air Resources Board, or their designee.

* * * *

"All-Terrain Vehicle" (ATV) Class I" means any motorized off-highway vehicle ~~50 inches (1270 mm) or less in overall width, with an unladen dry weight of 606 pounds (275 kg) or less,~~ that has all of the following features and characteristics: designed to travel on four or more low pressure tires, having a seat designed to be straddled by the operator and handlebars for steering control, ~~and~~ intended for use by a single operator and no passengers~~. The vehicle is designed to carry not more than 350 pounds (160 kg) payload, excluding the operator~~, and is powered by an internal combustion engine. ~~Width and unladen weight shall be exclusive of accessories and optional equipment.~~ A golf cart is not, for purposes of this regulation, to be classified as an all-terrain vehicle.

ADD:
"All-Terrain Vehicle (ATV) Class II" means a motorized off-highway vehicle possessing the same features and characteristics as Class I ATVs, but having straddle seating for one operator and one passenger.

ADD:
(C) "All-Terrain Vehicle (ATV) Class III" means any off-highway motor vehicle that has all of the following features and characteristics: designed to travel on four or more wheels, having bench or bucket seating for two or more persons, designed for operation over rough terrain, having either a rear payload 350 pounds or more or seating for six or more passengers, having an engine displacement less than or equal to one liter, having a maximum brake power less than or equal to 30 kilowatts, and is capable of speeds over 25 miles per hour.

"Certificate of Conformity" means an Executive Order.

"Certification" means certification as defined in Section 39018 of the Health and Safety Code.

* * * *

"EPA Enforcement Officer" DELETE,
REPLACE WITH:
"EPA Enforcement Officer" means an "ARB Enforcement Officer" which means any employee of the Air Resources Board so designated in writing by the Executive Officer of the Air Resources Board or by the Executive Officer's designee.

* * * *

"Executive Order" means an order issued by the Executive Officer of the Air Resources Board certifying engines for sale in California.

"Exhaust Emissions" DELETE,
REPLACE WITH:
"Exhaust Emissions" means substances emitted to the atmosphere from any opening

downstream from the exhaust port of an off-highway recreational vehicle.

* * * *

ADD:

"Golf Cart" means a vehicle used to convey equipment and no more than two persons, including the driver, to play the game of golf in an area designated as a golf course. Golf carts are designed to have an unladen weight of less than 1,300 pounds and carry not more than 100 pounds, excluding passengers, accessories and optional equipment. A golf cart is not used for grounds keeping or maintenance purposes.

* * * *

"Motorcycle" DELETE,
REPLACE WITH:
"Motorcycle" means Off-Road Motorcycle, All-Terrain Vehicle, and Engines used in such vehicles.

* * * *

ADD:
"Off-Highway Recreational Vehicle Engines" or "Engines" are identified as: two-stroke or four-stroke, air-cooled, liquid-cooled, gasoline, diesel, or alternate-fuel powered engines or electric motors that are designed for powering off-road recreational vehicles and engines included in~~, but not limited to use in,~~ the following: off-road motorcycles, all-terrain vehicles, and golf carts. All engines and equipment that fall within the scope of the preemption of Section 209(e)(1)(A) of the Federal Clean Air Act, as amended, and as defined by regulation of the Environmental Protection Agency, are specifically not included within this category.

"Off-Road Equipment and Vehicle" means any non-stationary device, powered by an internal combustion engine or electric motor, used primarily off the highways, to propel, move, or draw persons or property including any device propelled, moved, or drawn exclusively by human power, and used in, but not limited to the following applications: Marine Vessels, Construction/Farm Equipment, Locomotives, Utility engines and Lawn and Garden Equipment, Off-Road Motorcycles, and Off-Highway Vehicles.

"Off-Road Motorcycle" means any two or three wheeled vehicle equipped with an internal combustion engine and weighing less than 1,499 pounds. An off-road motorcycle is primarily designed for use off highways. These vehicles are mainly used for recreational riding on dirt trails but are not limited to this purpose.

* * * *

"Total Test Distance" DELETE,
REPLACE WITH:
"Total Test Distance" is defined as the appropriate distance the vehicle should be driven to stabilize the emission characteristics of the engine. The manufacturer shall determine the appropriate distance.

ADD:
"Ultimate Purchaser" means the first person who in good faith purchases or leases a new engine, vehicle, or piece of equipment for purposes other than resale.

* * * *

"Useful life" DELETE,
REPLACE WITH:
"Useful life" is defined as follows:

ENGINE DISPLACEMENT (in cubic centimeters)	USEFUL LIFE (in years and Kilometers)
0 to less than 170	5 years or 10,000 km
170 to less than 280	5 years or 10,000 km
280 or greater	5 years or 10,000 km

* * * *

ADD:
"Vehicle Identification Number (VIN)" means an alpha numeric code which has been permanently assigned by the manufacturer to a vehicle. The VIN is unique to each vehicle and may contain information deemed necessary by governing agencies. Unless otherwise noted, the VIN will follow formats specified in the Code of Federal Regulations 49, Chapter V, Parts 565, 566, and 571, section 571.115 – Vehicle Identification Number – Content Requirements.

