PORT OF OAKLAND

Maritime Air Quality Improvement Plan (MAQIP)

October 2008

FINAL

FOREWORD

This Maritime Air Quality Improvement Plan (MAQIP) provides a master plan for the Port's long-term commitment to reducing the air quality impacts of its maritime operations.

This document embodies the primary obligation of the Port under the Oakland City Charter and as trustee of state tidelands: to ensure the proper management and administration of the Port Area for the purpose of navigation and commerce. As such, the strategies and goals outlined in the MAQIP reflect a careful balance between the needs for sustained economic viability in a competitive business environment and the need for environmental responsibility and justice. The document also describes the past, current and future efforts of the Port to initiate, finance, and monitor its fair share of emissions reductions in our communities.

The MAQIP also reflects the need for cooperative efforts among the Port, regulatory, enforcement and funding agencies, tenants, business stakeholders and the community. As one of many parties in a chain of international and interstate commerce and goods movement that operates across international and federal jurisdictions, the Port alone cannot realize all of the goals expressed in the MAQIP. Only in the spirit of true partnership will these goals be realized.

ACRONYMS AND ABBREVIATIONS

BAAQMD	Bay Area Air Quality Management District
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railroad
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CHE	Cargo Handling Equipment
CIP	Capital Improvement Program
CNG	Compressed Natural Gas
CO	Carbon Monoxide
DOC	Diesel Oxidation Catalyst
DPF	Diesel Particulate Filter
DPM	Diesel Particulate Matter
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
Genset	Generator Set
GHG	Greenhouse Gas
GMAP	Goods Movement Action Plan (CARB)
GMERP	Emission Reduction Plan for Ports and Goods Movement in California (CARB)
HC	Hydrocarbon
IMO	International Maritime Organization
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MAQIP	Maritime Air Quality Improvement Plan
MARPOL	International Convention for the Prevention of Pollution from Ships
µg	Microgram
NEPA	National Environmental Policy Act
NM	Nautical Mile
NO	Nitric Oxide
NOx	Oxides of Nitrogen (consists of NO and NO_2)
NO_2	Nitrogen Dioxide
OGV	Ocean-going Vessel
PM	Particulate Matter
PM10	Particulate matter less than 10 micrometers in aerodynamic diameter
PM2.5	Particulate matter less than 2.5 micrometers in aerodynamic diameter
Port	Port of Oakland
PPB	Parts per billion
PPM	Parts per million
ROG	Reactive Organic Gas (see also VOC)
SO_2	Sulfur Dioxide
SOx	Sulfur Oxide
TEU	Twenty-Foot Equivalent Unit
TOG	Total Organic Gases
UP	Union Pacific Railroad
VOC	Volatile Organic Compound
ULSD	Ultra-low Sulfur Diesel
WOEIP	West Oakland Environmental Indicators Project
WOTRC	West Oakland Toxics Reduction Collaborative

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This report was prepared by Anne Whittington, project manager and principal author, Marucia Britto and Celia McCarthy at the Port, with the assistance of Task Force members who submitted constructive recommendations and guidance. We especially acknowledge Commissioner Margaret Gordon for her leadership and guidance.

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1 INTRODUCTION

The Maritime Air Quality Improvement Plan (MAQIP) was born out of community engagement on behalf of better air quality in West Oakland. As landlord of the largest business in West Oakland, and the largest seaport in the Bay Area, the Port of Oakland (Port) recognized that emissions from maritime seaport-related operations must be controlled to reduce health risks to nearby residents.

Discussions with community groups, regulatory agencies and other interested parties in 2006 led to the formal initiation of the Port's air quality plan and the establishment of the MAQIP Task Force. For much of 2007 and through early 2008, this 35-member group met to create this air quality master plan that sets goals and will guide air quality efforts in the seaport (the Port's maritime area) for years to come, with the goal of reducing health risk from Port operations through emissions reductions. Not everyone agreed with all of the decisions surrounding the plan development or with all of the elements in this master plan. However, every Task Force member contributed to the planning process and to shaping this version of the plan.

The draft MAQIP document was discussed at a MAQIP Task Force meeting on June 19, 2008, and members were asked to provide written comments to be used in revising the plan prior to its approval by the Port of Oakland's Board of Port Commissioners. Some common themes that emerged from the comments are summarized in Section 1.4. Revisions and edits based on the comments are incorporated throughout this final plan.

1.1 Purpose of the Maritime Air Quality Master Plan

The MAQIP is the master plan of air quality goals and policies that covers all seaport-related development and operations at the Port. From the Port's perspective, all development projects must be scoped with an eye to meeting the MAQIP air quality goals. All grant funding opportunities should be reviewed as opportunities to meet the MAQIP goals. All seaport operations should consider opportunities for air quality improvement.

The essential elements of a master plan are included in this document, which:

- describes the current environment,
- reviews the goals and values that should guide Port operations and development,
- presents a vision of the future, and
- outlines how that future will be achieved.

While the MAQIP is a master plan guiding the Port's long-term air quality strategy through 2020, it also includes more detailed components, such as the initiatives, programs and projects, that provide a roadmap for the Port to follow in achieving its 2020 health risk goal. In support of that goal, the focus of the plan is on reducing diesel particulate matter (DPM) because of its link to health risk. Other criteria pollutants are also of concern, including NOx, SOx, ROG and CO, but the emphasis is on DPM. Greenhouse gases (GHG) are not addressed in this version of the plan but will be added in future updates, after GHG emissions have been calculated in an emissions inventory.[1]

[1] Recommendation to add GHG in comments by Diane Bailey, et al., Natural Resources Defense Council (NRDC), July 14, 2008.

Based on the MAQIP goals, the Port is committed to a three-fold emissions reduction strategy:

1. Target emissions reductions earlier than required by regulations ("early actions"),
2. Support enforcement of regulations, and
3. Target emissions reductions above and beyond those required by law.

The Port envisions the MAQIP as a living document, which may be updated and amended over time in response to the results of implementation strategies and to reflect changes in the regulatory, economic and technological context of the seaport operations.

The Port turned to its community, tenant, environmental, business and regulatory stakeholders for guidance in preparing the plan, which:

a) Describes the Port's operations, emissions and past air quality improvement efforts, along with the current and future air quality regulatory settings (Sections 2, 3, 4, 5, and 6);
b) Sets an overall West Oakland community cancer health risk reduction goal related to exposure to DPM emissions from Port operations, including interim emissions reduction goals (Section 7);
c) Outlines specific air pollutant reduction goals (Section 7) and both general and specific strategies to meet those goals (Section 8);
d) Provides a set of screening criteria for prioritizing additional air emission reduction measures that the Port could implement (Section 9);
e) Lists air quality improvement initiatives, along with programs and projects that may help the Port, its maritime tenants and related businesses in reaching the MAQIP early actions and 2020 goals (Section 9);
f) Discusses implementation and monitoring of emissions reduction programs and projects (Sections 10 and 11); and
g) Establishes the next steps for plan implementation and oversight (Section 11).

1.2 Maritime Air Quality Policy Statement

As a first solid step to using the MAQIP to guide the Port's activities, the Board of Port Commissioners approved the Port's Maritime Air Quality Policy Statement on March 18, 2008. The air quality policy sets a goal of an 85% reduction from 2005[2] to 2020 in neighboring community cancer health risks related to exposure to diesel particulate matter emissions from the Port's maritime operations through all practicable and feasible means. Furthermore, the Board stated that the Port, beginning immediately, would implement emissions reduction measures in advance of regulatory deadlines in order to reduce the duration of people's exposure to emissions that may cause health risks ("early actions"). Specific early action commitments include:

- Incentives for replacement or retrofit of older polluting drayage trucks
- Mechanisms for enforcing the prohibition of Port truck parking or operation on neighborhood streets, including truck registration and tracking, and
- Feasible and cost-effective means of reducing ship idling emissions.

In addition to committing the Port to the health risk reduction goal, the Board also committed to adopting funding mechanisms to pay for the Early Action emissions reduction measures.

[2] The baseline data that will be used to measure the Port's progress toward its health risk reduction goal are the "Port of Oakland 2005 Seaport Air Emissions Inventory" (2007, revised 2008) and the California Air Resources Board's "Diesel Particulate Matter Exposure Assessment Study for the West Oakland Community: Preliminary Summary of Results" (March 2008 and subsequent revisions).

Port of Oakland Maritime Air Quality Policy Statement

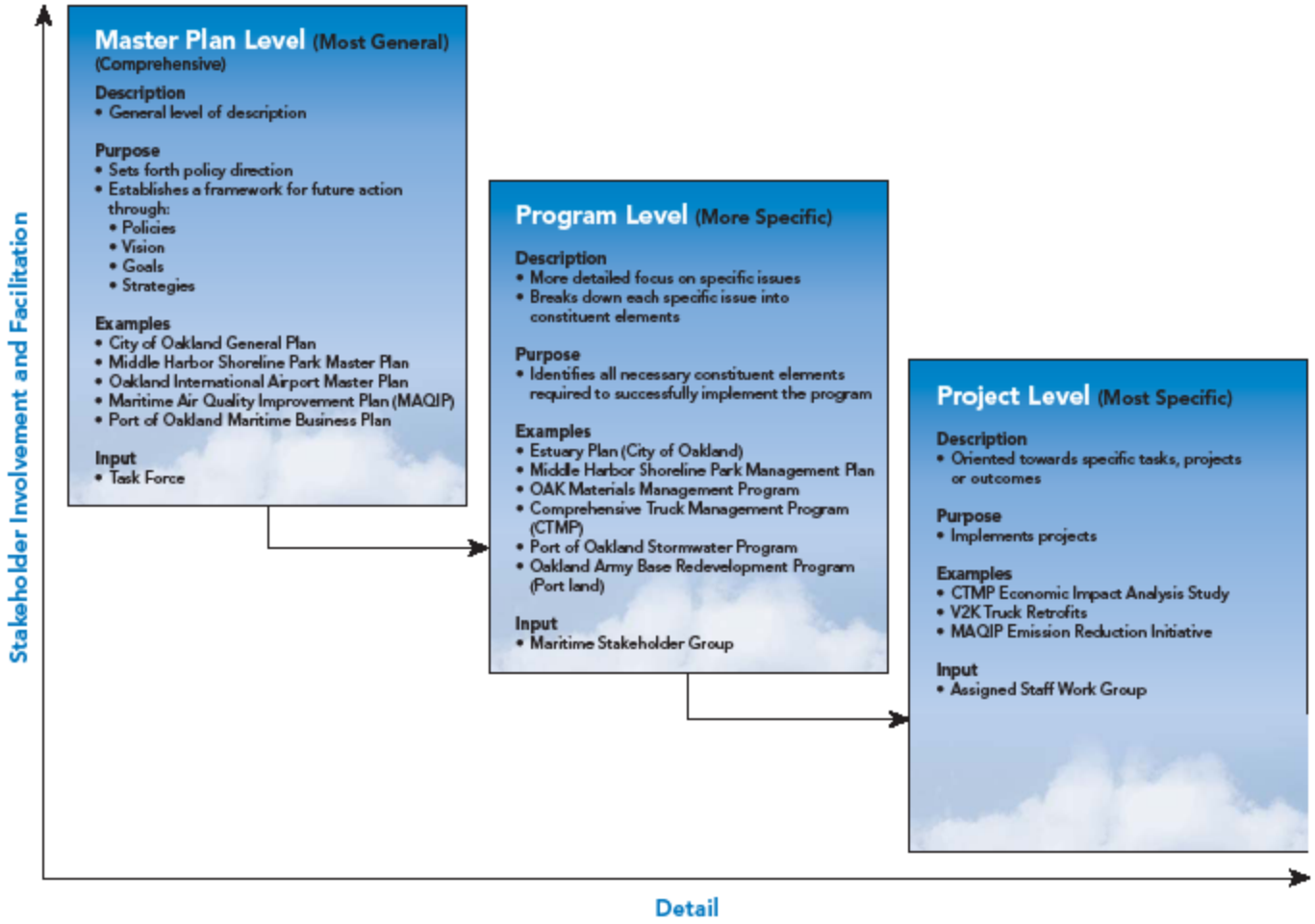
The Board of Port Commissioners affirms that it has the social responsibility to minimize exposure of neighboring residents to air pollution from Port sources and to support the rights of community, local businesses and workers to clean air and fair working conditions. Therefore, the Board is committed to improving air quality, safety and quality of life for neighboring residents and workers by reducing environmental impacts of Port operations, while fulfilling the Port's basic obligations to maximize commerce and to provide economic and job opportunities. To these ends, the Board hereby adopts the following policy principles that shall guide the Port's plans and actions, including the adoption of the Port's Maritime Air Quality Improvement Plan (MAQIP), Comprehensive Truck Management Plan (CTMP) and Early Actions (as defined below).

1. The Port adopts the goal of reducing the health risks to our neighboring communities (expressed as increase in cancer risk) related to exposure of people to diesel particulate matter emissions from Port sources by 85% by the year 2020 through all practicable and feasible means. Reduction will be calculated based on the Port's 2005 Seaport Emissions Inventory baseline.
2. The Board commits to adopting funding mechanisms, including the imposition of fees, to fund air emissions reduction measures. To the maximum extent possible, Port fee revenues shall leverage matching federal, state and private funds. Fees for the purpose of funding the measures shall be evaluated for legality and be enacted to the extent that they do not damage the Port's or its customers' market competitiveness.
3. The Port will implement certain air emissions reduction measures prior to the dates that such measures are required by state or federal regulations, in order to reduce the duration of people's exposure to emissions that may cause health risks ("Early Actions"). The Port shall implement, beginning in 2008, Early Action measures for the purpose of immediately reducing the impacts of Port-serving trucks and other Port operations on West Oakland and surrounding communities. These measures shall include:
    a. incentives for Early Action replacement and/or retrofit of older polluting truck engines,
    b. mechanisms for enforcing the prohibition of Port truck parking or operation on neighborhood streets, including truck registration and tracking, and
    c. feasible and cost-effective means of reducing ship idling emissions.

    In order to fund these Early Action measures, the Board will adopt truck or containers fees and apply for matching state and federal funds.

Adopted on March 18, 2008 by the Board of Port Commissioners of the Port of Oakland by Resolution No. 08057

Figure 1-1: Planning Continuum - Hierarchy of Planning Activities



1.3 Plan Methodology

The Port normally approaches planning through a continuum, starting with a conceptual strategic or master plan that provides a framework for how to achieve the goals delineated in the plan. The next step is to develop the comprehensive programs that manage how the goals will be reached. Finally, the specific projects that contribute to the goal are implemented. As illustrated in Figure 1-1, the MAQIP is at the master plan level, and provides policy direction for the Port's current and future maritime air quality activities.

In addition to following a rational planning methodology, the Port must carefully document both the opportunities and challenges presented by a plan. This analysis is intended to support the plan by articulating both the reasons for undertaking the planning effort (i.e., opportunities) and the potential barriers that the plan could face (i.e., challenges).

1.3.1 Planning Continuum

As the Port pursues solutions to environmental and other planning concerns and issues, it follows a methodology of interrelated steps. This methodology - called the "Planning Continuum" - is oriented towards the achievement of the planning goals.

The Planning Continuum organizes specific planning activities into discrete phases: the master plan phase, the program development phase, and the project implementation phase. Each phase focuses on its own goals and objectives. Careful adherence to the character of each planning phase promotes completion of tasks, efficiency of resource use, and progress towards the next stage of the planning process. Stakeholder involvement is a key component of the Port Planning Continuum, but the nature and focus of stakeholder involvement and facilitation change with each planning phase.

- Stakeholder involvement and facilitation is the highest in the Master Plan phase, since preparation of a comprehensive master plan typically includes soliciting a wide spectrum of viewpoints on a particular issue and developing a set of common goals and principles for the plan. The involvement of trained facilitators during this phase may be very high because stakeholders often hold widely divergent perspectives, and because reconciling those perspectives is frequently painstaking.
- Upon completion of the Master Plan phase, the focus of stakeholder input turns to program design and development. During the program development phase, facilitators may be used to orient stakeholder dialogue towards identifying specific program components and elements.
- Finally, the specific projects that achieve the planning goal are identified and implemented. At the project phase of the Planning Continuum, stakeholder involvement focuses on promoting implementation of projects and on monitoring and reporting activities. Facilitation, if required, is oriented towards constructive feedback and adaptive management activities.

The MAQIP Task Force was convened at the highest Master Plan level to ensure that the voices of all interested stakeholders would be heard throughout preparation of the maritime air quality master plan. An experienced facilitator, CONCUR, Inc., led the Task Force and Port staff through a consultative planning process. Once the Port's Board approves the MAQIP, stakeholder involvement will move to the next phase, the maritime stakeholder group, to ensure that the design of specific programs is consistent with the planning guidance of the MAQIP. Facilitators may assist with periodic review and updates of the plan's initiatives. Finally,

stakeholders will continue their involvement during the project phase through the MAQIP's monitoring and reporting provisions.

1.3.2 Opportunities and Challenges

The benefits to the Port of developing a long-range maritime air quality plan are clear. Setting air quality goals ensures that the air will be cleaner. Developing a strategy and framework to help maritime-related businesses meet or exceed regulatory standards supports their compliance with the regulations. Equally important, community and stakeholder participation in establishing the goals, the plan and its implementation promotes accountability by the Port to accomplish the plan's elements. The challenges of the MAQIP are also clear; regulations adopted by air quality agencies must be feasible and enforceable.

Unambiguous goals provide direction for the organization and for its tenants and customers. With support and policy direction from the Board of Port Commissioners for the MAQIP and its goals, Port staff will place a higher priority on working towards cleaner air in the seaport area. The West Oakland community, including Port staff, will benefit through lower cancer health risk from maritime-related diesel emissions.

Reaching those goals, however, is only possible with strong statewide – and preferably national and international – regulations. This plan counts on the benefits of regulations to reduce emissions to levels close to the MAQIP goals. Therefore, the Port must rely on its agency partners with rule-making authority, especially the California Air Resources Board (CARB), the San Francisco Bay Area Air Quality Management District (BAAQMD) and the U.S. Environmental Protection Agency (EPA), to establish regulations that apply uniformly to the maritime industry. The reality of the economic climate is that cargo customers look for the lowest cost transportation services, and the shipping lines and terminal operators look for the most cost-effective way to provide those services. The more uniformly a regulation is applied throughout a wide geographic region, the less likely air quality improvements will be seen as a competitive concern and financial burden.

Compliance by the maritime industry with adopted and planned regulations has the potential to yield large emissions and risk reductions at the Port's seaport as well as elsewhere in the state. However, full and timely compliance may be difficult since existing and proposed regulations are complex, may be costly to implement, and affect maritime sources and activities well into the future.