86.403-78 Abbreviations.

ARB- California Air Resources Board.
* * * *
Bhp- Brake-horsepower.
Bhp-hr- Brake horsepower-hour.
* * * *
Hp- Horsepower.
* * * *
PM- Particulate Matter
* * * *

86.404-78 Section Numbering

* * * *

86.405-78 Measurement system.

* * * *

86.406-78 Introduction, structure of subpart, further information.

DELETE

86.407-78 Certificate of conformity required.

DELETE,
REPLACE WITH:
Every new off-road motorcycle, all-terrain vehicle, golf cart, and engines used in such vehicles produced for sale, lease, or use, or introduced into commerce in California which is subject to any of the standards prescribed in this subpart is required to be covered by an executive order issued pursuant to this subpart.

86.408-78 General Standards; Increase in Emissions; Unsafe Conditions.

(a) DELETE, "Any system installed on or incorporated in a new motorcycle to enable such vehicle to conform to standards imposed by this subpart:"

REPLACE WITH:
"Any system installed on or incorporated in a new off-road motorcycle, all-terrain vehicle, golf cart or engines used in such vehicles to enable such vehicles to conform to standards imposed by this subpart:"

(b) DELETE,
REPLACE WITH:
(b) Every manufacturer of new off-road motorcycles, all-terrain vehicles, and engines used in such vehicles, which subject to any of the standards imposed by this subpart shall test or cause to be tested off-road motorcycles, all-terrain vehicles, and engines used in such vehicles, in accordance with good engineering practice to ascertain that such test vehicles will meet the requirements of this section for the useful life of the vehicle.

86.409-78 Defeat Devices, Prohibition.

(a) motorcycle DELETE,
REPLACE WITH:
"off-road motorcycle, all-terrain vehicle, golf cart, or engine used in such vehicles,"

* * * *

86.410-90 Emission standards for 1990 and later model year motorcycles. 54 FR 14539, Apr. 11, 1989

(a) DELETE,
REPLACE WITH:
(a)(1) Exhaust emissions from 1997 and later off-road motorcycles and all-terrain vehicles (Class I and Class II) with engines greater than 90 cc must not exceed:

(~~i~~i) Hydrocarbons. 1.2 grams per vehicle kilometer. Compliance is based on a manufacturer's corporate average basis, as provided in (b) below.
(ii) Carbon Monoxide. 15.0 grams per vehicle kilometer.

(2) Exhaust emissions from 1999 and later off-road motorcycles and all-terrain vehicles (Class I and Class II) with engines 90 cc or less must not exceed:

(~~i~~i) Hydrocarbons. 1.2 grams per vehicle kilometer. Compliance is based on a manufacturer's corporate average basis, as provided in (b) below.
(ii) Carbon Monoxide. 15.0 grams per vehicle kilometer.

(3) Exhaust emissions from 2007 and later all-terrain vehicles (Class III) must not exceed:
(i) Hydrocarbons plus oxides of nitrogen. 12.0 grams per kilowatt-hour. Compliance is based on a manufacturer's corporate average basis, as provided in (b) below.
(ii) Carbon Monoxide. 400 grams per kilowatt-hour.

(~~3~~4) The standards set forth in paragraphs (a)(1) and (a)(2) of this section refer to the exhaust emitted over driving schedules as set forth in subpart F and measured and calculated in accordance with those procedures.

(b) DELETE,
REPLACE WITH:
(b) Compliance with a standards to be applied as a "corporate average" shall be determined as follows:

$$\frac{\sum_{j=1}^{n}(PROD)_{jx}(STD)_{jx}}{\sum_{j=1}^{n}(PROD)_{jx}} = STD_{ca}$$

n = Off-road motorcycle and all-terrain vehicle engine families.

$PROD_{jx}$= Number of units in engine family j produced for sale in California in model year x.

STD_{jx} = The manufacturer designated HC exhaust emission standard for engine family j in model year x, which shall be determined by the manufacturer subject to the following conditions: (1) no individual engine family exhaust emission standard shall exceed 2.5 g/km, and (2) no engine family designation or engine family exhaust emission standard shall be amended in a model year after the engine family is certified for the model year, and (3) prior to sale or offering for sale in California, each engine family shall be certified in accordance with these test procedures, and shall be required to meet the manufacturer's designated HC exhaust emission standard as a condition of the certification Executive Order. Prior to certification the manufacturer shall also submit estimated production volumes for each engine family to be offered for sale in California.

STD_{ca} = A manufacturer's corporate average HC exhaust emissions from those California off-road motorcycles and all-terrain vehicles subject to the California corporate average HC exhaust emissions standard, as established by an Executive Order certifying the California production for the model year. This order must be obtained prior to the issuance of certification Executive Orders for individual engine families for the model year and shall include but not be limited to the following requirements:

(1) During the manufacturer's production year, for each vehicle produced for sale in California, the manufacturer must provide the following information to the Executive Officer within 30 days after the last day in each calendar quarter:

(~~i~~i) vehicle identification numbers and an explanation of the identification code if applicable;

(ii) model number and engine size of vehicle;

(iii) the total number of vehicles marketed and produced for sale in California and their applicable designated emissions standards;

(2) The manufacturer's average HC exhaust emissions shall meet the corporate average standard at the end of the manufacturer's production for the model year.

(3) Production and sale of vehicles which result in noncompliance with the California standard for the model year shall cause a manufacturer to be subject to civil penalties, according to applicable provisions of the Health and Safety Code. All excess emissions

resulting from non-compliance with the California standard shall be made up in the following model year.

(4) For a period of up to one year following the end of the model year, for each model the manufacturer shall submit California sales and registration data as it becomes available.

ADD:

(c) As an option to the standards set forth in section (a)(1) above, exhaust emissions from 1997 and later all-terrain vehicle engines must not exceed the equivalent to the off-road motorcycle and all-terrain vehicle standard using the test procedures set forth in "California Exhaust Emission Standards and Test Procedures for 1995 ~~and Later~~ 2004 Small Off-Road Engines", adopted March 20, 1992, and last amended ~~March 26, 1998~~ July 26, 2004, which is hereby incorporated by reference herein. Compliance with the optional HC standard is based on a manufacturer's corporate average basis, as provided in (b) above.

(d)(1) Emissions from 1997 and later model year golf carts operating in federal ozone non-attainment areas of California must not exceed zero grams hydrocarbon, carbon monoxide, oxides of nitrogen, and particulate matter.

(2) These vehicles must be certified by the Executive Officer pursuant to all applicable regulations set forth in CCR, Title 13, Chapter 9. Emission test procedures are not applicable to these vehicles.

(3) On or after January 1, 1997, manufacturers must not produce for sale in federal ozone non-attainment areas of California new nonzero emission engines for use in golf carts.

(e)(1) As an option to the standards set forth in section (a) above, off-road motorcycles and ATVs, and engines used in such vehicles, that do not meet the emissions standards in section (a) may operate only during certain periods at certain off-highway vehicle (OHV) riding areas. CCR, Title 13, Chapter 9, Article 3, Section 2415 lists these California OHV riding areas and their associated riding seasons for off-highway recreational vehicles that are subject to use restrictions.

(2) These vehicles must be certified by the Executive Officer pursuant to all applicable regulations set forth in CCR, Title 13, Chapter 9. Emission testing is not applicable to these vehicles.

(f) No crankcase emissions shall be discharged into the ambient atmosphere from 1997 and later off-road motorcycles, all-terrain vehicles, golf carts, or engines used in such vehicles.

(g) The Executive Officer may find that any off-road motorcycles, all-terrain vehicles, or engines used in such vehicles certified to comply with California emission standards

and test procedures for on-road or other off-road applications are in compliance with these regulations.

86.411 - 78 Maintenance instructions, vehicle purchaser.

(a) "motorcycle" DELETE,
REPLACE WITH:
"off-road motorcycle, all-terrain vehicle, golf cart, and engines used in such vehicles"

* * * *

86.412 - 78 Maintenance instructions, submission to Administrator.

* * * *

(a)(1) DELETE,
REPLACE WITH:
(a)(1) The manufacturer must provide to the Executive Officer, at least 30 days before being supplied to the ultimate purchaser (unless the Executive Officer consents to a lesser period of time), a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser. The instructions must include the periodic and anticipated maintenance contained in the applications for certification or contained in the manufacturers' records. Such instructions must be reasonable and necessary to assure the proper functioning of the vehicle's emission control systems.

* * * *

b) "motorcycle" DELETE,
REPLACE WITH:
"off-road motorcycle, all-terrain vehicle, golf cart, and engines used in such vehicles"

* * * *

86.413 - 78 Labeling. 42 FR 56737, Oct. 28, 1977

(a) DELETE,
REPLACE WITH:
(a) All 1997 and later model year off-road motorcycles, all-terrain vehicles, and engines used in such vehicles, except those certified according to 86.410-90(e), have California labeling requirements which shall be consistent with (a) these test procedures, and (b) Title 13, California Code of Regulations, Chapter 9, Section 2413 ~~and the incorporated "California Motor Vehicle Emission Control and Smog Index Label Specifications", adopted March 1, 1978, as last amended June 24, 1996 (as corrected September 20, 1996), which are incorporated herein by~~

~~reference~~.

(b) DELETE

86.414 - 78 Submission of vehicle identification number.

(a) DELETE,
REPLACE WITH:

(a) Upon the request by the Executive Officer, the manufacturer of any off-road motorcycle or all-terrain vehicle shall, within 30 days, identify by vehicle identification number, the vehicle(s) covered by the executive order.