This maritime air quality master plan establishes a framework for the programs and projects that will assist the Port's tenants and business partners in meeting the regulatory requirements, with an emphasis on early actions (i.e., meeting standards earlier than required by regulations), on full compliance with the adopted regulations, and on exceeding the requirements to achieve even cleaner air. The monitoring and reporting commitments in this plan allow the Port and its stakeholders to ascertain that programs and projects are undertaken according to guidelines and are achieving the expected emissions reductions.

The Port must rely on the regulatory agencies to ensure that their regulations are feasible: that exhaust retrofits are available and will work without damaging equipment, that the fuel needed to satisfy regulatory requirements is plentiful, that companies providing necessary services will be able to afford new equipment on a reasonable schedule, and that the regulations themselves can stand up to legal scrutiny.

Finally, the Port must rely on the agencies to determine that their regulations are having the anticipated effect. As a landlord port, the Port's jurisdiction is limited to the provision of property and, in some cases, facilities to its tenants. Since seaport activities are not directly controlled by the Port, the full cooperation of the Port's tenants and maritime business partners will be needed to reduce emissions from activities on the San Francisco Bay, in the Port area, and on nearby freeways and thus reduce health risks to West Oakland residents and workers. The Port will ensure that its tariff and leases continue to require compliance with all applicable laws and regulations. Furthermore, the Port will develop funding mechanisms, such as a user fee.

The Port will continue its partnership with tenants, other maritime businesses and regulatory agencies to share information, funding sources, and strategies to support the full regulatory compliance and additional measures that will be needed to achieve the goals of this plan: dramatic reductions in emissions and health risk in the West Oakland community.

1.4 Summary of Comments on the Draft MAQIP

Port staff asked MAQIP Task Force members to submit written comments on the Draft MAQIP for the purpose of obtaining constructive editorial guidance and recommendations for the final document. The Port received fifteen comment letters by August 8, 2008. Common themes emerged from many of the comments, and merit identification and discussion in this section. Text revisions and edits based on these and other comments are incorporated throughout the plan, sometimes in clarifying footnotes. The comment letters are available on the Port's MAQIP web site[3].

The major areas in which commentors thought the plan should be improved were:

- overemphasis on challenges and constraints,
- clear commitments and implementation schedules for all of the control measures necessary to meet the 2020 goals,
- reliance on compliance with State regulations to meet its goals,
- enforcement,
- nature of the MAQIP planning process,
- master plan vs. detailed plan,
- public and agency participation,
- backup plan for MAQIP, and
- recommendations for additional studies.

1.4.1 Overemphasis on Challenges and Constraints

Many Task Force members noted that the constraints to a successful implementation of the MAQIP were mentioned repeatedly throughout the draft plan, to the point of sounding excessively discouraging. The intention of the caveats was to incorporate the realistic concerns of the Port and of some MAQIP Task Force stakeholders about the difficulties surrounding implementation of the measures required to reach the MAQIP goals.

The MAQIP has been revised to eliminate repetitive caveats relative to implementation of the plan. It is more appropriate to consolidate feasibility issues in subject-specific sections. Therefore, discussions of uncertainties and challenges are presented by the following subject areas in the noted sections:

[3] The Port's MAQIP website is http://www.portofoakland.com/environm/prog_04c_info.asp

- overall challenges (Section 1.3.2, "Opportunities and Challenges"),
- limitations of forecasting emissions (Section 5.2, "Future Emissions"),
- air quality goals (Section 6.3, "Challenges"),
- institutional limitations (Section 9.2, "Port Organizational Capacity and Constraints").

1.4.2 Clear Commitments and Implementation Schedules for Control Measures Necessary to Meet the 2020 Goals

Many Task Force members also requested that the plan be revised to provide a clear commitment, time line and implementation schedule for each of the control measures necessary to meet the air quality emissions and health risk reduction goals. More information was particularly requested on the specific DPM control measures that would meet the gap in 2020 between the 73% health risk reductions expected from compliance with regulations and the MAQIP goal of 85% DPM health risk reduction.

This is a valid request, and the subject of considerable effort by the Port. Staff has included currently foreseeable projects in the MAQIP. However, any other fully-scoped projects to bridge the gap to the 2020 goal would be speculative due to the rapidly changing regulatory and technological environment. A practical consideration is that CARB's adopted and proposed regulations to control port-related emissions represent an aggressive effort to implement the best available control technology for all targeted sources. There are few feasible and measureable approaches that are not already incorporated into CARB rule-making. Over the next decade, when new technologies are introduced and verified, the Port will be in a better position to develop programs and projects to further reduce emissions. Even CARB faced this issue, as noted in its "Emissions Reduction Plan for Ports and Goods Movement in California" (2006):

> "Reductions achieved through 2005, from controls that have already been enacted, are included in the starting emissions. Reductions shown for 2010 and later strategies are dependent on the future actions and further development of control technologies.…The new reductions – 2020 strategies are conceptual at this point. We believe that global concern about emissions from ships and health impacts near ports will compel the development of the new technologies that will allow ships to eventually be nearly as clean as land-based transportation sources." [4]

Further development of new technologies, especially for off-shore ship emissions, cannot be quantified, but can be expected. Similarly, operational efficiencies, terminal redesign and vessel replacements, which can provide substantial reductions in emissions over time, are not easily predictable because they are operating business decisions, which are outside the Port's purview.

Therefore, the 2020 MAQIP goals with specific targets for DPM, SOx and NOx emissions reductions do not yet have a complete list of implementable projects with measureable emissions reductions that add up to the target reductions. The Port is committed through the MAQIP to coordinating with its stakeholders on the selection of measures that the Port will pursue. Those measures will be drawn primarily from the MAQIP initiatives, as revised over time by the stakeholders upon further analysis.

The Port's overall emissions reduction strategy is:

1. Target emissions reductions earlier than required by regulations ("early actions"),

[4] CARB's "Emissions Reduction Plan for Ports and Goods Movement in California" (2006b), page 54. The plan and staff updates are available at: http://www.arb.ca.gov/planning/gmerp/gmerp.htm

2. Support enforcement of regulations, and
3. Target emissions reductions above and beyond those required by law.

The Port's focus, with support from CARB and the BAAQMD and in consultation with stakeholders, is on early action measures to reduce harmful emissions as expeditiously as possible, in compliance with the broad MAQIP health risk and air quality goals. Therefore, projects and programs that are underway or in a planning stage and that will achieve reductions in advance of regulatory deadlines are briefly scoped and presented in Table 9-4 (description and project schedule), Table 9-6 (PM and NOx reductions) and Table 10-2 (timeline and early actions).

In the longer term, the best opportunities for the Port, tenants and maritime-related businesses to reduce emissions beyond regulatory requirements center on:

- promotion of operational efficiencies within terminal and rail yards, and
- design of new facilities that incorporate measures to minimize emissions.

While such measures can substantially reduce emissions by minimizing fuel usage through better layouts, reduced idling, etc. within a container yard, the emissions reductions are difficult to quantify.

1.4.3 Plan relies on implementation and compliance with State regulations to meet its goals

The MAQIP does rely on implementation of state regulations and on compliance with those regulations to reach the Port's air quality improvement and health risk reduction goals. Reliance on State regulations is not unreasonable, given CARB's mission "To promote and protect public health, welfare and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state." Over the last several years, CARB embarked on an aggressive effort to regulate all targeted port-related sources throughout the state, using the best available control technologies. CARB staff is highly knowledgeable about the scientific, technical and legal aspects of their emissions reductions regulations, and the agency is staffed and organized to design measures, obtain widespread public comment, address concerns about proposed regulations through revisions, adopt and implement measures, and finally, monitor and enforce compliance using their own staff or in partnership with local air districts and ports (see Section 1.4.4).

As discussed in Section 1.4.2, the Port's goals both rely on regulations and require reductions above and beyond those achieved through regulatory compliance. The Port will coordinate selection of such measures in consultation with a maritime stakeholder group and will draw initially on the MAQIP initiatives, as revised by the stakeholders upon further analysis.

1.4.4 Enforcement

Compliance with port-related emissions reduction regulations is key to achieving the Port's air quality goals. In response to several comments about the need to more directly address how the Port will contribute to the enforcement of regulations, the MAQIP now includes three new sections (Section 8.3 "Regulatory Compliance and Enforcement", Section 8.4 "Port of Oakland Control Measures and Strategies" and Section 10.1 "Overview of Port's Legal Authority") as well as an expanded discussion of the Port's authority with respect to maritime tenants and customers (Section 10.2 "Port Implementation Approaches").

The Port recognizes that designated enforcement staff from CARB and the BAAQMD may need support from Port staff, so the Port is prepared to:

- coordinate with the agencies as they develop enforcement protocols for adopted regulations,
- provide or participate in forums to educate maritime tenants on the regulations,
- remind tenants of regulatory compliance and reporting deadlines,
- coordinate with agency partners in designing and implementing incentive programs for tenants and maritime-related businesses to promote early actions to meet regulatory goals in advance of deadlines.

1.4.5 Nature of the MAQIP Planning Process

The general approach adopted by the Port staff and Co-Chairs with the assistance of the neutral facilitator, CONCUR, Inc., was to structure the MAQIP process as a robust consultative planning process, rather than as an agreement-focused process. This approach was adopted largely based on the recognition that the primary authors of the Plan are Port staff. At the same time, with the advice of the facilitator and the support of Port staff, many sections of the Plan – particularly the guiding principles and the list of action strategies – were drafted with very extensive involvement of Task Force members.

One comment letter asked that participation in the Task Force meetings as a member or Co-Chair should be correctly interpreted, and not overstated as "agreement" with the text of the MAQIP. To reflect the true nature of the consultative approach to planning, the MAQIP text uses the term "in consultation with", or similar language, instead of "agreement" to accurately describe the process used. Furthermore, all of the comment letters received from Task Force members, including those expressing disagreements with portions of the June 2008 draft MAQIP, are posted on the Port website[5], along with all letters and handouts distributed at any MAQIP Task Force meeting.

1.4.6 Master Plan vs. Detailed Plan

The main function of a master plan is to provide a policy structure and strategic direction (i.e. "road map") to address a given planning or environmental issue. A master plan accomplishes this function by setting forth a vision and establishing a framework composed primarily of policies, goals, objectives, and general actions and measures. A master plan will also typically include background information on key planning issues, a planning horizon, a setting section describing the geographic boundaries of the plan, and a comprehensive analysis of the planning or environmental issues/problems/concerns to be addressed. The level of detail in a master plan can be described as "general" as opposed to "specific" or "detailed." This general level of detail serves the policy-framing and strategic functions of the plan.

Some commentors questioned the Port's characterization of the MAQIP as a Master Plan, expressing their view that the Port had changed the parameters of the MAQIP at a mid-course point in the planning process. Also, some commentors stated that the Port's introduction of the "Planning Continuum" reflected a change in the character and direction of the planning process.

However, a review of MAQIP planning documents on both the Port and CONCUR's websites shows that the Port clearly described the MAQIP as a master plan document from the inception of the planning process. Port staff prepared a written description of the MAQIP as a master plan document in the "MAQIP Planning Document" which was presented to the Co-Chairs for review

[5] The Port's MAQIP website is http://www.portofoakland.com/environm/prog_04c_info.asp

and discussion prior to being presented to the entire Task Force at the June 11, 2007 Task Force meeting.

Consistent with the structure of a master plan, the Port's presentation discussed parameters and goals of the MAQIP planning process and established 2020 as the proposed planning horizon. At the December 14, 2007 meeting, some members of the Task Force and attendees again questioned the master plan concept and approach. Port staff restated the function of a master plan and reminded participants of the June 11 discussion.

Because questions regarding the different phases and nature of planning and programming remained, Port staff developed a more detailed explanation of the relationship of master planning to subsequent planning phases, program development and project implementation. These concepts are illustrated in Figure 1-1 ("Planning Continuum: Hierarchy of Planning Activities"), and further described in Section 1.3.1.

1.4.7 Public and Agency Participation

Some commentors requested that a public process continue to ensure participation of impacted communities, environmental groups, elected officials, air quality agencies and others in MAQIP consultation, project and funding assistance, and monitoring.

As outlined in Section 11.5, the Port will create a maritime stakeholder group through a due diligence process that is envisioned to address ongoing monitoring of MAQIP initiatives, community outreach, research and study, and funding and policy. This group will convene on a regularly scheduled basis and consider recommendations from the MAQIP, CTMP, Oakland Mayor's Task Force, the Oakland Partnership, and similar groups as they pertain to the Port and the neighboring community. The maritime stakeholder group will be comprised of key air quality agency staff, community members, Port maritime tenants and other maritime related businesses and other organizations.

1.4.8 Back-up Plan for MAQIP

One commentor noted: "The final MAQIP should identify a back-up plan, or at the very least a concrete plan for creating a back-up plan, that can be implemented in the event that the Port of Oakland is unable to meet the expected reduction targets."[6] In response to this recommendation, a new subsection, 11.3.4 ("Reconsideration of MAQIP Strategies"), has been added to Section 11 ("Monitoring and Reporting").

1.4.9 Recommendations for additional studies

Several commentors[7] requested that the Port conduct additional studies and analyses for the MAQIP, some of which are:

- 2000 emissions inventory
- 2005 emissions inventory revision to look at understatement of truck emissions (see Section 5.1) and research/analysis plans to look at truck emissions and socio-economic and labor challenges of trucking
- GHG inventory
- Uncertainties associated with the CARB health risk assessment study[8]

[6] Sandra Witt, Alameda County Health Care Services Agency, Public Health Department, July 14, 2008.
[7] Sandra Witt, Alameda County Health Care Services Agency, Public Health Department, July 14, 2008; Diane Bailey et al., Natural Resources Defense Council (NRDC), July 14, 2008; Jamie Fine, Environmental Defense Fund.
[8] CARB, "Diesel Particulate Matter Exposure Assessment Study for the West Oakland Community: Preliminary Summary of Results" (March 2008b).

- Risk management decision framework for emissions estimate uncertainties

These studies fall beyond the current purpose, budget and schedule of the MAQIP. Staff expects to conduct a GHG inventory when the maritime emissions inventory is updated (in 2009, based on 2008 data). At that time, better trucking data may be available to assist in obtaining a more

2 MARITIME AIR QUALITY IMPROVEMENT PLAN DEVELOPMENT

Over the last decade, residents living in neighborhoods adjacent to seaports throughout California have grown more concerned about the potential impacts on their health of air emissions from goods movement. The Port has sponsored and participated in many community air quality efforts since the late 1990's, including the Vision 2000 Air Quality Mitigation Program, the West Oakland Environmental Indicators Project (WOEIP), the West Oakland Toxics Reduction Program, Ditching Dirty Diesel, and others. The community-led efforts also benefit from the support of programs at the Pacific Institute, BAAQMD (Community Air Risk Evaluation or CARE program), and the EPA (WOEIP). Local air districts, such as the BAAQMD, and CARB have responded to these concerns and are developing and enforcing regulations statewide to substantially reduce emissions from port-related sources.

In 2005, the Port decided to prepare a comprehensive air emissions inventory of seaport operations to provide baseline emissions data for future planning activities, such as this air quality master plan, and to enable the Port to track its tenants' progress in reducing harmful emissions.

During development of the inventory, CARB announced that, in response to requests from residents of West Oakland, it intended to carry out a human health risk assessment of the potential health effects of diesel particulate matter on the neighborhood. The study focus was on the diesel emissions from maritime sources at the Port and the Union Pacific Railyard, and from other sources that could affect West Oakland residents (e.g, freeways, ferries, local industries, etc.). To assist CARB, the Port adapted its emissions inventory to agree with CARB's current methodologies. Through weekly calls, the Port, along with the BAAQMD, participated in the development of CARB's health risk assessment. The Port's emissions inventory was released in August 2007, and finalized in March 2008[1]; CARB's report "Diesel Particulate Matter Exposure Assessment Study for the West Oakland Community: Preliminary Summary of Results" was made available in March 2008[2].

This plan relies on the emissions inventory and health risk assessment results to forecast future emissions and to help set its goals for emissions reductions.

2.1 Plan Overview and Development

A year-long facilitated participatory process led to the design of the MAQIP, with the MAQIP Task Force establishing guiding principles, adopting goals, proposing air quality improvement initiatives, and providing guidance for the preparation of this master plan.

Two broad planning goals to reduce the Port's impacts on public health and on ambient air quality were adopted by the MAQIP Task Force. The Port presented supporting quantitative goals that proposed explicit emission reduction targets for specific air pollutants in future years.

In support of the adopted goals, the Task Force explored two types of strategies to reduce emissions and health risk:

[1] (Port of Oakland, 2007b) "Port of Oakland 2005 Seaport Air Emissions Inventory" is available at: www.portofoakland.com/environm/airEmissions.asp

[2] (CARB, 2008b) "Diesel Particulate Matter Exposure Assessment Study for the West Oakland Community: Preliminary Summary of Results" available at: www.arb.ca.gov/ch/communities/ra/westoakland/westoakland.htm. The final report is scheduled for release in late 2008.

- Measures that comply with current and anticipated regulations, and
- Measures that accelerate or otherwise go beyond regulatory requirements.

Task Force members prepared an extensive list of possible measures, or initiatives, that could potentially help the Port, tenants, customers and related businesses go above and beyond regulatory requirements in achieving emissions and health risk reductions. Those proposed initiatives are intended both to help the Port and its maritime partners reach the 85% health risk reduction goal adopted by the Board, and to achieve emissions reduction earlier than required by regulations.

2.2 Public Participation

The MAQIP was developed through an extensive public stakeholder participation process led by Port staff with the assistance of facilitators from CONCUR, Inc. The MAQIP Task Force of 35 stakeholders, selected through a nomination process from community members, Port tenants, environmental advocacy groups, air quality and health agencies and maritime-related businesses, was appointed by the Port's Executive Director, and first met in June 2007 to guide the development of the air quality master plan. Planning activities for the Task Force were led by a team of four co-chairs.

While the Board of Port Commissioners is responsible for approving the final content of the MAQIP through formal approval of the plan, the policy direction and content were shaped by the Port's planning partners through a consultative process led by staff from a neutral facilitator, CONCUR, Inc. Key stakeholders and their roles in the creation of the MAQIP are described here, and a complete roster is provided in Table 2-1.

Task Force Co-Chairs

- Mr. Omar Benjamin, Executive Director, Port of Oakland,
- Mr. Jack Broadbent, Executive Officer, Bay Area Air Quality Management District,
- Mr. Brian Beveridge, Co-Chair, West Oakland Environmental Indicators Project (this position was held by Ms. Margaret Gordon until Fall 2007, when she was appointed to the Board of Port Commissioners),
- Mr. Andy Garcia, Executive Vice President, GSC Logistics Inc.