(b) DELETE,
REPLACE WITH:
(b)(1) The manufacturer of any off-road motorcycle or all-terrain vehicle certified under an Executive Order shall furnish to the Executive Officer, at the beginning of each model year, its vehicle identification-number (VIN) coding system description which identifies such vehicle(s) as covered by the Executive Order.

(b)(2) The (VIN) shall be consistent with the Code of Federal Regulations 49, Chapter V, Parts 565, 566, and 571, section 571.115 – Vehicle Identification Number – Content Requirements, which are incorporated herein by reference, except as noted below.

(b)(3) Manufacturers shall identify all California certified off-road motorcycles and all-terrain vehicles meeting the emission standards in 86.410-90(a) by using any letter or digit other than the letter "C" or the digit "3" in the eighth character of the VIN.

(b)(4) Manufacturers shall exclusively reserve all letters and digits other than the letter "C" or the digit "3" for use in the eighth character of the VIN of California certified off-road motorcycles and all-terrain vehicles meeting the emission standards in 86.410-90(a).

(b)(5) Manufacturers shall use either the letter "C" or the digit "3" for use in the eighth character of the VIN of California off-road motorcycles and all-terrain vehicles meeting the requirements in 86.410-90(e).

(b)(6)In lieu of (b)(3) and (b)(4) above, manufacturers may, at their option, agree to identify off-road motorcycles and all-terrain vehicles that do not meet the emission standards in 86.410-90(a), and do not meet the requirements in 86.410-90(e), and are offered for sale in California, by using the letter "C" or the digit "3" in the eighth character of the VIN.

86.415 - 78 Production vehicles. 49 FR 48138, Dec. 10, 1984.

* * * *

86.416 - 80 Application for certification. 49 FR 48138, Dec. 10, 1984.

(a) DELETE, "New motorcycles produced by a manufacturer whose projected sales in the United States is 10,000 or more units (for the model year in which certification if sought) are covered by the following:"

REPLACE WITH:
"New off-road motorcycles, all-terrain vehicles, and engines used in such vehicles are covered by the following:"

* * * *

(iii) DELETE,
REPLACE WITH:
(iii) Projected California sales data sufficient to enable the Executive Officer to select a test fleet representative of the vehicles for which certification is requested.

* * * *

(b) DELETE,
REPLACE WITH:
(b) For new 1997 and subsequent model golf carts and off-road motorcycles and all-terrain vehicles meeting the requirements of 86.410-90(e) ["the vehicle(s)"], the certification application shall include the following, as applicable:

(1) Identification and description of the vehicle(s) covered by the application.

(2) Identification of the curb weight and gross vehicle weight rating of the vehicle.

(3) Identification and description of the propulsion system for the vehicle (golf carts only).

(4) Projected number of vehicles produced and delivered for sale or use in California, and projected California sales.

(5) All information necessary for proper and safe operation and maintenance of the vehicle, including recharging information (golf carts only), and other relevant information as determined by the Executive Officer.

(6) A copy of the owner's manual must be submitted during certification for approval by the Executive Officer. The manual must include the information as required by subsections (1), (2), (3), and (5) above.

(c) DELETE,
REPLACE WITH:
(c)(1) Manufacturers of off-road motorcycles, all-terrain vehicles, and engines used in such vehicles must submit to the Executive Officer the number of vehicles, and engines used in such vehicles, marketed and produced for sale in California.

(2) Such data must be submitted on a quarterly basis for all such vehicles and engines identified in the preceding paragraph that have been produced for sale in California on or after January 1, 1997. In addition to the data required under paragraph (c)(1), manufacturers must also provide the model number and VIN of each vehicle or engine sold for use in California and the number sold for use in California for each model. These data must be provided to the Executive Officer within 30 days after the last day in each calendar quarter.

* * * *

86.417 - 78 Approval of application for certification.

* * * *

86.418 - 78 Test fleet selection.

(a) DELETE,
REPLACE WITH:
Test fleet selection and requirements on test vehicles are found in 86.419 to 86.423.

86.419 - 78 Engine displacement, motorcycle classes.

* * * *

(b)(1) DELETE,
REPLACE WITH:
(b)(1) Class I - 0 to 169 cc displacement (0 to 10.4 cu. in.).

* * * *

86.420 - 78 Engine families. 44 FR 48205, Aug. 17, 1979.

* * * *

86.421 - 78 Test fleet.

* * * *

(b) DELETE

* * * *

86.422 - 78 Administrator's fleet.

* * * *

86.423 - 78 Test vehicles. 49 FR 48138, Dec. 10, 1984.

(a)(1) DELETE,
REPLACE WITH:
(a)(1) The manufacturer may perform a zero-kilometer exhaust emission test.

* * * *

(a)(3) DELETE

* * * *

86.425 - 78 Test procedures.