Task Force Members

The MAQIP Task Force was comprised of representatives from the following stakeholder groups:

- West Oakland residents,
- Commerce, community, and environmental justice organizations based in West Oakland or actively involved in West Oakland studies,
- Terminal operators and shipping companies,
- Trucking enterprises,
- Railroads,
- Other goods movement related industry,
- Labor,
- Elected and appointed officials (including the Office of the Mayor, City of Oakland),
- Environmental regulatory and health agencies, and
- Energy and utility companies.

Table 2-1 Port of Oakland MAQIP Task Force Members and Alternates

MAQIP Task Force Co-Chairs	Alternates	Affiliation
Omar Benjamin	Joe Wong, Richard Sinkoff, Diann Castleberry (formerly held by Bernida Reagan)	Port of Oakland
Brian Beveridge	formerly held by Margaret Gordon	West Oakland Environmental Indicators Project
Jack Broadbent	Jean Roggenkamp, Jack Colbourn	Bay Area Air Quality Management District
Andy Garcia	Robert Rodriguez	GSC Logistics, Inc.
MAQIP Task Force Members	**Alternates**	**Affiliation**
Bill Aboudi	Jeff Caldwell (Yolo Enterprises)	AB Trucking
Wendy Alfsen	Kent Lewandowski	Sierra Club, Northern California
Marisa Arrona		Office of Councilmember Nancy Nadel
John Berge	John McLaurin, Laura Williams	Pacific Merchant Shipping Association
Ted Blanckenburg		American Navigation Maritime Services
Doug Bloch	Zach Goldman	Change to Win
George M. Bolton	Steve Lowe (West Oakland Commerce Association)	WOCAG
Washington Burns MD		Prescott Joseph Center
Miguel Bustos	Steve Lautze, VaShone Huff	City of Oakland, Office of the Mayor
Sharon Cornu	Wendall Chin	Alameda Labor Council
Chris Ferrara	Mike Trevino	Pacific Gas and Electric (PG&E)
Eric Goodman/Robert Tooke	Mike Stanfill, Ryan Perry	BNSF Railway Company
Carol A. Harris/Andy Perez	Darcy Wheeles, Peter Okurowski (CA Environmental Association, for Assoc.of American Railroads)	Union Pacific Railroad Co.
Ginny Hessenauer	Scott Smith	American President Lines (APL)
Robyn Hodges		Office of Supervisor Nate Miley
Maha Ibrahim	Leslie Littleton	Office of Congresswoman Barbara Lee
Jerry Jackson	Kevin Williams	JC Penney
Ellen Joslin Johnck	Richard Rhoads (Moffatt and Nichol)	Bay Planning Coalition
Deborah Jordan	Mike Bandrowski, Richard Grow, Amy Zimpfer	U.S. Environmental Protection Agency
Andy Katz	Amy De Reyes	Office of Supervisor Keith Carson
Ray Kidd	David de Korsak	West Oakland Neighbors (WON)
Ken Larson		SSA Terminals
Kenneth Levin	Fran Black	San Francisco Bar Pilots
Ellen Parkinson	Marcus Johnson	West Oakland Resident
Michael Porte	Dave O'Neill	TraPac, Inc.
Swati Prakash	Jamie Fine (Environmental Defense Fund)	Pacific Institute
Kurt Sulzbach	Jim Flanagan	APM Terminals Pacific Ltd.
Queen Thurston		West Oakland Resident and Economic Council for West Oakland Revitalization
David Weinreich	Maurice Williams	Office of Senator Don Perata
Veronica Williams		Office of Assemblymember Sandre Swanson
Sandra Witt	Pamela Evans (Alameda County Environmental Health Dept.)	Alameda County Public Health Dept.

Following a MAQIP kickoff meeting held on April 10, 2007, the MAQIP Task Force was formed and met seven times at roughly one to two month intervals during plan development. The role of the Task Force included proposing or reviewing meeting topics, prioritizing air

emission reduction measures, deliberating the merits of proposed actions, contributing to strategies for implementation, monitoring, and adaptive management, and generally shaping plan content. Stakeholder deliberations routinely included brainstorming sessions, break-out group exercises, and roundtable discussions following various presentations by select stakeholder groups. Port staff worked in consultation with Task Force members and other stakeholders to develop broad-based consensus on the elements of the MAQIP, although no formal voting procedure was used to decide on the final MAQIP content. All Task Force meetings were open to the public and comment was solicited from both Task Force and non-Task Force members. Not everyone agreed with all of the decisions surrounding the plan development or with all of the elements in this master plan. However, the contributions of every Task Force member ultimately shaped this version of the plan. Constructive disagreements led to new perspectives and to the development of ambitious air quality and health risk reduction goals. Some of the recurring differences were reflected in the comment letters on the draft MAQIP and are summarized in Section 1.4.

The facilitators prepared a Key Outcomes Memorandum after each meeting to summarize major points of the discussion and any decisions made. All meeting materials, including presentations, handouts and the Key Outcomes memoranda, were posted on the Port's MAQIP web site[3]. To further record its decisions, the Task Force adopted the following documents during the course of the MAQIP development:

Ground Rules, adopted on June 11, 2007. Describes the composition of the MAQIP Task Force and the roles and responsibilities of members (Appendix A).

Guiding Principles and Goals, provisionally adopted on August 14, 2007, subject to revisions, which were subsequently incorporated in the document. Identifies the values guiding the development of the MAQIP and the two overarching goals of the MAQIP. Outlines topics to be covered in the plan (Appendix B).

Screening Criteria for Air Quality Initiatives, adopted on September 27, 2007. Characterizes the criteria used to screen the potential emission and risk reduction initiatives suggested by the Task Force (Appendix C).

Proposed Lists of Primary Interest and Secondary Interest Air Quality Initiatives for Potential Implementation, revised by the MAQIP Task Force on January 30, 2008. Describes the selection process and presents the MAQIP air quality initiatives as of January 30, 2008 (Appendix D).

2.3 Guiding Principles

The MAQIP Task Force identified seven guiding principles to articulate values that drove the planning process for the MAQIP and that should guide future updates. These principles were adopted by the Task Force on August 14, 2007[4]:

1. **Seek Economic Growth:** The Port of Oakland is an economic engine for the City of Oakland and the region. As such it is vital that the seaport remain strong and grow in a

[3] The Port's MAQIP web site is http://www.portofoakland.com/environm/prog_04c.asp.

[4] One Task Force member commented that the adopted Guiding Principles "should be reordered to place environmental quality and public health principles at the top of the list, and economic principles toward the end of the list." However, since this is the format in which the document was adopted in 2007, the original order is retained.

fiscally responsible manner. The Port recognizes that its ability to operate, grow, and be a good neighbor will depend on its ability to address potentially adverse environmental impacts resulting from activities occurring at the seaport, at the same time remaining a viable and competitive organization.

2. **Promote Environmental Stewardship:** The Port of Oakland holds environmental stewardship as one of its core organizational goals. The Port is committed to ensuring that seaport activities are carried out in an environmentally responsible manner, minimizing adverse impacts on our neighbors and the environment, and striving to improve the environmental conditions in the seaport area, for the benefit of both present and future generations.
3. **Apply Concept of "Fair Share":** The Port of Oakland seaport commits to achieving its fair share of air emission reductions, while recognizing that it alone does not have the resources needed to subsidize the entire cost of emission reductions. Therefore, the seaport will count on the support of its private industry and government partners, and on the commitment of all companies engaged in goods movement at, to, and from the Port of Oakland, to achieve and fund their fair share of emission reductions in an equitable manner.
4. **Exercise Authority:** The Port of Oakland seaport commits to using its authority and influence to achieve air quality improvement within market and legal constraints. Seaport operations produce emissions, but the Port does not own or operate the sources that produce those emissions. Where the Port may not have authority over an emission source, the Port will strive to develop voluntary partnerships or agreements aimed at reducing emissions. The Port will pursue emission reduction measures in conjunction with and relying upon local, state, and federal regulations.
5. **Engage Stakeholders:** The Port of Oakland seaport commits to actively engage and partner with its diverse stakeholder community in developing, implementing, and monitoring the MAQIP. The Port recognizes the need to especially collaborate and partner with those who are most affected by seaport operations, including, but not limited to labor, tenants, customers, and neighboring residents.
6. **Promote Environmental Justice:** The Port of Oakland seeks to prevent and address adverse impacts to communities that experience disproportionate environmental and economic effects.
7. **Build Knowledge:** The Port of Oakland believes that good planning builds knowledge and educates, and thus results in informed decisions. To this end, the Port strives to create a plan that educates and adds value and in which knowledge is built, shared, and used by all participants as a basis for informed and accountable decision-making. The Port and its stakeholders will rely on the best available information, science, and technology in all aspects of maritime air quality planning. The Port and its stakeholders will remain flexible in their approaches to improving air quality, in order to respond to, adapt to, and incorporate new advancements, information, and evolving regulatory programs.

2.4 MAQIP Goals and Strategies

Early in the MAQIP planning process, the Task Force adopted two planning goals[5] (see Section 7):

1. Reduce the adverse public health impacts of the Port of Oakland's seaport-related air emissions at the seaport area and in neighboring communities that are most affected by goods movement at the seaport (in particular West Oakland) and on workers in the maritime area, as expeditiously as feasible.

2. Reduce the adverse impacts of the Port of Oakland's seaport-related air emissions on ambient air quality in West Oakland and more generally in the San Francisco Bay Area Air Basin, as expeditiously as feasible.

For the Port, its tenants, customers and related businesses to reach these goals, the Task Force realized that it was essential to rely largely on federal and state regulations to reduce emissions, but that additional emissions reductions could also be necessary. Therefore, in support of the adopted goals, the Task Force explored two types of strategies to reduce emissions and health risk:

- Measures that comply with current and anticipated federal and state regulations, and
- Measures that go beyond federal and state regulatory requirements.

Emissions Reductions Through Regulatory Compliance

With the adoption in 2006 of the "Emission Reduction Plan for Ports and Goods Movement in California" (GMERP) as a state-wide air quality master plan, CARB embarked on an ambitious effort to regulate the major sources of port-related emissions, especially DPM. The GMERP contained a goal of reducing DPM emissions back to 2001 levels by 2010 and reducing statewide DPM health risk 85% by 2020, compared to 2001 levels. To reach these goals, CARB is developing a comprehensive set of regulations to control port-related goods movement emissions. Some regulations are already making a difference in seaport emissions, while others have not yet taken effect, or are still under development (see Table 4-1 and Appendix E).

Additional and Accelerated Emissions Reductions

The other approach to reaching the Port's MAQIP goals is to seek additional and accelerated emissions reductions beyond those expected to accrue from timely compliance with regulatory requirements. Many of the regulations are extremely aggressive, so they do not leave much room for voluntary actions that produce additional emissions reductions. However, accelerated compliance with regulations can result in earlier reductions in emissions and risk. All of the MAQIP initiatives described in Section 9 fall into this additional reduction category, and each will require a feasibility analysis to ensure that the measure is financially, technologically and legally feasible.

[5] Source: Guiding Principles and Goals, provisionally adopted on August 14, 2007, subject to revisions. The entire revised document is provided in Appendix B.

2.5 MAQIP Elements

Since the purpose of the year-long MAQIP effort was to produce a written maritime air quality master plan, the MAQIP Task Force members proposed that the Port's plan include at least the following elements:[6]

1. Geographic and jurisdictional boundaries of seaport emission sources and the affected neighboring areas to which air quality improvement efforts will be primarily targeted.
2. Pollutants that will be targeted for reductions, and the impacts of those pollutants on the environment and public health;
3. Regulations affecting seaport operations;
4. Quantification of baseline and projected emissions, and the linkage between emissions and risk;
5. Quantitative objectives or "goals" for reducing the adverse public health and environmental impacts of seaport air emissions;
6. Potential measures and related initiatives for reducing emissions from seaport operations that build upon the regulatory and voluntary efforts of others to reduce emissions and the health impacts associated with these emissions. These potential measures may also be included in specific mitigation plans that may be adopted as part of CEQA review for future development projects at the Port of Oakland seaport;
7. Timelines, standards, and strategies for implementing the Plan, monitoring and measuring the progress of such implementation, performing adaptive management, and addressing progress shortfalls; and
8. Public health and regulatory agency leadership and coordination to assist the Port in tracking risk reduction, by providing routine updates to risk studies.

All of the above elements are incorporated in this plan, except for the last, which is managed through a separate but related effort: the MAQIP Interagency Group. Composed of representatives of the public agencies and elected officials that participated in the MAQIP development (CARB, EPA, BAAQMD, City of Oakland, Port of Oakland, Alameda County Public Health and Environmental Health Departments, Offices of Mayor Ron Dellums of Oakland and Alameda County Supervisor Nathan Miley), the group meets periodically to coordinate on air quality and health risk reduction concerns and issues.

The Port added additional elements to complete the plan, including:

- Master plan purpose and planning approach,
- Information about the Port history, organization and its maritime operations,
- Overview of the MAQIP development process and Task Force roles,
- Port emissions reduction strategies
- Relationship of Port air quality programs and projects to the proposed initiatives.

[6] ibid.

3 PORT OF OAKLAND AND ITS SEAPORT OPERATIONS

As an independent department of the City of Oakland, the Port, operating through its Board of Port Commissioners, manages property stretching along 19 miles of Oakland waterfront. This "Port Area" encompasses property from Oakland International Airport to Jack London Square, in addition to the seaport area. However, this maritime air quality master plan applies only to the seaport area and operations.

3.1 History of the Port of Oakland

The history of harbor development in Oakland dates to the mid-nineteenth century, when Oakland was first incorporated as a city. Oakland's shallow harbor was a port of call for bay and river vessels, such as ferries and scow schooners, but it was the city's designation as the terminus of the transcontinental railroad in 1869 that brought fundamental change to the Oakland waterfront. The railroad, which had gained control of Oakland's waterfront, was a magnet for industry. A vast railyard, adjoined by factories and canneries, spread over the marshes of West Oakland, and the Oakland Long Wharf, which extended nearly three miles into deep water, soon became one of the most important shipping terminals on the Pacific Coast. Large-scale federal harbor improvements to make Oakland more accessible to ocean-going vessels began in 1874. By the late 19th century, wooden hulled schooners could discharge their cargo into dockside warehouses, known as transit sheds, and longshoremen moved cargo between shore and vessel with hand trucks, shipboard derricks, and cargo nets.

The transition from wind-powered wood hulls to fuel-powered steel hulls in the early 1900s required new facilities and greater depths for increasingly larger vessels. Municipal waterfront development in the Oakland Estuary began shortly after the city regained title to the waterfront in 1909. These early municipal facilities were reconfigured, and additional wharves and transit sheds were added, after the Port of Oakland was established as an independent department of the City of Oakland in 1927 with the passage of a City Charter amendment. By the mid-1930s, the Port was a regular port of call for more than forty international steamship lines. World War II transformed Oakland into one of the nation's busiest military ports. Two large military bases covered hundreds of acres of former tidelands on the western waterfront and the military occupied most of the Port's maritime facilities. Wartime shipyards, which employed thousands of people, lined the Estuary. Most East Bay shipyards closed after the war ended in 1945.

The Port introduced large-scale container operations to the Pacific Basin in 1962. Containerized shipping revolutionized the cargo-handling industry and necessitated the conversion of traditional break-bulk facilities. Gradually, private and military-held waterfront land west of Jack London Square was consolidated and redeveloped into marine terminals. Transit sheds and other structures were removed and wharves and storage areas were either reinforced or rebuilt to handle the increased loads from cranes and stacked containers. The Port's maritime area now includes more than 1,210 acres of marine terminal facilities and support areas in the shoreline and water areas.

The most recent changes to the Port have come about through the closure of military bases. The site of the Navy's Fleet and Industrial Supply Center, Oakland (FISCO), reverted to the Port in 1999. The Port developed that property under the Vision 2000 program to construct two new maritime terminals, an intermodal rail facility and a public park. A companion project to deepen channels and berths from -42' to -50' and to create a wildlife habitat in Middle Harbor is nearing completion. The Oakland Army Base was closed in 1999 and the title to that property

transferred from the Army to the Oakland Base Reuse Authority in 2003, and then to the Port and the City of Oakland in 2006. Environmental review of projects proposed for the Port's 182-acre share of the Army Base property was initially completed in 2002.

3.2 Seaport Operations

Located on the eastern shore of San Francisco Bay, one of the great natural harbors of the world, the Port was among the first ports to specialize in intermodal container operations, which revolutionized international trade and helped create today's global economy. Today, the Port's maritime seaport accounts for approximately $2 billion annual economic impact in annual trade and 28,000 jobs. In Fiscal Year 2007, the seaport produced 46% of total Port operating revenues, or approximately $127 million, and 74% of net revenues. The seaport is the 3rd and 5th largest container port on the West Coast and in the United States, respectively.

Facilities

The Port serves as the principal ocean gateway for container cargo in Northern California. The seaport provides an interface for waterborne international and domestic cargo moving between inland points in the United States and the Pacific Basin, as well as other points in the world.

The seaport (Figure 3-1) comprises four major marine terminal areas: the Outer Harbor Terminal Area, the 7th Street Terminal Area, Middle Harbor Terminal Area and the Inner Harbor Area. The seaport's 20 deepwater berths and 37 container cranes are backed by a network of local roads and interstate freeways, ancillary services, warehouses and intermodal railyards. One railyard is situated on Port-owned land; the other is on private property adjacent to the Port. The seaport includes more than 1,210 acres of water area and land-side facilities.

The seaport is a landlord port; it leases terminal facilities to shipping lines and stevedoring companies. The seaport does not operate, or employ the people who operate the terminals, ships, cargo handling yard equipment, trucks or trains that move the cargo that passes through the Port. Aside from the electric-powered container cranes used to move cargo on and off the ships, all of these pieces of equipment and machinery are almost exclusively powered by diesel engines and, consequently, are sources of diesel particulate matter (DPM), oxides of nitrogen (NOx), oxides of sulfur (SOx) and other pollutants, which are the subject of the MAQIP. While the seaport does not own or operate these sources of air emissions, the Port is committed to doing its part, working with its community and business partners, to reduce air pollution from goods movement activities.

Trade

The seaport is one of the four major gateways for international containerized cargo shipments on the North American West Coast, with a market share of approximately 10% in calendar year 2007. In that same year, the seaport handled 2.4 million TEUs, or 1.3 million containers. For comparison, the other two major gateways on the United States West Coast are the Ports of Los Angeles/Long Beach and Seattle/Tacoma, with 2007 market shares of approximately 63% and 16%. The Oakland seaport handles a diverse range of containerized cargo including both import and export commodities. Principal exports moving through the Port are agricultural products, pulp and waste paper, raw cotton, animal feed, meat, synthetic resins and plastic chemicals, specialized industrial machinery, and wood and lumber. Principal imports are fruits and vegetables, beverages, meat, electronic data processing equipment, auto parts, newsprint, iron and steel, coffee, tea, and spices. The balance of trade at the Port is slightly tipped toward export

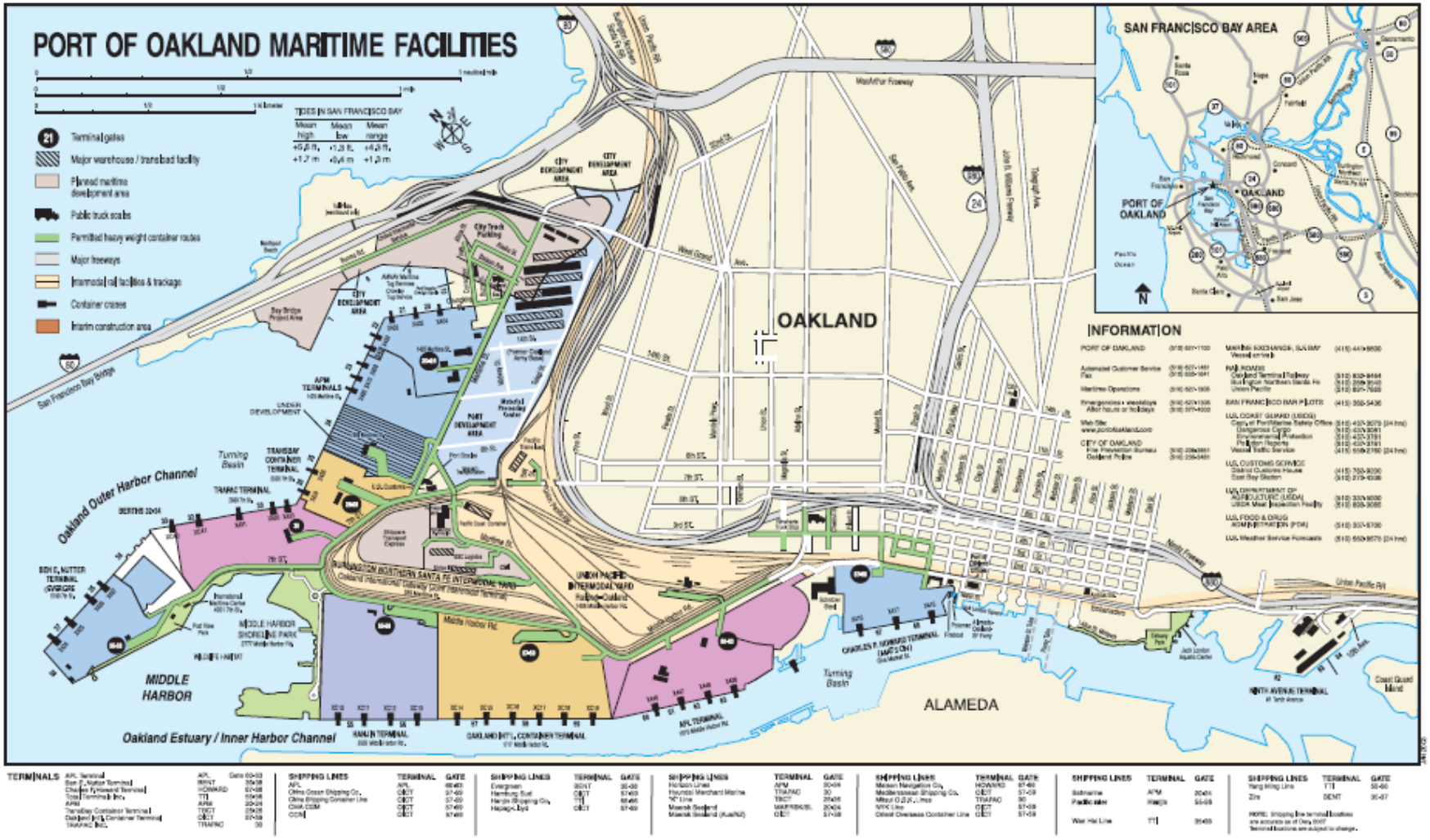


Figure 3-1 Port of Oakland Maritime Facilities

(outbound), which represents approximately 55% of the cargo handled at the Port. The breakdown of import vs. export cargo from year to year changes in response to economic conditions. Pacific Rim countries continue to be the principal origination and destination points for cargo through the Port. Of the total cargo traffic at the seaport, approximately 70-80% is destined for local markets in Northern and Central California and the remaining 20-30% is destined for non-local markets elsewhere in the United States.

Competition

In the last 10 years West Coast ports increased their combined share of container traffic relative to all ports in North America by approximately 7%. This gain occurred primarily due to increased imports from Asia. However, over time, future improvements to the Panama Canal and capacity increases at East and Gulf Coast ports will tend to benefit those ports over West Coast ports. Additionally, in the future, Canadian and Mexican ports may capture a growing share of container traffic that originates or terminates in the United States.[1]

Despite the aggregate West Coast port growth over the last 10 years, the seaport's market share has decreased relative to that of other major West Coast North American ports. In 1997, the Port's share of the West Coast market was 13% of all TEUs; in 2007, it was 9.7%. The seaport's decrease in market share resulted largely from an increase in the combined market share of the Ports of Los Angeles and Long Beach. The large local market and robust intermodal system serving the southern California ports often make these ports the preferred gateway for North American container imports.[2]

Tideland Trust Properties

Beginning in 1852, the State of California conveyed tideland to the City, as trustee for the people of the State of California, to accommodate and promote harbor commerce and navigation. These tideland grants and trust assets may be subject to amendment or revocation by the State legislature, as grantor of the trust and as representative of the beneficiaries (the people of the State). Most of the property on which the seaport facilities are located is subject to a trust imposed by more than a dozen tideland grants. Certain requirements and restrictions are imposed by the grants. Generally, the use of lands subject to the trust is limited under the terms of the grants to harbor and airport uses and other uses of statewide interest, such as fishing, public recreation, and enjoyment of the waterfront. The Port may not sell any of the granted lands, nor lease for periods of more than 66 years. There are also certain limitations on the use of funds generated from the lands and trust assets. Trust-generated funds may be used only for trust purposes as opposed to general municipal purposes. All revenues earned by the Port in effect constitute funds to the state trust.

Seaport Revenue

The Port and all other California public ports control and determine their own rate structures for the use of their facilities. The primary source of seaport revenue is the assessment of charges to customers of the seaport for use of its facilities. Charges are assessed in two ways: the Port tariff and negotiated agreements. The tariff sets forth the seaport's rules and regulations and standard charges for the use of seaport facilities. In addition, most seaport customers operate under one of several types of agreements: Preferential Assignments, Lease Agreements, Fixed Revenue Agreements, and Short Term Agreements. With the exception of Short Term Agreements, these agreements are usually negotiated for time periods of no less than 10 years, and most have multi-year options to extend. The Port only enters into agreements with enterprises that conduct

[1] (Port, 2007a) Port of Oakland Feasibility Report for 2007 Bonds, October 2007.
[2] ibid.

business on Port-owned land (e.g., marine terminal operators). Therefore, for example, the seaport does not have such agreements with shipping lines. All revenues earned by the Port in effect constitute funds to the state trust, and can only be used for trust purposes. Because of the long-term nature of most of its leases and the conditions imposed by the Tidelands Trust, the Port has limited ability to increase its revenues or to use those funds for purposes not specified in the state land grants.

3.3 Future Seaport Growth

During the planning horizon of the MAQIP, the Port or its tenants may construct infrastructure projects, such as expansion of rail or other facilities at the former Oakland Army Base, the 7th Street Grade Separation and marine terminal modernization, to improve cargo movement, terminal efficiencies and traffic circulation. All such projects are subject to review under the California Environmental Quality Act (CEQA) prior to the Board of Port Commissioners' approval of construction agreements, building permits or other authorizations. The MAQIP does not pre-empt or replace project review under CEQA, and does not replace project-specific air quality mitigation plans, if required by the CEQA analysis.

4 TECHNICAL AND REGULATORY BACKGROUND

The types and effects of harmful air pollutants are described in this section, along with the technical and regulatory context of air quality measurement, planning, and control. Air quality planning is driven by regional compliance with ambient air quality standards, which set maximum concentrations of different pollutants in the air. Air quality improvement policies and standards are generally established to reduce the risk to human health, while regulations often target the equipment emissions that produce the pollutants.

While reduction of all air pollutants from Oakland's seaport operations is a goal, the focus of the MAQIP Task Force and of the Port is on diesel particulate matter (DPM) due to the health risk it poses for nearby residents.

4.1 Pollutants and Their Impacts

United States and California air pollution laws establish two types of air pollutants: "criteria" pollutants, and "hazardous" or "toxic" pollutants (U.S.) or contaminants (California).[1] The two types of pollutants are regulated differently.

The United States Environmental Protection Agency (EPA) and CARB have each established ambient air quality standards for criteria pollutants. The ambient standards prescribe a maximum concentration of each pollutant that is allowed in the air based on public health criteria. In general, pollutant concentrations lower than the standards are considered safe to breathe. State and federal laws require air pollution control agencies to develop regional air quality plans to demonstrate how they will attain ambient air quality standards over time.

There are no comparable ambient standards or planning requirements for toxic air contaminants. Most toxic air contaminants are known or suspected carcinogens, although some are also regulated because exposure can cause other acute or chronic health effects. For carcinogens, regulatory policy assumes that any level of exposure can increase the risk of developing cancer, so no level of exposure is considered safe. Instead of ambient standards or plans, state and federal law require the control of toxic air contaminants at their source with the goal of minimizing public exposure.

The U.S. EPA and CARB both set ambient air quality standards for criteria pollutants. The most common criteria air pollutants are:

- Ozone (O_3),
- Carbon monoxide (CO),
- Sulfur dioxide (SO_2),
- Nitrogen dioxide[2] (NO_2),
- Particulate Matter, consisting of PM_{10} (coarse particles 10 μm or less in diameter), and $PM_{2.5}$, (fine particles 2.5 μm or less in diameter).

Diesel engines produce nearly all of the air pollution emitted by goods movement activities associated with the Port of Oakland. Diesel engines emit all major criteria pollutants but some

[1] A toxic pollutant is defined as "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health" (CA Health and Safety Code section 39655).

[2] Nitrogen oxides (NOx) include nitric oxide and nitrogen dioxide.

are of more concern than others. Because of their fundamental design, uncontrolled diesel engines are, compared to gasoline engines, "naturally" high emitters of nitrogen oxides (NO_X) and particulate matter and relatively low emitters of carbon monoxide (CO) and reactive organic gases (ROG). In addition, diesel engines burning fuel with a high sulfur content such as is typically used, for example, by large ocean going vessels, will also be high emitters of sulfur dioxide (SO_2). High fuel sulfur content also increases particulate emissions. The particulate matter emitted by diesel engines contributes to $PM_{2.5}$ and PM_{10} concentrations in the air.

Diesel particulate matter (DPM), in addition to contributing to $PM_{2.5}$ and PM_{10}, is also identified by the State of California as a toxic air contaminant, and is therefore of particular concern to the Port. DPM is the particulate portion of diesel engine exhaust. Diesel exhaust is a complex "stew" of pollutants of various chemical species that occur in both solid and gaseous forms. The composition will vary depending on engine design, operating conditions, fuel composition, lubricating oil, and whether an emission control system is present. DPM contains carbon particles, which are often coated with various other substances, a soluble organic fraction, and a sulfate fraction. DPM consists of very small particles (over 90% are $PM_{2.5}$ or smaller) that are inhaled and can be absorbed deep into the lungs when breathed. The level of exposure to DPM depends on proximity to sources of DPM emissions, on the magnitude of the emissions from the sources and the duration of the exposure.

Nitrogen oxides and ROG emitted by diesel engines and other sources react in the atmosphere with other pollutants to form several important secondary pollutants, especially ozone and various species of secondary particulate matter. Sulfur dioxide also reacts in the atmosphere to form several species of secondary particulate matter. The chemical reactions that transform these gases into other secondary pollutants are complex and take time to occur as winds disperse pollutants and transport them downwind from where they are emitted. As a result, the contributions to ozone and secondary particulate matter formation of the Port's NO_X, ROG and SO_2 emissions are more regional in nature and typically occur well downwind of the Port as the Port's emissions mix with those from numerous other sources.

4.2 Overview of Ambient Air Quality

Monitoring of ambient air quality, and comparing the results to state and federal standards, is the most accepted way to measure air quality. While the Bay Area Air Quality Management District (BAAQMD) manages the regional air monitoring system, the Port established its own monitors in West Oakland during construction of the Vision 2000 projects (Berths 55-59 and a railyard) due to concerns about the impacts of construction on local air quality.

4.2.1 Regional Setting

The San Francisco Bay Area Air Basin consists of all or parts of nine counties.[3] BAAQMD has jurisdiction over the air basin, although it shares regional air quality planning responsibilities with two other regional planning agencies, the Metropolitan Transportation Commission and the Association of Bay Area Governments. A network of air monitoring stations operates throughout the air basin to measure concentrations of criteria pollutants. Data collected from this network show that ambient standards for ozone and particulate matter are exceeded at some locations in the region. As a result, CARB has designated the San Francisco Bay Area Air Basin as "Nonattainment" for ozone and particulate matter and the U.S. Environmental Protection

[3] Alameda, Contra Costa, San Mateo, Santa Clara, Napa, San Francisco, Marin, and parts of Solano and Sonoma Counties

Agency has designated the Air Basin as "Nonattainment" for ozone.[4] The San Francisco Bay Area is designated "Attainment" for other pollutants.

Ozone concentrations in the Bay Area are highest in the summer and fall, particularly during periods of high temperatures and light winds. Peak ozone concentrations tend to occur in warmer, more inland areas like the Livermore Valley and the South Bay. Ozone levels are lower in coastal cities like San Francisco and Oakland.

Bay Area particulate levels are higher in the winter than the summer. Peak concentrations occur throughout the Bay Area during cool, stagnant periods when pollutants from cars, trucks, fireplaces and other sources are trapped near the surface and are poorly dispersed. Because these conditions typically occur on a regional scale, when elevated particulate levels occur in Oakland they also occur in other areas.

Toxic air contaminant concentrations are also monitored at several locations in the Bay Area. Though some commonly emitted or ubiquitous toxic air contaminants are measured at these stations, others are not. For example there is as yet no monitoring method for specifically measuring DPM as distinct from other types of particulate matter in the ambient air so DPM concentrations can only be estimated by indirect means.

4.2.2 Local Setting

Air pollution potential in northwestern Alameda County is lowest close to the Bay, due largely to two factors: good ventilation from winds and relatively low flux of pollutants from upwind areas.[5] However, numerous sources of pollutants are located close to the Bay shore, and ship traffic on the Bay releases emissions that are subsequently blown towards shore. This concentration of sources contributes to community exposure to directly emitted pollutants in locations near the sources.

Recent air monitoring data collected in Alameda County shows that air quality in the County occasionally exceeds State and national ambient air quality standards for ozone, and the State particulate matter standards, but all other ambient air quality standards are attained[6].

The MAQIP focuses primarily on particulate pollution, more specifically on DPM in the immediate vicinity of the Port of Oakland due to the health risk potential of DPM. As previously noted, current monitoring technology is not capable of measuring DPM concentrations directly in the ambient air. However, DPM contributes to ambient concentrations of fine fraction particulate matter ($PM_{2.5}$), which is a subset of PM_{10}. Both $PM_{2.5}$ and PM_{10} can be directly measured, although the DPM fractions of $PM_{2.5}$ and PM_{10} can only be roughly estimated.

Neither CARB nor BAAQMD have traditionally operated a monitoring station to measure PM_{10} or $PM_{2.5}$ in Oakland by the Federal Reference Method (FRM) needed to determine compliance with the National Ambient Air Quality Standards (NAAQS); the closest monitoring site with both is in Fremont. The Filbert Street station in West Oakland, which has been in operation since 2001, measures $PM_{2.5}$ with a beta attenuation monitor, or BAM, technology which is not

[4] The official designations are: "Marginal-Nonattainment" for the National 8-hour ozone standard, and "Nonattainment" for the State ozone, PM_{10} and $PM_{2.5}$ standards.
[5] (BAAQMD, 1999) "CEQA Guidelines: Assessing the Air Quality Impacts of Projects and Plans", December 1999.
[6] (CARB, 2008a) ADAM data base http://www.arb.ca.gov/adam/cgi-bin/db2www/adamtop4b.d2w/start . The site was accessed March 25, 2008.

strictly comparable to the NAAQS[7]. In November 2007 the BAAQMD opened an air monitoring station on International Boulevard in Oakland to measure ozone, nitrogen dioxide, carbon monoxide and $PM_{2.5}$. No exceedances of any air quality standards were measured during the two months of operation of this station in 2007[8]. In addition, the BAAQMD plans to open a monitoring station near West Grand Avenue in Oakland in the near future.

Table 4-1 Cumulative Average Values of $PM_{2.5}$ and PM_{10}, West Oakland and Bay Area[a]

Location	$PM_{2.5}$ Cumulative Average ($\mu g/m^3$)	PM_{10} Cumulative Average ($\mu g/m^3$)
West Oakland - Port site	11.7	25.9
West Oakland - Residential site	10.6	23.5
Bay Area region	11.25	22.0

[a] Source: GAIA Consulting, Inc., "Cumulative Final Report (1997-2005), West Oakland Particulate Air Quality Monitoring Program", June 2006. The dates used for this analysis were: 1999-2005 for $PM_{2.5}$ and 4/1997-4/2005 for PM_{10}

From 1997 to 2005, the Port operated particulate monitoring stations to characterize existing particulate air quality conditions and to provide baseline data on particulate air pollution prior to and during construction and operation of the Port's Vision 2000 marine terminal and rail yard projects. One station was located on Port property ("Port site") and the other in West Oakland ("residential site"). While these monitoring stations used approved monitoring equipment and analytical methods, the data collected are not part of the San Francisco Bay Area's official monitoring record because the stations were not operated by CARB or BAAQMD. Nevertheless, the data shown in Table 4-1 indicate the average particulate levels at the locations monitored over the approximate eight years of program operation. Neither West Oakland station recorded any particulate levels exceeding federal $PM_{2.5}$ or PM_{10} standards during this period, although some measurements did exceed the State 24-hour PM_{10} standard.

4.3 Human Health Exposure, Risk and Other Impacts

This section provides a brief discussion of the health impacts of the more important air pollution problems to which maritime sources at the Port contribute. The purpose here is to provide an overview of the public health context in which the MAQIP was developed as well as some perspective on the Port's contribution.