(a) DELETE,
REPLACE WITH:
(a) Off-road motorcycle and all-terrain vehicle emission test procedures are found in Subpart F. All-terrain vehicles shall be tested on the Class I cycle, regardless of the engine displacement. With prior approval by the Executive Officer, manufacturers of all-terrain vehicles (Class I and Class II) may use the emission test procedures incorporated in California Code of Regulations, Title 13, Sections 2403 to certify their vehicles. Manufacturers of Class III all-terrain vehicles must use the emission test procedures of Section 2403. The Executive Officer shall grant approval to those manufacturers who provide information and test results showing the appropriate emission standards on the small off-road engine test cycle that are equivalent to the all-terrain vehicle emission standards set forth in 86.410-90(a)(1). The Executive Officer shall consider data submitted by the manufacturer from engines similar to the engine to be certified. This data will include, but not be limited to, the engine size, performance, operating characteristics, and technology used. The data should be statistically valid in order to set the complying emissions standard applicable for the engine family to be certified on the small off-road engine test cycle.

* * * *

86.426 - 78 Service accumulation. 42 FR 56737, Oct. 28, 1977.

DELETE,
REPLACE WITH:
Manufacturers shall determine the appropriate service accumulation for their vehicles.

86.427 - 78 Emission tests. 49 FR 48139, Dec. 10, 1984.

(a)(1) DELETE,
REPLACE WITH:
(a)(1) Each test vehicle shall be driven with all emission control systems installed and operating for a period of time as deemed appropriate by the manufacturer to stabilize the emission characteristics of the engine.

* * * *

(b) DELETE,
REPLACE WITH:
(b) All vehicles shall undergo at least two emission tests at intervals specified by the manufacturer. Additional tests may be performed at the manufacturer's option.

(c) DELETE

(d) DELETE

(e) DELETE

* * * *

86.428 - 80 Maintenance, scheduled; test vehicles.

DELETE,
REPLACE WITH:
Periodic maintenance on the engine, emission control system, and fuel system of test vehicles shall be scheduled for the same intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser.

86.429 - 78 Maintenance, unscheduled; test vehicles.

* * * *

86.430-78 Vehicle failure. 49 FR 48139, Dec. 10, 1984.

* * * *

86.431 - 78 Data submission. 49 FR 48139, Dec. 10, 1984.

(a) DELETE,
REPLACE WITH:
(a) Data from all tests (including voided tests) performed by a manufacturer shall be included in the applications.

* * * *

86.432 - 78 Deterioration factor. 49 FR 48139, Dec. 10, 1984.

(a) DELETE,
REPLACE WITH:
(a) The manufacturer shall determine the appropriate deterioration factors.

* * * *

(c) DELETE,
REPLACE WITH:
(c) Manufacturers shall determine the appropriate deterioration factor for the designated useful life.

(d) DELETE

* * * *

(f) DELETE

86.434 - 78 Testing by the Administrator. 49 FR 48139, Dec. 10, 1984.

(a) DELETE,
REPLACE WITH:
(a) At the conclusion of certification testing by manufacturers, the ARB may require confirmatory testing. The ARB will designate where such testing shall be performed.

* * * *

86.435 - 78 Extrapolated emission values. 49 FR 48139, Dec. 10, 1984.

DELETE

86.436 - 78 Additional service accumulation. 49 FR 48139, Dec. 10, 1984.

DELETE

86.437 - 78 Certification. 47 FR 49807, Nov. 2, 1982.

(a) DELETE, "New motorcycles produced by a manufacturer whose projected sales in the United States is 10,000 or more units (for the model year in which certification is sought) are covered by the following:"

REPLACE WITH:
"Manufacturers of new off-road motorcycles and all-terrain vehicles produced on or after January 1, 1997, shall submit to the Executive Officer a statement that the test vehicles, for which data are submitted, have been tested, and conform to the requirements of the regulations to their designated useful life."

* * * *

(b) DELETE

86.438 - 78 Amendments to the application.

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86.439 - 78 Alternative procedure for notification of additions and changes. 49 FR 48139, Dec. 10, 1984.

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86.440 - 78 Maintenance of records. 49 FR 48140, Dec. 10, 1984.

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86.441 - 78 Right of entry.

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86.442 - 78 Denial, revocation, or suspension of certification. 42 FR 56738, Oct. 28, 1977.

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86.443 - 78 Request for hearing.

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86.444 - 78 Hearings on certification.

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Subpart F -- Emission Regulations for 1978 and Later New Motorcycles; Test Procedures

SOURCE: 42 FR 1137, Jan. 5, 1977, unless otherwise noted.

86.501 - 78 Applicability.

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86.502 - 78 Definitions.

* * * *

86.503 - 78 Abbreviations.
DELETE,
REPLACE WITH:
The abbreviations in 86.403-78 apply to this subpart, with the following additions:

ARB-	California Air Resources Board.
Bhp-	Brake-horsepower.
Bhp-hr-	Brake horsepower-hour.
Hp-	Horsepower.
PM-	Particulate Matter.

86.504 - 78 Section numbering.

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86.505 - 78 Introduction; structure of subpart.

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86.508 - 78 Dynamometer. 42 FR 56738, Oct. 28, 1977.

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86.509 - 90 Exhaust gas sampling system. 54 FR 14539, Apr. 11, 1989.