4.3.1 Non-Cancer Effects of Ozone and Particulate Matter

The potential public health consequences of exposure to ozone and particulate matter are significant. According to CARB,

> "Exposure to levels of ozone above the current ambient air quality standard can lead to human health effects such as lung inflammation and tissue damage and impaired lung functioning. Ozone exposure is also associated with symptoms such as coughing, chest tightness, shortness of breath, and the worsening of asthma symptoms. The greatest risk for harmful health effects belongs to outdoor workers, athletes, children and others who spend greater amounts of time outdoors during smoggy periods."[9]

[7] (BAAQMD, 2008b) Personal communications with Eric Stevenson, BAAQMD, October 2 and 20, 2008.
[8] (BAAQMD, 2008a) "2007 Air Monitoring Network Plan", July 2008, p. 34: http://www.baaqmd.gov/tec/aammet/ambient_network_plan.pdf
[9] (CARB, 2008e) http://www.arb.ca.gov/research/aaqs/caaqs/ozone/ozone.htm accessed March 26, 2008.

Ozone forms on a regional scale from various precursor pollutants that are emitted over a large area. The primary precursors are reactive ROG and NO_x. The Port contributed <1% of regional (Bay Area) ROG emissions and about 2% of NOx emissions in 2005.[10]

CARB has described the impacts of exposure to particulate matter as follows:

> "Extensive research indicates that exposure to outdoor PM10 and PM2.5 levels exceeding current air quality standards is associated with increased risk of hospitalization for lung and heart-related respiratory illness, including emergency room visits for asthma. PM exposure is also associated with increased risk of premature deaths, especially in the elderly and people with pre-existing cardiopulmonary disease. In children, studies have shown associations between PM exposure and reduced lung function and increased respiratory symptoms and illnesses."[11]

CARB recently published a report that updated some of the prior estimates of the public health consequences of exposure to particulate matter, with a focus on increased mortality.[12] The report discusses a number of health studies that show an association between long term particulate exposure and increased rates of premature death, even at levels well below current federal and state ambient $PM_{2.5}$ standards. There is still considerable uncertainty as to the number of premature deaths that occur annually, but CARB estimated the number as somewhere between 14,000 and 24,000 statewide in 2005. An estimated 1,800 to 3,700 premature deaths, about 15% of the statewide total, occurs in the San Francisco Bay Area, as defined by the boundaries of the BAAQMD.[13]

These mortality estimates, which are higher than previous estimates, occur from exposure to all types of directly emitted and secondary particulate matter. CARB also updated its estimate of the portion of total particulate exposure and premature deaths that can be attributed to the goods movement industry in California. CARB estimated that 3,700 deaths occurred statewide because of goods movement sources in California in 2005.[14] A little over half of the estimated health impact was due to DPM, while nearly all of the rest was due to exposure to nitrate particulate matter which forms via conversion of NOx emissions from goods movement sources to secondary particulate matter. Goods movement emissions are clearly a major contributor to estimated premature deaths in California.

CARB has not yet updated its estimate of the non-cancer adverse health effects caused by all goods movement sources in the Bay Area or by the maritime source emissions associated with the Port of Oakland. A very rough estimate of the Port's contribution to regional-scale health impacts can be made by comparing Port DPM and NOx emissions with regional emissions totals. The Port's estimated 2005 DPM emissions were <1% of Bay Area DPM while, as reported above, Port-related NOx emissions are about 2% of the region's total.[15]

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[10] (CARB, 2006c) Regional Bay Area emissions from "California Almanac of Emissions and Air Quality-2006 Edition", http://www.arb.ca.gov/aqd/almanac/almanac06/almanac06iu.htm Table A-25.

[11](CARB, 2008f) http://www.arb.ca.gov/research/aaqs/caaqs/pm/pm.htm accessed March 26, 2008.

[12] (CARB, 2008d) "Methodology for Estimating Premature Deaths Associated with Long-term Exposures to Fine Airborne Particulate Matter in California", Draft Staff Report, May 2008. The report was presented to the CARB at a public meeting on May 22, 2008.

[13] ibid., Tables 4a and 4b, p. 34.

[14] ibid., Table 6, p. 38.

[15] (CARB, 2006c) Regional Bay Area emissions from "California Almanac of Emissions and Air Quality-2006 Edition", http://www.arb.ca.gov/aqd/almanac/almanac06/almanac06iu.htm, Tables A-25 and Table 5-42.

4.3.2 Cancer Risk from Diesel Particulate Matter

While DPM contributes to non-cancer impacts, it is also a toxic air contaminant and therefore a source of cancer risk. The potential cancer risk from known carcinogens is expressed as the incremental number of potential cancers that could develop per million people, assuming the population is exposed to the carcinogen at a defined concentration continuously over a presumed 70-year lifetime. The potential number of excess cancers per million people can also be interpreted as the incremental likelihood of an individual exposed to the carcinogen developing cancer from continuous exposure over a lifetime.

CARB used monitoring data for some toxic air contaminants, along with modeled estimates of DPM concentrations, to estimate the background cancer risk in the Bay Area from the combination of toxic air contaminants to which the public is routinely exposed. CARB estimated that risk to be 660 in a million in 2000, with about 70 percent of that total attributable to DPM exposure.[16] Since risk levels vary from place to place due to a variety of factors, this estimate should be considered a rough estimate of average risk in the San Francisco Bay Area.

The health risk assessment conducted by CARB in cooperation with the BAAQMD, the Port, and Union Pacific Railroad, estimated cancer risk in West Oakland from all major sources of DPM in the area. The health risk assessment is a complex process that is based on current knowledge and a number of assumptions. The study estimated average cancer risk levels from DPM exposure in West Oakland at 1,180 in one million in 2005, of which about 16% (or 192 chances in one million) was caused by DPM associated with maritime operations at the Port.[17] This risk estimate should not be interpreted as a literal prediction of disease incidence in the affected communities but more as a tool for comparison of the relative risk between one facility or location and another. For more information on the 2008 West Oakland health risk assessment, see Section 5.2.

4.4 Regulatory and Policy Setting

CARB listed DPM as a toxic air contaminant in 1998 based on its potential to cause cancer, premature death, and other health problems. In September 2000, CARB followed up the identification of DPM as a toxic air contaminant by adopting a statewide risk reduction strategy: "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles". The goals were to reduce statewide DPM emissions and average risk from DPM exposure by 75 percent by 2010, and 85 percent by 2020, compared to 2000 levels. The plan targeted virtually every category of diesel engines in the state.

In 2005, California initiated a broad planning initiative to develop and adopt a "Goods Movement Action Plan" (GMAP) for the state. The GMAP and the various initiatives that stemmed from it are important to the MAQIP for two primary reasons. First, it led to CARB's setting statewide goals for reducing the air quality impacts of goods movement sources. Those goals, particularly the goal of reducing statewide cancer risk from DPM exposure, became an important marker for the Port and the Task Force in setting MAQIP goals. Second, the GMAP led CARB to adopt a major regulatory initiative to reduce DPM emissions. Compliance with the

[16] (CARB, 2006c) "California Almanac of Emissions and Air Quality-2006 Edition", http://www.arb.ca.gov/aqd/almanac/almanac06/almanac06iu.htm, Table 5-43.
[17] (CARB, 2008b) "Diesel Particulate Matter Health Risk Assessment Study for the West Oakland Community: Preliminary Summary of Results, Fact Sheet", March 2008.

regulations adopted by CARB and other agencies by the maritime and related industries is essential to meeting the MAQIP emissions and health risk reduction goals.

4.4.1 California Goods Movement Action Plan

The overall policy goal of the GMAP is "to improve and expand California's goods movement industry and infrastructure, in a manner which will:

- generate jobs,
- increase mobility and relieve traffic congestion,
- improve air quality and protect public health,
- enhance public and port safety, and
- improve California's quality of life."[18]

An important offshoot of the focus on improving the goods movement system was the approval by California voters of the "Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006." The impact of the "infrastructure bond," or I-Bond as it came to be called, as a funding source for efficiency improvements and air quality projects at the Port of Oakland is significant.

4.4.2 CARB Emission Reduction Plan for Ports and Goods Movement in California

CARB named its master plan for reducing emissions from goods movement activities throughout the state, the "Emission Reduction Plan for Ports and Goods Movement in California," (GMERP). The plan, which was adopted in 2006, assessed the public health impacts and costs of the contribution made by goods movement sources to public exposure to diesel particulate matter (DPM), ozone and other pollutants. It estimated current and future emissions and proposed a series of regulatory actions for diesel sources under state jurisdiction. The plan focused heavily on DPM and NOx, and contained a number of specific statewide goals, including reducing DPM emissions back to 2001 levels by 2010 and reducing statewide DPM health risk 85 percent by 2020, compared to 2001 levels. The plan also called for a major reduction in NOx emissions by 2020, with specific goals for the Los Angeles area.

Although container ports like Oakland's are an important focus, CARB's plan has a broader objective. The plan is aimed at reducing emissions from all goods movement activities, both international and domestic, and included sources such as bulk cargo, car carriers and refinery vessels, and rail and cargo truck movements on land. The planned percent reduction in DPM emissions and risk is a statewide goal and benefits will not occur uniformly across the state. In particular, the benefits will vary from port to port.

The CARB resolution adopting the GMERP risk and emissions reduction goals called for the CARB staff to bring a series of regulations to the governing board for consideration in 2007 and 2008. Specifically, the regulations were to address port trucks, privately-owned truck fleets, low sulfur marine propulsion fuel, shore power for ships and harbor craft, harbor craft fleets, new harbor craft engine standards, and upgrading switcher/yard locomotives.[19]

4.4.3 Air Quality Regulations Affecting Seaport Operations

Table 4-2 briefly summarizes regulatory activities affecting emissions sources at the Port of Oakland. While most actions are the responsibility of CARB because of their legal jurisdiction

[18] (Cal EPA, 2007) "Goods Movement Action Plan", Business, Transportation and Housing Agency and California Environmental Protection Agency, January 2007

[19](CARB, 2006a) CARB Resolution 06-14, April 20, 2006

over California's port-related sources, the federal EPA holds responsibility for standards covering engine emissions. In addition, the BAAQMD is a regulatory partner with CARB and plans to support the overall emissions reduction effort with inspections, enforcement and other compliance-related measures. In the longer term, the International Maritime Organization (IMO) intends to continue adopting international treaty-based voluntary standards that will reduce emissions through amendments to Annex VI ("Prevention of Air Pollution from Ships") of the International Convention for the Prevention of Pollution from Ships (MARPOL). More details on each of the listed regulations are provided in Appendix E in the summary prepared by members of the MAQIP Interagency Group.

Most of the regulations listed in Table 4-2 are "future-effective"; that is, they will produce most or all of their emissions reductions in future years as they are phased in. The emissions forecasts used in the MAQIP include the estimated benefits of most, but not all of those regulations (see Table 6-2).

Because future-effective regulations can be delayed, amended or even invalidated by court decisions, their estimated future benefits must be re-evaluated periodically. In the event of such delays, the Port intends to work actively with regulatory agencies, industry groups, other ports, community members and others to pursue appropriate revisions to regulations that may need modifications to achieve the targeted emissions reductions. Regulatory delays would also be discussed with members of a maritime stakeholders group.

Table 4-2 Summary of Adopted and Anticipated Maritime Air Quality Regulations and Standards by Source

Agency	Rule or Control Measure Description	Pollutants Most Affected	Status
Ocean-Going Vessels (Ships)			
CARB	Use low sulfur fuel in auxiliary and main engines and in boilers	DPM, SO_2 & NOx	Adopted in July 2008
CARB	Auxiliary engines use dockside electrical power while hotelling	DPM & NOx	Adopted 2007, phase-in beginning in 2014
EPA	US large marine engine emissions standards	DPM & NOx	Proposed for adoption in 2009
IMO	International large marine engine emissions standards	DPM & NOx	Amendments to MARPOL Annex VI adopted in October 2008 for implementation starting in 2010
IMO	International small marine engine standards	NOx	In effect, not ratified by US
CARB	Vessel speed reduction during cruise mode	NOx	Under development for possible 2009 adoption
IMO	Use lower sulfur fuel in Western US waters (SECA)	DPM, SO_2	Application under development, due in 2009
Cargo Handling Equipment			
CARB	Retrofit or replace existing equipment with new clean engines	DPM & NOx	Adopted and being phased-in beginning 2007
CARB/EPA	Emissions standards for new off-road engines	DPM & NOx	Adopted and in effect
CARB	Require use of ultra-low sulfur diesel fuel	DPM, SO_2, NOx	Adopted and in effect
Harbor Craft (Tugs)			
EPA	Emissions standards for new & rebuilt marine engines	DPM & NOx	Adopted, effective starting in 2009
CARB	Require use of ultra-low sulfur diesel fuel	DPM, SO_2	Adopted and in effect
CARB	Retrofit or replace existing equipment with new clean engines	DPM & NOx	Adopted in 2007, phase-in starting late 2009
On-road Trucks & Port Trucks			
CARB	Retrofit or replace existing port trucks with new clean engines	DPM & NOx	Adopted in 2007, phase-in starting in 2009
CARB	Retrofit or replace trucks in all private fleets with clean new engines	DPM & NOx	Proposed for adoption in December 2008
CARB	Emissions standards on new truck engines	DPM & NOx	Adopted, with phase-in starting in 2007
CARB	Require use of ultra-low sulfur diesel fuel	DPM, SO_2	Adopted and in effect
Locomotives			
EPA	Emissions standards on new and remanufactured locomotive engines	DPM & NOx	Adopted, phase-in of most recent rule starting in 2010
CARB	Require use of ultra-low sulfur diesel fuel on "intrastate" locomotives	DPM, SO_2	Adopted and in effect
CARB and the railroads also have a MOU to reduce locomotive idling in rail yards			
All Port Sources			
BAAQMD	San Francisco Bay Area Green Ports Initiative includes BAAQMD enforcement of CARB regulations affecting Port operations; grants for earlier or greater emission reductions; outreach; and monitoring progress.	all	Adoption expected by December 2008

5 PORT OF OAKLAND BASELINE EMISSIONS AND HEALTH RISK

The Port prepared a 2005 seaport air emissions inventory, which was used by CARB to conduct a West Oakland human health risk assessment (HRA) study. This section summarizes the results of these two efforts. Together, the 2005 inventory and the HRA constitute a baseline to assess progress in improving air quality from implementation of the MAQIP.

5.1 Baseline Emissions

The Port's "2005 Seaport Air Emissions Inventory" (March 2008)[1] identifies and quantifies air emissions from maritime activities during the 2005 baseline year. The inventory is organized by five major source categories:

- Deep-Draft Ocean-Going Marine Vessels (OGV)
- Commercial Harbor Craft (dredging and assist tugs)
- Cargo Handling Equipment (CHE)
- Trucking (container movements)
- Locomotives

The Port's baseline inventory provides estimates for emissions of five "criteria" air pollutants:

- Reactive organic gases (ROG)
- Carbon monoxide (CO)
- Nitrogen Oxides (NOx) which consist primarily of NO with some NO_2
- Particulate matter including diesel particulate matter (PM)[2]
- Sulfur oxides (SOx) which consist almost entirely of SO_2

The Port voluntarily chose to prepare an air emissions inventory of its seaport in advance of any regulatory directive. The emissions inventory highlighted the Port's commitment to improve understanding of the nature, location and magnitude of emissions from its maritime-related operations. The Port decided to develop this inventory to better understand the emissions from typical Port activities so the Port and stakeholders can better address its impacts on air quality. The inventory provides a technical basis for setting priorities and evaluating the cost-effectiveness and potential benefits of air pollutant control measures outlined in the MAQIP.

The Port and its consultants; ENVIRON and Sierra Nevada Air Quality Group, provided CARB with detailed spatial information on emissions so the inventory could be used as input to the West Oakland health risk assessment study performed by CARB. In January 2007 the Port released to the public a draft working document presenting the Port-proposed methodology for estimating emissions for each source category, along with CARB's comments on the proposed methodology. Public comment on the methodology was accepted through a Port-sponsored meeting on January 31, 2007; no comments directly related to the methodology were received. Preparation of the inventory commenced and a review copy of the completed emissions inventory was released in August 2007 for public comment. Comments were summarized in the "Response to Comments" document completed in November 2007. One of the comments received pointed to the need to include construction equipment emissions in the inventory. In response to this, Port staff commissioned a "2005 Seaport Construction Air Emissions

[1] Port of Oakland, "2005 Seaport Air Emissions Inventory" (March 2008) is available at: www.portofoakland.com/environm/airEmissions.asp

[2] Nearly 95% of the particulate matter emissions included in the inventory is diesel particulate matter (DPM). Some non-DPM emissions come from boilers on ships and LPG-powered engines on some cargo handling equipment.

Inventory", which was posted on the Port's website in March 2008, along with the finalized emissions inventory for all other sources. Full documentation of the data and assumptions used to develop the Port's inventory are available on the emissions inventory website[3].

The seaport emissions inventory includes air emissions generated by maritime activities conducted by the Port of Oakland's tenants. On the water side, the spatial domain of the inventory includes Port-related marine vessel transit from dockside out through the Golden Gate Bridge, to the first outer buoys beyond the Pilot Buoy, approximately 30 miles away from the Port. On the land side, the spatial scope of the inventory includes nine marine terminals, one rail yard which is situated on Port-owned property (the Oakland Intermodal Gateway) and the road traffic between those facilities and the nearest freeway interchanges. The Port area was defined approximately by the boundaries of I-80, I-880, and the Howard Terminals (Berths 67 and 68) adjacent to Jack London Square. Within this defined geographic area, three significant areas were specifically excluded as they were not controlled or operated by the Port of Oakland in 2005: the Schnitzer Steel terminal, the Union Pacific rail yard, and the former Oakland Army Base located between Maritime Street and I-880.

A summary of the Port emissions inventory is provided in Table 5-1. Port sources are estimated to have released a total of 274 tons of PM in 2005, nearly all of which (262 tons) is DPM. To put the Port's emissions in perspective, DPM emissions from all sources in the San Francisco Bay Air Basin were estimated to total 4,550 tons in 2005 (CARB, 2006b). Thus the DPM emissions from sources at the Port represent less than 6% percent of the total estimated Bay Area DPM emissions.

Table 5-1 Port of Oakland Emissions Summary by Emission Source Category, 2005 (tons)

Emission Source Category	ROG	CO	NOx	PM	SO2
Ocean-going vessels (OGV)	117	235	2,484	220[1]	1,413
OGV – Off-shore[2]	*97*	*169*	*1717*	*158*	*950*
OGV – Berth[3]	*21*	*65*	*767*	*61*	*464*
Harbor Craft	22	83	345	13	3
CHE	53	408	766	22[1]	7
Truck[4]	52	154	339	17	2
Locomotive	7	11	76	2	2
Construction	3	12	34	1	0.25
Total	**254**	**903**	**4,044**	**274**	**1,428**

[1] A small portion of the total PM emissions from OGVs and CHE are not classified as diesel particulate matter (DPM) as defined by CARB. This includes PM from OGV diesel fired boilers and CHE liquefied petroleum gas (LPG) engine emissions. DPM emissions from OGVs are 208.5 tons, DPM emissions from CHE are 21.2 tons; PM emissions from all other source categories are 100% DPM. Thus, the Port total DPM emissions equal 262 tons, 12 tons less than the total PM emissions.