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86.511 - 90 Exhaust gas analytical system. 54 FR 14539, Apr. 11, 1989.

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86.513 - 90 Fuel and engine lubricant specifications. 54 FR 14544, Apr. 11, 1989.

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86.514 - 78 Analytical gases.

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86.515 - 78 EPA Urban Dynamometer Driving Schedule.

* * * *

86.516 - 90 Calibrations, frequency and overview. 54 FR 14546, Apr. 11, 1989.

* * * *

86.518 - 78 Dynamometer calibration.

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86.519 - 90 Constant volume sampler calibration. 54 FR 14546, Apr. 11, 1989.

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86.521 - 90 Hydrocarbon analyzer calibration. 54 FR 14546, Apr. 11, 1989.

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86.522 - 78 Carbon monoxide analyzer calibration.

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86.523 - 78 Oxides of nitrogen analyzer calibration. 52 FR 47870, Dec. 16, 1987.

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86.524 - 78 Carbon dioxide analyzer calibration.

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86.526 - 90 Calibration of other equipment. 54 FR 14551, Apr. 11, 1989.

* * * *

86.527 - 90 Test procedures, overview. 54 FR 14551, Apr. 11, 1989.

* * * *

86.528 - 78 Transmissions.

* * * *

86.529 - 78 Road load force and inertia weight determination.

* * * *

86.530 - 78 Test sequence, general requirements.

* * * *

86.531 - 78 Vehicle preparation.

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86.532 - 78 Vehicle preconditioning.

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86.535 - 90 Dynamometer procedure. 54 FR 14551, Apr. 11, 1989.

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86.536 - 78 Engine starting and restarting.

* * * *

86.537 - 90 Dynamometer test runs. 54 FR 14551, Apr. 11, 1989.

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86.540 - 90 Exhaust sample analysis. 54 FR 14551, Apr. 11, 1989.

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86.542 - 90 Records required. 54 FR 14551, Apr. 11, 1989.

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86.544 - 90 Calculations; exhaust emissions. 54 FR 14553, Apr. 11, 1989.

The following provisions of Subparts B, C, F, and I, Part 1051, Title 40, Code of Federal Regulations, as adopted or amended by the U. S. Environmental Protection Agency on the date listed are adopted and incorporated herein by this reference as the California Exhaust Emission Standards and Test Procedures for 1997 and Later Off-Highway recreational vehicles and engines. The following modifications generally substitute California references for federal references, but do not change any standard, implementation, or test procedure related to the evaporative control requirements found in the incorporated subparts of the federal regulation.

PART 1051, CONTROL OF EMISSIONS FROM RECREATIONAL ENGINES AND VEHICLES

Subpart B, Emission Standards and Related Requirements

SOURCE: 70 FR 40487, July 13, 2005, unless otherwise noted.

1051.101 What emission standards and other requirements must my vehicles meet?
DELETE.

1051.103 What are the exhaust emission standards for snowmobiles?
DELETE.

1051.105 What are the exhaust emission standards for off-highway motorcycles?
DELETE.

1051.107 What are the exhaust emission standards for all-terrain vehicles (ATVs) and offroad utility vehicles?
DELETE.

1051.110 What evaporative emission standards must my vehicles meet?

DELETE Introductory Text,
REPLACE WITH:
Your new vehicles must meet the emission standards of this section over their full useful life. Note that section 1051.245 of these test procedures allows you to use design-based certification instead of generating new emission data.

(a) DELETE
REPLACE WITH:
(a) Beginning with the 2008 model year, permeation emissions from your vehicle's fuel tank(s) may not exceed 1.5 grams per square-meter per day when measured with the test procedures for tank permeation in subpart F of this part of these test procedures. You may generate or use emission credits under the averaging, banking, and trading (ABT)

program, as described in Subpart H, Part 1051, Title 40, Code of Federal Regulations.

* * * *

1051.115 What other requirements must my vehicles meet?
DELETE.

1051.120 What emission-related warranty requirements apply to me?
DELETE.

1051.125 What maintenance instructions must I give to buyers?
DELETE.

1051.130 What installation instructions must I give to vehicle manufacturers?
DELETE.

1051.135 How must I label and identify the vehicles I produce?
DELETE.

1051.137 What are the consumer labeling requirements?
DELETE.

1051.145 What provisions apply only for a limited time?
DELETE.

Subpart C, Certifying Engine Families

SOURCE: 70 FR 40492, July 13, 2005, unless otherwise noted.

1051.201 What are the general requirements for obtaining a certificate of conformity?
DELETE.

1051.205 What must I include in my application?
DELETE.

1051.210 May I get preliminary approval before I complete my application?
DELETE.

1051.220 How do I amend the maintenance instructions in my application?
DELETE.

1051.225 How do I amend my application for certification to include new or modified vehicles or to change an FEL?
DELETE.