[2] Includes emissions from ships while transiting outside the Golden Gate, while operating in the Reduced Speed Zone between the Golden Gate and the Bay Bridge, and while maneuvering between the Bay Bridge and the dock.

[3] Includes only emissions from auxiliary engines and boilers while ship is berthed (hotelling emissions).

[4] Based on EMFAC2007 as used in emission projection analysis; EMFAC2006 was used in the original inventory.

Trucks, harbor craft, and cargo handling equipment each produced 5-10% of the estimated Port-related PM emissions. Locomotives operating at the Oakland Intermodal Gateway produced a small fraction of the total emissions. Ocean-going vessels constitute the largest source category for all pollutants, producing 80-85% of estimated PM emissions and the major portion of other pollutants included in this emissions inventory.

[3] (Port of Oakland, 2007b) http://www.portofoakland.com/environm/airEmissions.asp

Some MAQIP Task Force members expressed concerns that the "emission inventory significantly underestimates the emissions from Port trucks and thus, the Port's contribution to regional air pollution."[4] The Port's emissions inventory characterized the emissions from Port trucks using the best available information at the time for a defined geographic area; DPM was calculated at 17 tons in 2005. The CARB health risk assessment of West Oakland sources (Section 5.2) allocated a portion of freeway trucks outside the Port boundaries to the Port, resulting in an additional 3 tons of DPM in 2005 from Port trucks. Given the complex nature of port drayage, emissions from Port trucks are possibly the most difficult source category to quantify in an emissions inventory. As additional drayage truck information is collected that may better characterize the emissions in both the West Oakland community and the region, the information will be included in subsequent Port inventory updates.

It is important to keep in mind that the location where emissions are released is often as significant as – or even more significant than – the total quantity released. Emissions occurring close to a community will have a greater effect on human health risk on a per ton basis than more remote sources. Impacts of the various sources on West Oakland air quality will not necessarily be directly proportional to the magnitude of their emissions since some sources are located much closer to West Oakland than others. For example, particulate matter emissions from ocean-going vessels transiting outside the Golden Gate will have less impact to sensitive receptors in West Oakland than emissions that occur closer to shore. The HRA (Section 5.2) provides more information on the relationship between location and health risk.

5.2 CARB West Oakland Human Health Risk Assessment

In March 2008, CARB, working in cooperation with the Port , Union Pacific (UP) Railroad, and the BAAQMD, completed a study designed to help understand the potential health impacts from DPM emissions on residents of the West Oakland community. The purpose of CARB's study was to:

- Investigate potential health risks to residents of West Oakland and the Bay Area from DPM emissions from Port seaport operations, from UP railyard operations and from freeway, industrial, construction and other non-Port/non-UP diesel sources in and around West Oakland; and
- Provide information to help evaluate the effectiveness of possible mitigation measures.

CARB examined the impacts of diesel emissions from all major sources in and around West Oakland. These sources were divided into three groups or "parts":

- Part I (Maritime Port of Oakland): ocean-going vessels, commercial harbor craft, cargo handling equipment, on-port locomotives (Oakland Intermodal Gateway) and port drayage trucks operating on Port property, in West Oakland, and on local freeways
- Part II (Union Pacific Railyard): locomotives, cargo handling equipment, drayage trucks, and truck refrigeration units and reefer cars
- Part III (Non-port and non-Union Pacific Railyard areas in and adjacent to the West Oakland Community): on-road trucks, ocean-going vessels, commercial harbor craft, ferries, fishing fleets, cargo handling equipment, locomotives, Amtrak Maintenance facility, major construction projects, stationary point sources, truck-based businesses and distribution centers.

[4] Letter from Diane Bailey et al., Natural Resources Defense Council, July 14, 2008.

CARB estimated the impacts of these parts individually and cumulatively on West Oakland (population 22,200) in 2005. CARB also estimated impacts in 2015 and 2020 based on projected future emission levels. CARB also estimated the impact of just the Part I sources over a much larger area of about 3,800 square miles with a total population of 5 million stretching from Petaluma and Fairfield in the north, to San Jose in the south, and from the Pacific coastal waters in the west, to Livermore and Antioch in the east.

Key findings from CARB's study were:

- DPM ambient concentrations in West Oakland are estimated to be nearly three times the background DPM concentrations averaged over the entire Bay Area.
- The estimated lifetime potential cancer risk for residents of West Oakland from exposure to all DPM emissions included in the study is estimated to be about 1,200 excess cancers per million. This estimate assumes residents are exposed to the estimated 2005 outdoor DPM levels continuously for 70 years. By way of comparison, the corresponding background risk from DPM emissions over the entire Bay Area is estimated to be 480 excess cancers per million, the corresponding background risk from emissions of all air toxics species in the Bay Area is 660 per million and the expected cancer rate from all causes, including smoking, is about 200,000 to 250,000 per million, according to the CARB study.
- Of the total West Oakland DPM exposure risk noted above (1,200 per million from all sources), emissions from Port seaport operations (Part I) contribute 16% (190 per million), Union Pacific railyard (Part II) sources contribute 4% (40 per million) and other (Part III) sources in and around West Oakland contribute the remaining 80% (970 per million).
- As shown in Figure 5-1, the largest contributors to the potential excess cancer risk levels in West Oakland are emissions from non-Port on-road heavy-duty trucks, followed by ocean-going vessel (OGV) emissions (representing transiting, maneuvering, anchoring, and hotelling emissions), harbor craft, locomotives, and cargo handling equipment.

CARB's projections of future DPM emissions indicate that emissions and associated health risks will be reduced in West Oakland by about 80 percent by 2015, reflecting reductions achieved by State and Federal regulations. The Port undertook a more detailed examination of emissions reductions expected in the future from Port sources; this analysis is presented in Section 6.

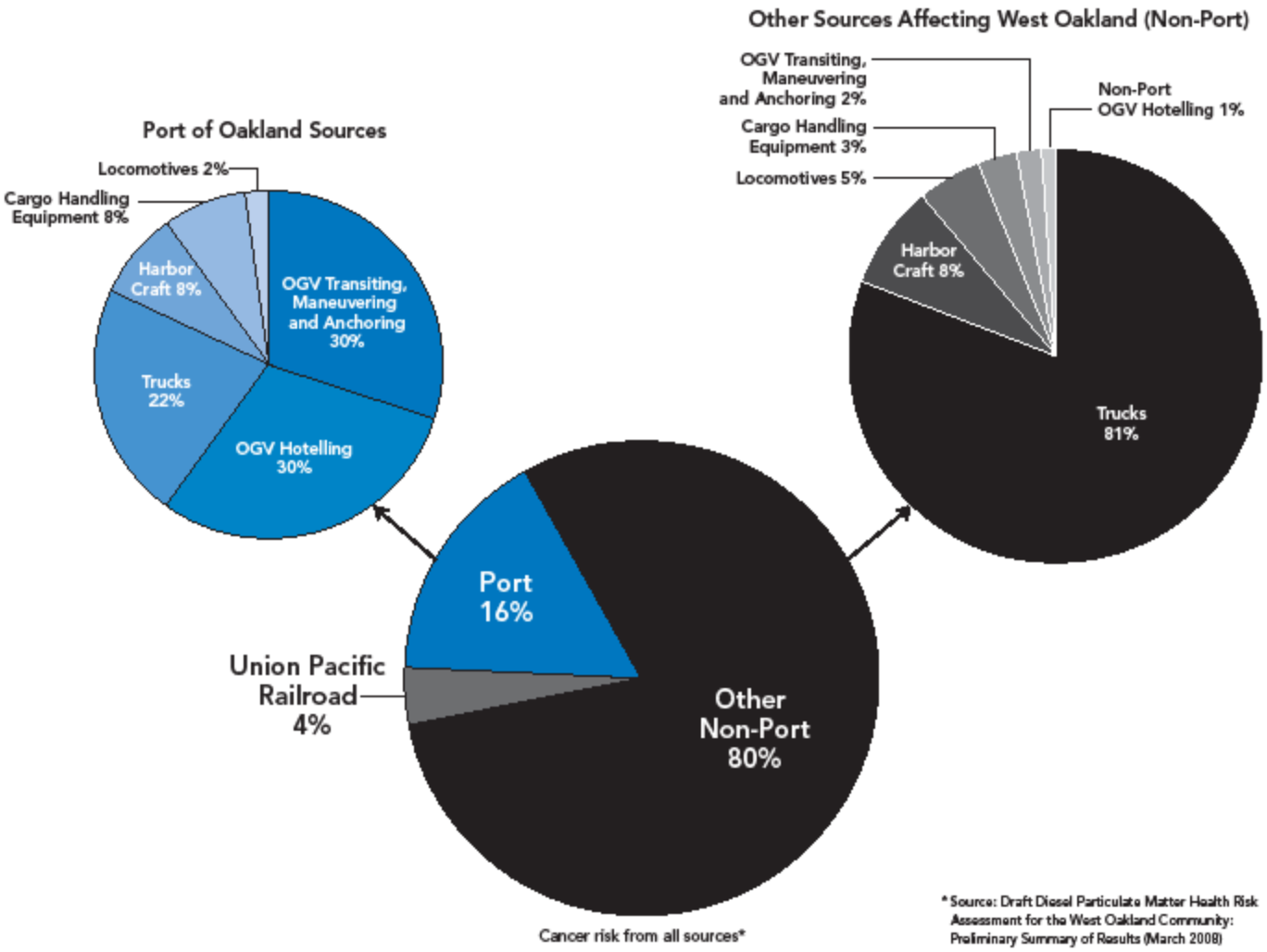
The results of the health risk assessment study reinforce the link between land uses and community health. With advice from members of the CARB Environmental Justice Stakeholders Group, CARB prepared "Air Quality and Land Use Handbook: A Community Health Perspective" (April 2005), which recommends considering limitations on the siting of new sensitive land uses, such as new residences, schools, day care centers, playgrounds, and medical facilities, in areas immediately downwind of ports. The handbook recommends:

> *Where possible, we recommend a minimum separation between new sensitive land uses and existing sources. However, this is not always possible, particularly where there is an elevated health risk over large geographical areas. Areas downwind of ports and rail yards are prime examples. In such cases, we recommend doing everything possible to avoid locating sensitive receptors within the highest risk zones.*[5]

The Port will continue to work with the City of Oakland and local developers to ensure that only appropriate land uses are located adjacent to the seaport area.

[5] (CARB, 2005) "Air Quality and Land Use Handbook: A Community Health Perspective", April 2005.

Figure 5-1: Source Contributions to Diesel Particulate Matter Cancer Risk in West Oakland, 2005



6 PORT OF OAKLAND FUTURE EMISSIONS AND HEALTH RISK

While the Port's maritime business will likely grow through 2020 and beyond, some air emissions and health risk to West Oakland residents and workers from seaport activity are projected to decline dramatically due to existing and pending air quality regulations.

Because the expected benefits of regulations were central to the choice of MAQIP goals and to the plan's three-pronged approach (emissions reductions through regulations and through additional initiatives, and support for enforcement of regulations), it is important to see how those regulations can make a difference in future emissions associated with cargo activity. Projections of future cargo at the Port were analyzed for emissions, taking into account the benefits of existing and likely future regulations. The emissions data were in turn used to estimate future levels of health risk to the community resulting from seaport operations. By better understanding the potential reductions, the Port, its tenants and its business partners can more clearly manage the air quality impacts of operations at the seaport over the coming years, and target additional measures, as necessary, to help reach the MAQIP goals.

6.1 Future Cargo Activity Levels

Overall maritime activity at the Port is governed by the market demand for international and domestic cargo movement into and out of Northern California and the availability of labor and critical physical assets such as terminal space and rail lines needed to meet the demand. To estimate future emissions, projections of the total annual cargo throughput at the Port resulting from the interplay of these governing factors are needed. The Port chose 2012 and 2020 as the forecast years for seaport activity to:

- Provide an estimate of interim (i.e., 2012) emissions and emissions reductions, and
- Maintain consistency with CARB statewide emission projections, which are based on the year 2020.

Due to uncertainties about future market conditions and development opportunities, four activity forecasts (high, medium, low and no growth) were considered, corresponding to different assumptions about future growth in seaport operations between the emissions baseline year of 2005 and 2020 (see Figure 6-1). These scenarios were developed expressly for the purpose of air quality master planning at the seaport, using a range of planning and feasibility assumptions about existing and potential future facilities. Given this planning context, the scenarios were developed using aggressive growth assumptions so as to limit the risk of underestimating future activity levels (and therefore emissions). The growth scenarios range from most aggressive (i.e. high growth) to least aggressive (i.e., low growth), and also include a no-growth alternative for comparison. None of the scenarios were reviewed or approved by the Board of Port Commissioners for purposes of facility development, expenditure of funds or CEQA determinations. Furthermore, the scenarios do not replace or eliminate the need for project-specific forecast analyses or subsequent revisions to forecasts as more information becomes available between now and 2020.

Given the aggressive planning assumptions used for this forecasting effort, even the low growth scenario may somewhat overestimate the likely container cargo (as 20-foot equivalent unit, or TEU) throughput in both 2012 and 2020 in the absence of significant new terminal or rail facility construction. Similarly, the medium growth scenario may overestimate future throughput, even if new cargo facilities are constructed. The high growth scenario of 6 million TEUs is

considered an upper bound that is very unlikely to be achieved by 2020, and approximately represents the maximum possible throughput at the Port based on logistical and capacity constraints, assuming construction of all necessary terminal and rail facilities. These forecast scenarios were developed prior to the national and international economic downturn in 2008, and may be overly optimistic representations of future cargo growth.

Given the need to balance business and public health considerations, the Port chose the medium growth scenario for the MAQIP projections since it is unlikely to underestimate future activity levels and resulting air emissions. Therefore, all forecasted emissions and reductions throughout the MAQIP are based on the medium growth scenario.

Forecasts of activity past 2020 are subject to even higher levels of speculation and uncertainty, thus making emission estimates past that year unsuitable for air quality planning. Activity and emission forecasts can be updated at a later date when more accurate information on post-2020 growth projections becomes available.

The growth in cargo throughput will result in increased activity by the various sources of air pollution at the Port. Some categories will grow faster than others. The relative growth of activity by trucks, rail and the other emissions source categories under the medium growth scenario is shown graphically in Figure 6-2. Although rail activity shows the highest *relative* growth in the years 2012 through 2020, rail shipments accounted for a relatively small fraction of total TEUs in the 2005 base year. Trucks will continue to move most containers to and from markets outside the Port area well into the future, although rail transport of cargo containers between the Port and more distant markets is expected to take an increasing share over the years. The projected market shares for off-port truck and rail movements based on the medium growth scenario are provided in Figure 6-3.

6.2 Future Emissions

Using the activity projections in Section 6.1, the Port developed forecasts of emissions for 2012 and 2020 for each major category of equipment used in seaport related activities (OGVs, harbor craft, cargo handling equipment, trucks and rail), incorporating expected changes due to existing and likely future air quality regulations. The forecasts show that current regulatory efforts are expected to yield substantial PM and SOx emission reductions in 2012 and 2020 relative to 2005 despite the considerable growth in cargo throughput projected under the medium growth scenario for this period.

A summary of estimated future year (2012 and 2020) emissions of NOx, PM, and SOx from the source categories located at the Port are presented in Table 6-1. Graphical summaries of projected PM, NOx, and SOx emissions are presented in Figure 6-4. Since emissions from sources located off-shore pose less of a risk to West Oakland and other communities near the Port than do similar levels of emissions from sources located on land or at the shoreline, all emissions in Table 6-1 are also presented in terms of off-shore and on-shore sources. Off-shore sources include OGV main and auxiliary engine and boiler emissions while transiting between the open ocean and the Bay Bridge, while maneuvering between their berths and the Bay Bridge and while anchoring off-shore of the Port, along with all harbor craft emissions.[1] On-shore sources include OGV auxiliary engine and boiler emissions while hotelling at berth and all cargo handling equipment, truck, and rail sector emissions.

[1] All harbor craft at the Port of Oakland are assumed to shut off their engines while at berth.