1051.230 How do I select engine families?
DELETE.

1051.235 What emission testing must I perform for my application for a certificate of conformity?
DELETE.

1051.240 How do I demonstrate that my engine family complies with exhaust emission standards?
DELETE.

1051.243 How do I determine deterioration factors from exhaust durability testing?
DELETE:

1051.245 How do I demonstrate that my engine family complies with evaporative emission standards?

(a) DELETE,
REPLACE WITH:
(a) For purposes of certification, your engine family is considered in compliance with the evaporative emission standards in subpart B of these test procedures and 2412(b), Title 13, California Code of Regulations (CCR), if you do either of the following:

(a)(1) DELETE,
REPLACE WITH:
(a)(1) You have test results showing permeation emission levels from the fuel tanks and fuel lines in the family are at or below the evaporative standards in section 1051.110 of these test procedures and section 2412(b), Title 13, CCR, throughout the useful life.

* * * *

(c) DELETE,
REPLACE WITH:
(c) To compare emission levels with the emission standards, apply deterioration factors to the measured emission levels. For permeation emissions, use the following procedures to establish an additive deterioration factor. An additive deterioration factor for a pollutant is the difference between emissions at the end of the useful life and emissions at the low-hour test point. In these cases, adjust the official emission results for each tested vehicle or engine at the selected test point by adding the factor to the measured emissions. If the factor is less than zero, use zero. Additive deterioration factors must be specified to one more decimal place than the applicable standard:

(1) Section 1051.515 of these test procedures specifies how to test your fuel tanks to develop deterioration factors. Small-volume manufacturers may use assigned deterioration

factors that we establish. Apply the deterioration factors as follows:

(i) Calculate the deterioration factor from emission tests performed before and after the durability tests as described in sections 1051.515(c) and (d) of these test procedures, using good engineering judgment. The durability tests described in section 1051.515(d) of these test procedures represent the minimum requirements for determining a deterioration factor. You may not use a deterioration factor that is less than the difference between evaporative emissions before and after the durability tests as described in sections 1051.515(c) and (d) of these test procedures.

(ii) Do not apply the deterioration factor to test results for tanks that have already undergone these durability tests.

(2) Determine the deterioration factor for fuel lines using good engineering judgment.

* * * *

(e)(1) DELETE.
REPLACE WITH:
(e)(1) For certification to the evaporative standards specified in section 1051.110(a) of these test procedures and section 2412(b), Title 13, CCR, with the control technologies shown in the following table:

* * * *

(e)(2) DELETE.
REPLACE WITH:
(e)(2) For certification to the standards specified in section 1051.110(b) of these test procedures and section 2412(b), Title 13, CCR, with the control technologies shown in the following table:

* * * *

1051.250 What records must I keep and make available to EPA?
DELETE.

1051.255 What decisions may EPA make regarding my certificate of conformity?
DELETE.

Subpart F, Test Procedures

SOURCE: 70 FR 40499, July 13, 2005, unless otherwise noted.

1051.501 What procedures must I use to test my vehicles or engines?

DELETE Introductory Test
(a) DELETE

(b) DELETE

(c) DELETE
REPLACE WITH:
(c) *Permeation testing.* (1) Use the equipment and procedures specified in section 1051.515 of these test procedures to measure fuel tank permeation emissions.

(2) DELETE
REPLACE WITH:
(2) Prior to permeation testing of fuel hose, the hose must be preconditioned by filling the hose with the fuel specified in paragraph (d)(3) of this section, sealing the openings, and soaking the hose for 4 weeks at 23 ±5 °C. To measure fuel-line permeation emissions, use the equipment and procedures specified in SAE J30 (incorporated by reference in section 1051.810 of these test procedures). The measurements must be performed at 23 ±2 °C using the fuel specified in paragraph (d)(3) of this section.

* * * *

(d)(1) DELETE

(d)(2) DELETE
REPLACE WITH:
(d)(2) *Fuel Tank Permeation.* (i) For the preconditioning soak described in section 1051.515(a)(1) of these test procedures and fuel slosh durability test described in section 1051.515(d)(3) of these test procedures, use the fuel specified in Table 1 of section 1065.710, Title 40, Code of Federal Regulations, blended with 10 percent ethanol by volume. As an alternative, you may use Fuel CE10, which is Fuel C as specified in ASTM D 471–98 (incorporated by reference in section 1051.810 of these test procedures) blended with 10 percent ethanol by volume.

(ii) For the permeation measurement test in section 1051.515(b) of these test procedures, use the fuel specified in Table 1 of section 1065.710, Title 40, Code of Federal Regulations. As an alternative, you may use the fuel specified in paragraph (d)(2)(i) of this section.

(d)(3) DELETE
REPLACE WITH:
(d)(3) *Fuel Hose Permeation.* Use the fuel specified in Table 1 of section 1065.710, Title 40, Code of Federal Regulations, blended with 10 percent ethanol by volume for permeation testing of fuel lines. As an alternative, you may use Fuel CE10, which is Fuel C as specified in ASTM D 471–98 (incorporated by reference in section 1051.810 of these test procedures) blended with 10 percent ethanol by volume.