Figure 6-1: Port of Oakland Future Cargo Growth Scenarios, In Annual TEUs

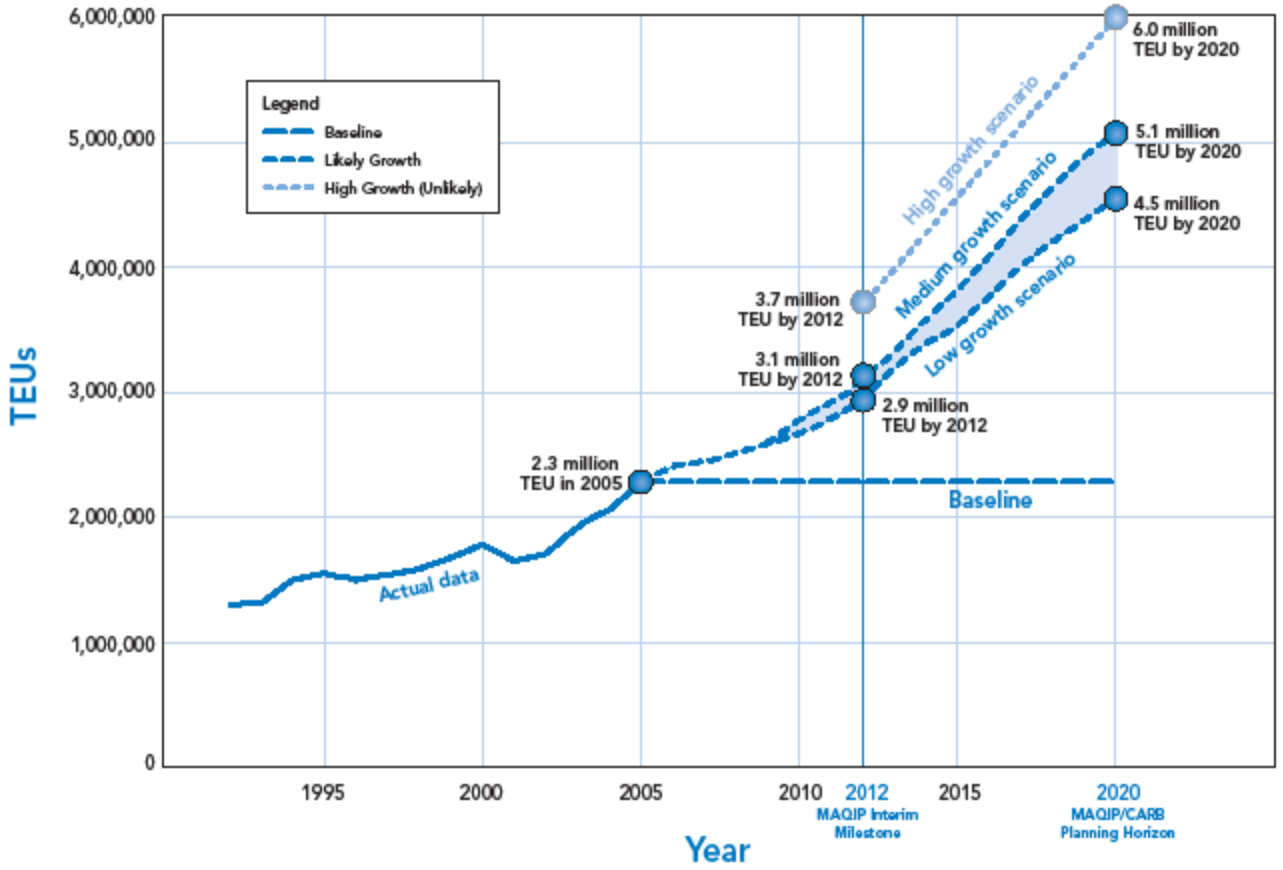


Figure 6-2: Rate of Growth of Seaport Activity by Source Category, 2005-2020 (Medium Growth Scenario)

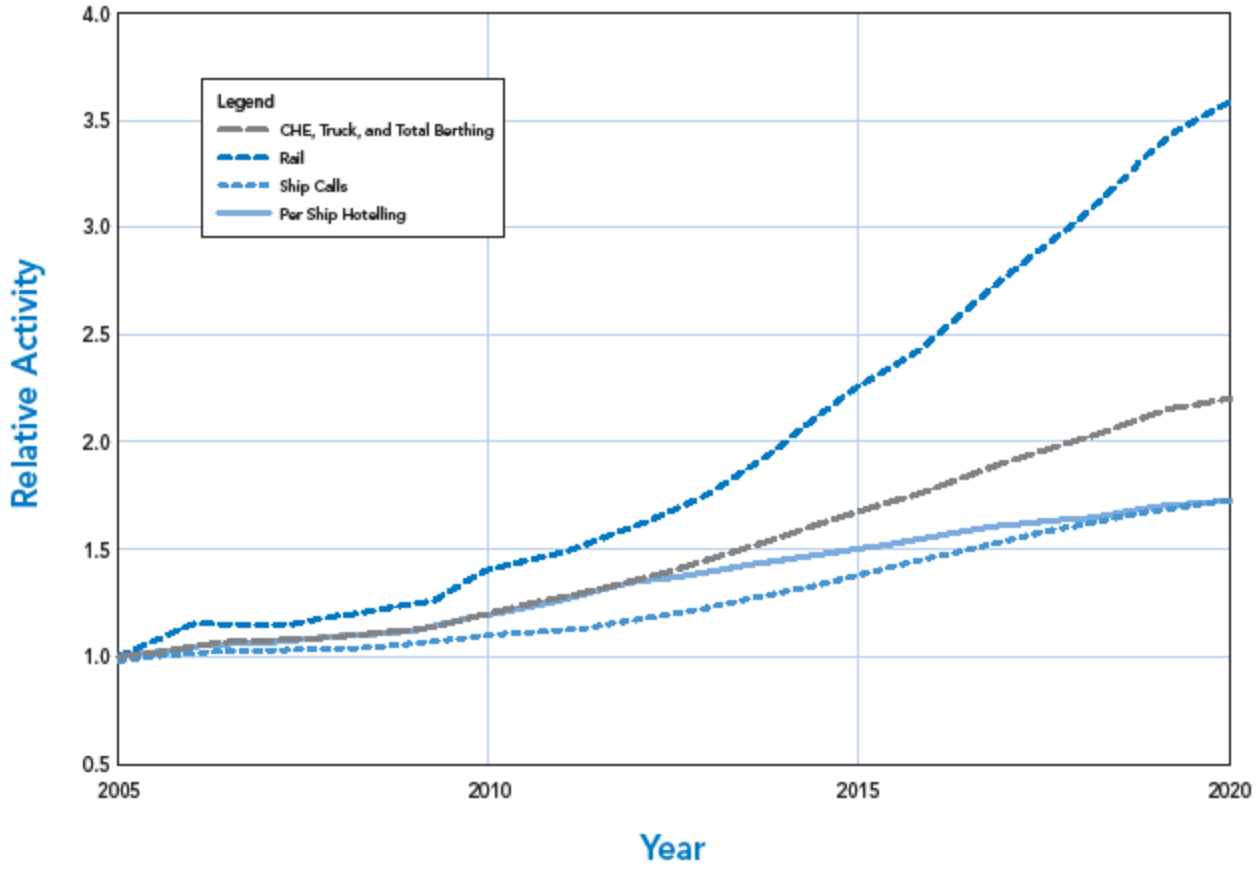
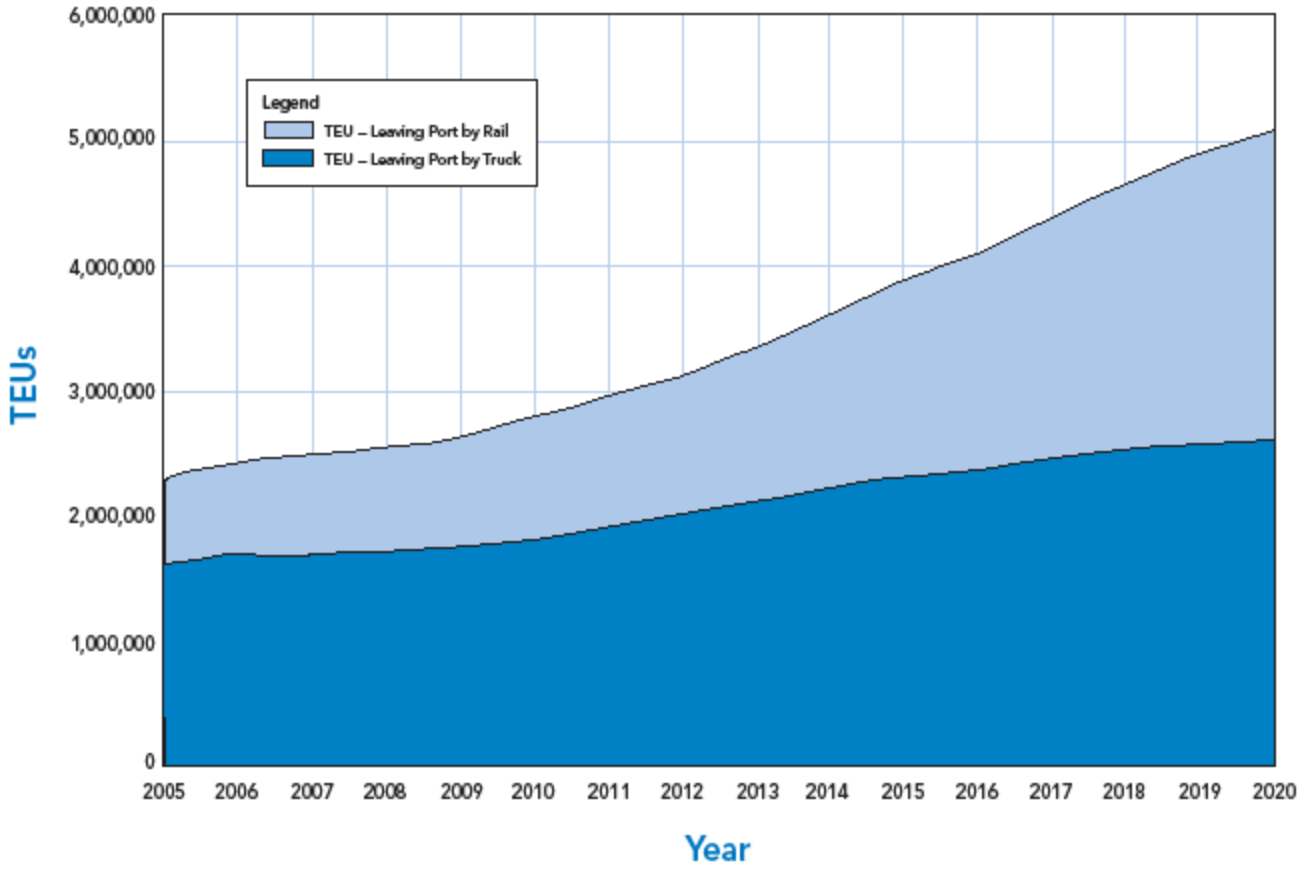


Figure 6-3: Port of Oakland Truck and Rail Forecast, In Annual TEUs (Medium Growth Scenario)



Projections of all pollutants, including ROG and CO, for each of the activity forecasts of baseline, low, medium and high cargo growth are provided in Appendix G.

Table 6-1 Port of Oakland Baseline and Projected Emissions for All Source Categories, Based on Regulations, in Tons per Year (Medium Growth Scenario)[a]

Emission Source[b]	2005			2012 Forecast[c]			2020 Forecast[c]		
	NOx	PM	SOx	NOx	PM	SOx	NOx	PM	SOx
Total Off-Shore **% change from 2005**	**2,062**	**172**	**953**	**2,301 (+12%)**	**175 (+2%)**	**926 (-3%)**	**3,018 (+46%)**	**56 (-67%)**	**73 (-92%)**
OGV - Off-Shore	*1,717*	*158*	*950*	*2,013*	*163*	*924*	*2,821*	*48*	*73*
Harbor Craft	*345*	*13*	*3*	*287*	*13*	*2*	*198*	*8*	*0*
Total On-Shore **% change from 2005**	**1,948**	**102**	**475**	**1,964 (+1%)**	**36 (-65%)**	**32 (-93%)**	**1,375 (-29%)**	**20 (-81%)**	**19 (-96%)**
OGV - Berth	*767*	*61*	*464*	*1,008*	*19*	*30*	*529*	*11*	*17*
CHE	*766*	*22*	*7*	*427*	*11*	*1*	*226*	*4*	*2*
Truck	*339*	*17*	*2*	*422*	*4*	*0.3*	*405*	*2*	*0.4*
Locomotive	*76*	*2*	*2*	*107*	*2*	*0*	*215*	*3*	*0*
Grand Total **% change from 2005**	**4,010**	**273**	**1,428**	**4,265 (+6%)**	**211 (-23%)**	**958 (-33%)**	**4,394 (+10%)**	**76 (-72%)**	**92 (-94%)**

Note: This table was revised subsequent to the June 2008 Draft MAQIP document due to: a change in CARB's main engine low sulfur fuel rule to include requirements for using low sulfur fuel in ship boilers; an error in double-counting the benefit of the auxiliary engine low sulfur fuel rule while transiting and maneuvering, and minor transcription errors. Totals may differ slightly due to rounding.

[a] Results for the medium growth scenario are presented here; results for the no growth, low growth and high growth scenarios, and for ROG and CO for all scenarios can be found in Appendix G.

[b] Construction emissions are not included in this table because future construction estimates are not available. For 2005 construction estimates, see Table 5-1.

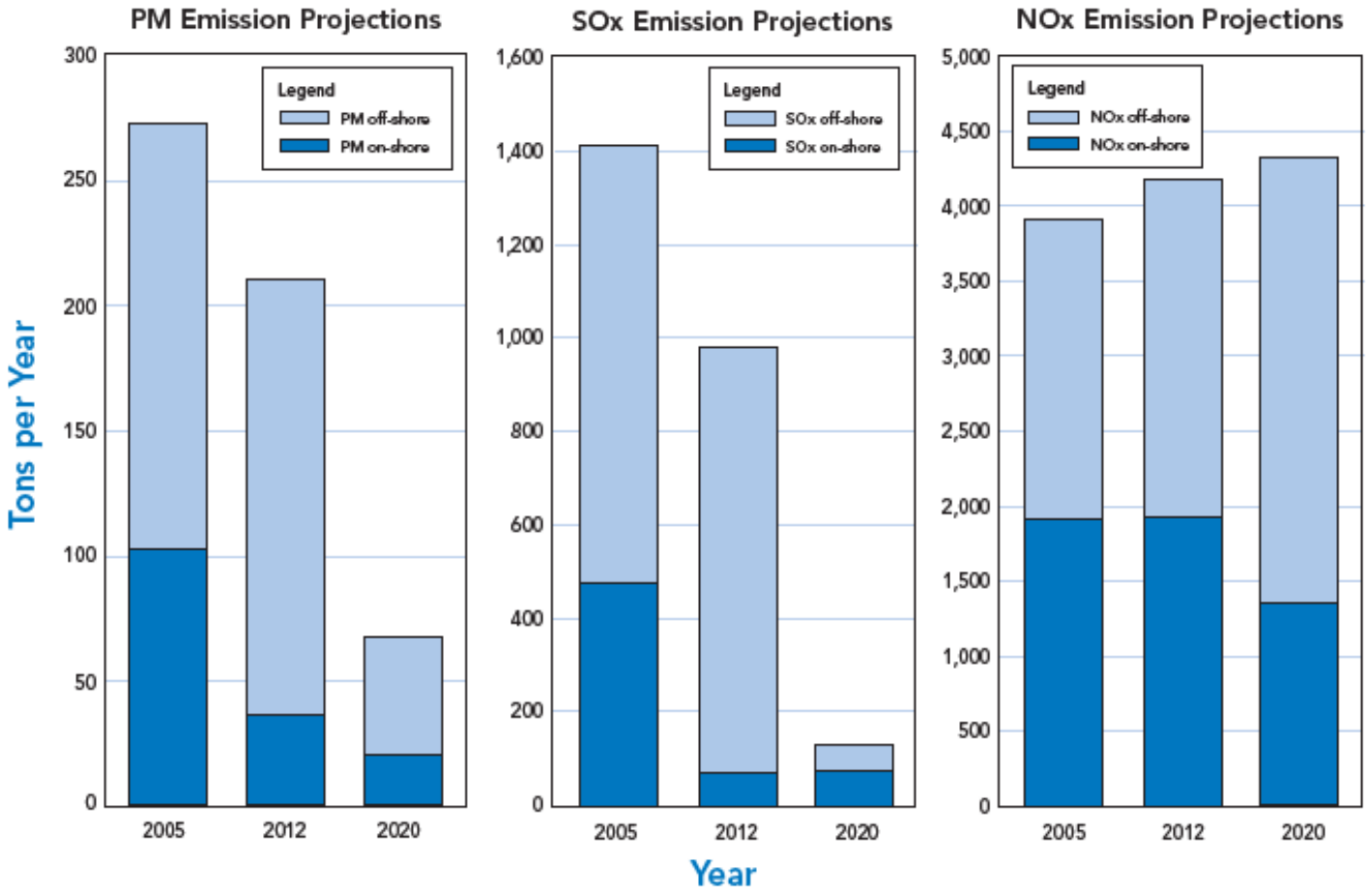
[c] All existing and likely regulations from Table 6-2 are included in the forecasts.

These emission projections were developed by:

- taking emission-generating activities included in the 2005 baseline inventory described in Section 5,
- increasing them in accordance with estimates of future growth in cargo throughput, using the medium growth scenario described in Section 6.1, and
- applying estimates of emission reduction benefits expected from both continued implementation of current regulations (for example, regulations requiring that new replacement trucks use cleaner engines) and implementation of certain future Federal and State rules (such as CARB's proposed ocean-going vessel main engine low sulfur fuel rule) which are likely to be implemented by 2020.

The forecast of future emissions shown in Table 6-1 and Figure 6-4 do *not* estimate emissions reductions from actions above and beyond regulatory requirements; see Sections 7 and 9 for a discussion of air quality goals and potential initiatives that address reductions beyond those provided by regulations. In addition, the forecasts do not include construction equipment emissions. Construction activity varies from year to year, so there is no reliable means of predicting construction emissions for specific future years. Based on the Port's "2005 Seaport Construction Air Emissions Inventory", those emissions are not expected to be significant.

Figure 6-4: Port of Oakland Projected Emissions for On-shore and Off-shore Sources (Medium Growth Scenario)



Major regulations impacting these emission forecasts are listed in Table 6-2. The selection of which upcoming regulations are "likely", and therefore included in the forecasts, is somewhat subjective. With few exceptions, the regulations listed in the table were adopted into law, though most of their reduction requirements will not be fully effective for a number of years.

Table 6-2 Major Regulations Included in Future Year Emission Forecasts

Source Category	Existing and Likely Regulations	Included in 2012 Forecast	Included in 2020 Forecast
Ocean-Going Vessels (OGV)	California low sulfur limits for fuel in OGV auxiliary engines [a]	✓	✓
	California low sulfur limits for fuel in OGV main engines		✓
	State shoreside power requirements for OGV		✓
Harbor Craft	Federal Tier 3 and 4 emission standards for marine engines		✓
	State harbor craft engine rule	✓	✓
Cargo Handling Equipment (CHE)	State and Federal standards for new off-road engines and fuel	✓	✓
	State rulemaking for cargo handling equipment	✓	✓
Port Container Trucks	Federal and State new engine emission standards	✓	✓
	State port trucks rule	✓	✓
	State Heavy-Duty (In Use) Commercial Trucks rule		✓
Locomotives	Statewide/Railroad agreement to limit locomotive idling (railyard MOU)	✓	✓
	Federal retrofit and new Tier 3 and 4 locomotives engine standards	✓	✓

[a] As of May 7, 2008, enforcement of this rule was suspended pursuant to a federal district court order. A new rule covering low sulfur limits for fuel in both main and auxiliary OGV engines was adopted in July 2008. Some carriers have been voluntarily continuing to comply with the auxiliary engine rule requirements.

As shown in Table 6-1, the forecasted emissions reductions due to regulations for on and near-shore sources are larger than the reductions for off-shore sources, reflecting:

(a) the difficulty and uncertainty around the control (including regulation) of some off-shore sources, particularly OGVs, and
(b) the regulatory and public health focus on reducing emissions that occur closest to people and that can be expected to contribute more to health risk than off-shore emissions.

On-shore NOx emissions are forecast to decline by 2020, while off-shore NOx emissions increase due to gains in OGV activity and a lack of OGV NOx control requirements, resulting in an overall increase in total NOx emissions.

The emission projections presented in this section are subject to some uncertainties, including:

- Only existing regulations and those anticipated ("likely") future regulations about which sufficient information is available for analysis, could be incorporated into the projections. It was not possible to estimate benefits from other potential future regulations, including

additional proposed regulations described in CARB's Goods Movement Emission Reduction Plan.