(e) DELETE

* * * *

1051.505 What special provisions apply for testing snowmobiles?
DELETE.

1051.510 What special provisions apply for testing ATV engines? [Reserved]
DELETE.

1051.515 How do I test my fuel tank for permeation emissions?

* * * *

(a)(1) DELETE.
REPLACE WITH:
(a) *Preconditioning fuel soak.* To precondition your fuel tank, follow these five steps:
(1) Fill the tank with the fuel specified in section 1051.501(d)(2)(i) of these test procedures, seal it, and allow it to soak at 28 ±5 °C for 20 weeks. Alternatively, the tank may be soaked for a shorter period of time at a higher temperature if you can show that the hydrocarbon permeation rate has stabilized.

* * * *

(a)(3) DELETE.
REPLACE WITH:
(a)(3) Fill the fuel tank with the test fuel specified in section 1051.501(d)(2)(ii) of these test procedures to its nominal capacity. If you fill the tank inside the temperature-controlled room or enclosure, do not spill any fuel.

* * * *

(b)(7) DELETE.
REPLACE WITH:
(b)(7) At the end of the soak period, weigh the sealed fuel tank and record the weight to the nearest 0.1 grams. You may use less precise weights as long as the difference in mass from the start of the test to the end of the test has at least three significant figures. Unless

the same fuel is used in the preconditioning fuel soak and the permeation test run, record weight measurements on five separate days per week of testing. The test is void if a linear plot of tank weight vs. test days for the full soak period for permeation testing specified in paragraph (b)(5) of this section yields a coefficient of determination (r^2) below 0.8. The coefficient of determination (r^2) is calculated per the following equation:

$$r_y^2 = 1 - \frac{\sum_{i=1}^{N}\left[y_i - a_{0y} - \left(a_{1y} \cdot y_{refi}\right)\right]^2}{\sum_{i=1}^{N}\left[y_i - \bar{y}\right]^2}$$

In this equation, "N" denotes sample size, "i" denotes an index, "y" denotes a generic measured quantity, the superscript over-bar "¯" denotes an arithmetic mean, and the subscript "ref" denotes the reference quantity being measured.

* * * *

(c) DELETE.
REPLACE WITH:
(c) *Determination of final test result.* To determine the final test result, apply a deterioration factor to the measured emission level. The deterioration factor is the difference between permeation emissions measured before and after the durability testing described in paragraph (d) of this section. Adjust the baseline test results for each tested fuel tank by adding the deterioration factor to the measured emissions. The deterioration factor determination must be based on good engineering judgment. Therefore, during the durability testing, the test tank may not exceed the fuel tank permeation standard described in section 2412(b), Title 13, CCR, (this is known as "line-crossing"). If the deterioration factor is less than zero, use zero.

* * * *

(d)(3) DELETE.
REPLACE WITH:
(d)(3) *Slosh testing.* Perform a slosh test by filling the tank to 40 percent of its capacity with the fuel specified in section 1051.501(d)(2)(i) of these test procedures and rocking it at a rate of 15 cycles per minute until you reach one million total cycles. Use an angle deviation of +15° to −15° from level. This test must be performed at a temperature of 28 °C ±5 °C.

* * * *

1051.520 How do I perform exhaust durability testing?
DELETE.

Subpart I, Definitions and Other Reference Information

SOURCE: 70 FR 40507, July 13, 2005, unless otherwise noted.

1051.801 What definitions apply to this part?

DELETE ALL DEFINITIONS:

ADD:
The definitions in the California Health and Safety Code and in Title 13, CCR, § 2421, shall apply.

ADD:
The definitions in Part 86.402-78 of these test procedures shall apply and shall take precedent in the event of conflict.

ADD:
Act means California Health and Safety Code, Division 26, and corresponding regulations, except where the context indicates otherwise.

ADD:
Clean Air Act means California Health and Safety Code, Division 26, and corresponding regulations, except where the context indicates otherwise.

ADD:
Designated Compliance Officer means the Executive Officer of the Air Resources Board (or the Executive Officer's designee).

ADD:
Designated Enforcement Officer means the Executive Officer of the Air Resources Board (or the Executive Officer's designee).

ADD:
EPA or U.S. EPA means Air Resources Board.

ADD:
We (us, our) means the Executive Officer of the California Air Resources Board and any authorized representatives.

ADD:
You means, within the context of its usage, the target entity to which the regulatory provision applies. This is typically the engine manufacturer, but may occasionally refer to the equipment manufacturer or other entity as specified.

1051.805 What symbols, acronyms, and abbreviations does this part use?
DELETE.

1051.810 What materials does this part reference?

DELETE Introductory Text

* * * *

Table 2 Row 2 "SAE J1930, Electrical/Electronic Systems 1051.135 Diagnostic Terms, Definitions, Abbreviations, and Acronyms, May 1998....."
DELETE.

1051.815 What provisions apply to confidential information?
DELETE.

1051.820 How do I request a hearing?
DELETE.