- Some regulations included in this analysis were or may be subject to legal challenges.
- Interpretation of how "likely" implementation is of the various regulations governing seaport sources of emissions is somewhat subjective. For example, the OGV main engine low sulfur fuel rule was still under development at the time of this analysis and the regulatory language was subject to change.
- The air quality improvements of some regulations rely on full-scale implementation of new procedures and technologies that have not yet been applied under "real world" conditions.
- Historically, economic forces result in gradual improvements to the efficiency of container movement through the Port (e.g., faster crane movements and increased use of 40-foot containers). Over time, similar gains in efficiency could lead to emission reductions, due, for example, to shorter berthing times and fewer lifts per TEU. Efficiency gains were not taken into account in the above analysis because the magnitude and timing of the gains, and therefore the emissions reduction, are too difficult to predict.

6.3 Relationship between Emissions and Health Risk

As discussed in Section 5.2, CARB released the "Draft Diesel Particulate Matter Health Risk Assessment for the West Oakland Community: Preliminary Summary of Results" in March 2008. A key part of this health risk assessment (HRA) study deals with the estimation of cancer risk associated with emissions from the maritime operations on and around Port property.

Cancer health risk is usually expressed as the estimated number of potential excess cases of cancer per million people exposed. The risk can also be formulated in terms of the incremental cancer risk per ton of DPM emitted from each source category. For example, the HRA results indicate that the 61 tons per year of DPM emitted from ocean going vessel auxiliary engines while vessels are docked at their berths (i.e., berthing or hotelling emissions) at the Port result in a population-weighted average excess lifetime cancer risk in West Oakland of 57 per million. Thus, the excess cancer risk per ton of emissions can be expressed as a ratio, 57 cancers divided by 61 tons, which equals 0.9. These incremental risk factors were calculated by CARB for each emissions source category and are shown in Table 6-3.

Incremental risk factors are higher for some categories than for others, reflecting the fact that sources like on-road trucks that typically operate within highly populated urban areas result in greater exposure (and therefore risk) per ton of DPM released than sources like OGVs and harbor craft that are typically located further away from residents. The incremental risk factors from the CARB report provide a basis for comparing the impact of various source categories at the Port both in 2005 and in the future.[2] For example, in 2005 each ton of DPM from on-road trucks serving the Port is estimated to correspond to an increment of about 2-in-a-million in the potential cancer risk in the West Oakland community. This is more than twice the risk per ton of OGV berthing emissions. Of all the Port sources, on-road trucks generate the greatest potential cancer risk per ton of diesel PM emissions, followed by locomotives, harbor craft, OGV berthing, cargo handling equipment and off-shore OGV activity.

[2] Incremental risk factors from different source categories are most appropriately interpreted in terms of their *relative* size rather than as a measure of the absolute amount of community cancer risk associated with a given level of emissions.

The excess cancer risk resulting from Port operations in 2012 and 2020 can be estimated by applying the incremental risk factors to projected DPM emissions for those years. Results of this calculation are shown in Table 6-3. The table shows that cancer risk to West Oakland community members from maritime DPM emissions is expected to be reduced dramatically from 2005 levels as a result of the projected reductions in seaport emissions due to current and proposed state and federal air quality regulations identified in Table 6-2.

Overall cancer risk is estimated to be 73% lower in 2020, while cancer risk from on-shore sources is reduced by 80%, in part due to the greater availability of cleaner engine technology for trucks, locomotives and terminal yard equipment. As stated in the "Port of Oakland Maritime Air Quality Policy Statement", the Port's goal is to reduce overall cancer risk by 85% in 2020. The Port will continue to target emissions reductions above and beyond those required by law to reach that goal by 2020.

Table 6-3 PM Emissions and Associated Cancer Risk in 2005 and 2020 (projected, based on regulations only)

Source Category[a]	Incremental Risk Factor[b] (excess cancer cases in 1 million/ton of PM)	PM Emissions (tons)		Cancer Risk (excess cancer cases in 1 million)		Reduction in Cancer Risk
		2005	2020[c]	2005	2020	2005 to 2020
Total Off-Shore		**172**	**56**	**78**	**28**	**-64%**
OGV-transit & maneuvering	0.4	156	48	62	19	
OGV- anchor	0.4	2	0.7	0.8	0.3	
Harbor Craft	1.1	13	8	15	8	
Total On-Shore		**102**	**20**	**109**	**22**	**-80%**
OGV-berthing	0.9	61	11	55	10	
Cargo Handling	0.7	22	4	15	3	
Truck	2.1	17	2	35	4	
Rail	2.0	2	3	4	6	
TOTAL		**273**	**76**	**187**	**50**	**-73%**
PORT-WIDE HEALTH RISK REDUCTION GOAL, 2005 TO 2020						**-85%**

Note: This table was revised subsequent to the June 2008 Draft MAQIP document. See note for Table 6-1. Totals may differ slightly due to rounding.

[a] Construction activity is not included in this calculation since it varies from year to year and no estimates are available for 2020 construction emissions; for 2005 construction estimates, see Table 5-1. CARB's study did not estimate health risks from on-Port construction activities.

[b] Population weighted average excess cancer risk due to DPM exposure per ton of DPM emitted as calculated by CARB (see Section 5.2).

[c] Emissions for 2020 are based on the medium growth scenario for the projection with all current and likely future regulations implemented. PM is substituted for DPM, since the emissions are essentially equivalent (see footnote on Table 5-1). These risk projections are based on the current spatial distribution of emissions, which may change over time.

7 AIR QUALITY IMPROVEMENT GOALS

Two types of goals are included in this air quality master plan: broadly stated goals to reduce the Port's impact on public health and ambient air quality, and explicit numerical targets for reductions of specific pollutants for future years.

7.1 Health Risk and Air Quality Goals

The centerpiece goals of the MAQIP that will guide the selection of specific air quality improvement projects and that will ultimately measure its success as an air quality master plan are:

Goal 1 Reduce the adverse public health impacts of the Port's seaport-related air emissions on workers in the maritime area and on residents in the neighboring communities that are most affected by goods movement at the seaport (in particular West Oakland), as expeditiously as feasible.

Goal 2 Reduce the adverse impacts of the Port's seaport-related air emissions on ambient air quality in West Oakland and more generally in the San Francisco Bay Area Air Basin, as expeditiously as feasible.

To support these goals, the Board of Port Commissioners on March 18, 2008, adopted the *Air Quality Policy Statement and "Early Actions" to Reduce Air Pollutant Emissions and Related Human Health Risk* (see Appendix H). This action commits the Port to a goal of reducing the community's excess cancer risk attributable to DPM emissions from seaport sources by 85% between 2005 and 2020 by taking all feasible measures to reach the goal, with an emphasis on early actions[1]. While the longer term goal to achieve an 85% reduction in health risk is key, the early action focus is equally important, with the opportunity to reduce health risk even earlier than the regulatory schedule by reducing the duration of exposure of neighborhood residents to harmful emissions.

During development of this plan, CARB's West Oakland Health Risk Assessment was still under development, so the precise relationship between emissions and risk was not known. Therefore, the Port and Task Force assumed a one-to-one correspondence between emissions and risk, consistent with CARB's own state-wide planning assumptions. Under this assumption, an 85% reduction in emissions yielded an 85% risk reduction. Therefore, the Port's goal is consistent with CARB's statewide goal of an 85% reduction in health risk from DPM from goods movement activities between 2001 and 2020.

7.2 Emission Reduction Goals

In support of the health risk and ambient air quality goals, the Port and the MAQIP Stakeholder Task Force established interim (2012) and longer term (2020) emission reduction targets for specific air pollutants (PM, SOx, and NOx) by emissions sources, as summarized in Table 7-1. These goals are based on a "medium" growth scenario for Port cargo (Figure 6-1)[2]. In setting

[1] The baseline data that will be used to measure the Port's progress toward this goal are the "Port of Oakland 2005 Seaport Air Emissions Inventory" (2007, revised 2008) and the California Air Resources Board's "Diesel Particulate Matter Exposure Assessment Study for the West Oakland Community: Preliminary Summary of Results" (March 2008 and subsequent revisions).

[2] Several commentors recommended changing the 2012 and 2020 emissions reduction goals to be more protective of human health or to be consistent with the amendments to MARPOL Annex VI. Further discussion with stakeholders would be required prior to revising the goals. The goal-setting rationale is explained in this section.

these emission reduction goals, a distinction was made between off-shore emission sources (ships underway and harbor craft activity) and on-/near-shore sources (other maritime sources, including ships at berth). By setting separate goals for off-shore sources, it was possible to take into account the challenges associated with reducing emissions from these sources (see Section 7.3). In addition, while off-shore sources represent a large fraction of Port emissions, they are potentially of less concern from a community health risk perspective than on-/near-shore sources since they are located further away from populated areas. Emissions from equipment sources within the on- and off-shore categories may not be reduced uniformly, and some may even increase. Therefore, the goals are based on emissions reductions within each category.

The 2012 interim goals are equal to the forecasted emissions reductions from the Port's medium growth scenario, recognizing that in the short term (2008 to 2012), reductions beyond those due to regulations will be difficult to achieve. Therefore, for the short term, the Port's primary focus is on early compliance with regulations ("early actions") so that emissions and risk can be reduced more quickly than mandated, and on supporting compliance with regulations as they take effect.

The 2020 goals assume that CARB's port emissions reduction regulations and federal engine standards (Table 6-2) are successfully implemented. These goals go beyond the benefits of those regulatory measures, however, and set higher reduction targets. The additional reductions needed to meet these goals will come from feasible emissions reductions measures employed by the Port, its tenants and business partners. The 2020 goals are clearly ambitious, and seek to achieve reductions beyond those forecasted under medium growth. The Port's forecasted emissions reductions for 2020 from Table 6-1, based on a medium growth business scenario with implementation of regulations, are included in Table 7-1 to allow a comparison between the goals and the forecast. The table includes a column identifying the additional PM, SOx and NOx reductions needed by 2020 to meet the Port's goals for on- and off-shore port-related sources.

These quantitative emissions reduction goals can be used to guide the design and selection of future initiatives, and can later serve as a measure of progress in implementing the air quality plan.

Table 7-1 Port of Oakland Emissions Reduction Goals and Forecasted Reductions

Pollutant by Port Source	Percent Change from 2005[a]			
	2012 Forecast/Goals	2020 Goals	2020 Forecast	Additional reductions needed to meet goals
PM Emissions				
On/Near-Shore	-65%	-85%	-81%	4%
Off-Shore	+2%	-85%	-67%	18%
SOx Emissions				
On/Near-Shore	-85%	-85%	-96%	exceeds goal
Off-Shore	-3%	-94%	-92%	2%
NOx Emissions				
On/Near-Shore	+1%	-34%	-31%	3%
Off-Shore	+12%	TBD	+46%	TBD

[a] 2012 goals are based on full regulatory compliance. 2020 goals are based on full regulatory compliance and adoption of additional feasible initiatives. 2020 forecasts assume full regulatory compliance.

7.2.1 DPM Reduction Goals

Given the emphasis by the Port's air quality policy, by regulators and by the community on reducing risk due to DPM exposure, the emission reduction goals are oriented towards achieving the greatest possible reductions in DPM emissions.

DPM Goal 1: By 2012, reduce on- and near-shore DPM from Port activities by 65% from the baseline 2005 emissions level.

DPM Goal 2: By 2020, reduce on- and near-shore DPM from Port activities by 85% from the baseline 2005 emissions level.

DPM Goal 3: By 2012, minimize the increase in off-shore DPM from Port activities to 2% over the baseline 2005 emissions level.

DPM Goal 4: By 2020, reduce off-shore DPM from Port activities by 85% from the baseline 2005 emissions level.

7.2.2 SOx Reduction Goals

Methods used to reduce DPM have the added benefit of also reducing oxides of sulfur (SOx) emissions, thus reducing exposure to both SO_2 and sulfate aerosols.

SOx Goal 1: By 2012, reduce on- and near-shore SOx from Port activities by 85% from the baseline 2005 emissions level.

SOx Goal 2: By 2020, reduce on- and near-shore SOx from Port activities by 85% from the baseline 2005 emissions level.

SOx Goal 3: By 2012, reduce off-shore SOx from Port activities by 3% from the baseline 2005 emissions level.

SOx Goal 4: By 2020, reduce off-shore SOx from Port activities by 94% from the baseline 2005 emissions level.

7.2.3 NOx Reduction Goals

DPM reduction technologies provide a relatively small concurrent benefit with respect to NOx reductions. As a result, the NOx emission goals allow for a small increase in NOx by 2012 in order to accommodate the growth forecast under the medium Port growth scenario as shown in Figure 6-1. By 2020, the goal is to reach a nearly 35% reduction from on- and near-shore sources. This reduction will be largely achieved by the introduction of shore power for OGVs when at berth and by the introduction of new, cleaner engines for cargo handling equipment, trucks, and locomotives. A specific goal for reduction of NOx emissions from off-shore sources by 2020 has not yet been defined due to uncertainties about the ability of regulators or the Port to reduce NOx emissions from OGVs. Note that simply making improvements to the composition of fuel used in OGV engines, while producing significant PM and SOx reductions, has little impact on NOx emissions.

NOx Goal 1: By 2012, minimize the increase in on- and near-shore NOx from Port activities to 1% over the baseline 2005 emissions level.

NOx Goal 2: By 2020, reduce on- and near-shore NOx from Port activities by 34% from the baseline 2005 emissions level.

NOx Goal 3: By 2012, minimize the increase in off-shore NOx from Port activities to 12% over the baseline 2005 emissions level.

NOx Goal 4: By 2020, reduce off-shore NOx from Port activities by an amount still to be determined, compared to the baseline 2005 emissions level.

7.3 Challenges

The Port's air quality improvement goals outlined in this plan face a number of challenges, including:

- New emissions reduction regulations adopted and proposed by CARB, in particular, are extremely aggressive in their implementation schedules and technological requirements. Some types of equipment may not become available when expected, may not be affordable or may not be as cost-effective as anticipated. Technological, economic or legal factors may result in suspension or postponement of certain requirements or deadlines.
- Due to their reliance on best available control technology, and on early turnover of equipment, the new regulations do not leave much room for voluntary actions that produce additional emissions reductions, at least in the near term. Furthermore, achieving full compliance with each regulation may be difficult, so enforcement will be key to achieving the targeted reductions. Therefore, one of the Port's primary air quality strategies is to support enforcement agencies by working with tenants and customers to promote compliance.
- Some CARB regulations, such as the Ocean-Going Vessel Auxiliary Diesel Engine regulation that became effective on January 1, 2007, have already been successfully challenged through the legal system, and other regulations may be contested as well. There is a possibility that the Port may also be challenged in trying to achieve reductions beyond those required by law.
- Since the development of the MAQIP and the Board's action, the preliminary results of the West Oakland HRA have been published and provide a more specific relationship between emissions and risk (Table 6-3). The HRA indicates that even more ambitious emissions reductions may be needed to reach the MAQIP risk reduction goals than anticipated during plan development and since adoption of the Port's maritime air quality policy.
- Emission reductions from ocean-going vessels are particularly challenging from a implementation standpoint as well as a legal perspective, since ocean-going vessels calling at the Port are nearly all international flagged and are not readily subject to local, state or even federal regulations. Achievement of substantial ship emissions reductions may require designating an Emission Control Area (ECA) that includes California, or even the entire North American continent. This effort would take the combined resources of the EPA and CARB, with the support of the Port and other West Coast ports.[3]

[3] Recommended by John McLaurin, Pacific Merchant Shipping Association, July 14, 2008.

8 EMISSIONS REDUCTION STRATEGIES

To achieve the MAQIP health risk reduction goals, emissions reductions from seaport operations will need to occur through both regulatory compliance and additional action on the part of Port tenants and customers. Therefore, Port is committed to a three-fold emissions reduction strategy:

1. **Target emissions reductions earlier than required by regulations ("early actions"),**
2. **Support enforcement of regulations, and**
3. **Target emissions reductions above and beyond those required by law.**

Emissions reductions – whether early action, "above and beyond" or regulation-driven – can be achieved through three general approaches:

- **Source control.** These can be voluntary actions or regulatory requirements. CARB's regulations generally target reductions through technological means, or source controls. Early actions on the part of the regulated community can promote accelerated emissions reductions.
- **Operational changes.** A non-regulatory approach to even greater levels of emissions reduction is through operational changes in the port industry that increase efficiency or otherwise reduce fuel usage.
- **Regulatory compliance.** Promoting a high level of compliance with enacted regulations ensures that all possible reductions can be achieved.

The Port is committed to pursuing specific emissions control measures and strategies using the approaches described above, within the context of its overall emissions reduction strategy. The specific measures are described in Section 8.4.

8.1 Source Controls

There are a limited number of control technology approaches that can reduce emissions from Port-related source categories, including ships, harborcraft, cargo handling equipment, trucks and trains. The basic choices are:

- switching to cleaner fuels or other means of powering the equipment,
- retrofitting existing equipment with emissions control devices, or
- replacing existing equipment with newer, cleaner equipment.

While all of the control technologies lead to air quality benefits, they vary in terms of the level of emissions reduction, the ease of implementation and the total cost. For example, while ultra-low sulfur diesel, which was introduced throughout California and the United States in 2006, was usable in nearly all on-road engines, the cleanest fuels (such as electricity and LNG) generally cannot be used in existing engines, and require new engines or equipment, along with a dedicated fueling infrastructure.

Table 8-1 summarizes examples of emission control technologies that can potentially be applied to Port-related sources of diesel emissions. Most of the control technologies are already required or will be required in the near future by State and Federal regulations, although some are still in development. It is anticipated that new technologies, especially those controlling ship emissions,

will be developed over the next decade as new ships are built and as more stringent regulations compel technological solutions.

Table 8-1 Summary of Diesel Emissions Control Technologies

Source Category	Owner or Operator	Fuels	Retrofit	Replacement
OGV (Ships) – Main Engines	Carriers	Low sulfur fuels, Emulsified fuels (fuel-water mix)	Install pollution control systems (e.g. selective catalytic reduction), Engine modifications	New engine standards, Accelerate old engine retirement
OGV (Ships) – Auxiliary Engines	Carriers	Low sulfur fuels, Emulsified fuels, Use grid power or portable clean generators while berthed	Pollution control systems (e.g. selective catalytic reduction), Engine modifications, Exhaust after-treatment (hood)	New engine standards, Accelerate old engine retirement
Harbor Craft (Tugs)	Tug companies	Low sulfur fuels, Emulsified fuels, Biodiesel, Use grid power or portable clean generators while berthed	Pollution control systems (e.g. selective catalytic reduction), Engine modifications	New engine standards, Accelerate old engine retirement
Cargo Handling Equipment	Terminal operators and railroads	Low sulfur fuels, Emulsified fuels, Biodiesel Electric hybrids, Fuel cell technologies, LPG/LNG	Pollution control systems (diesel oxidation catalysts, diesel particulate filters)	New engine standards, Accelerate old engine retirement
Trucks	Trucking companies and independent operators	Low sulfur fuels, Emulsified fuels, Biodiesel LPG/LNG	Pollution control systems (diesel oxidation catalysts, diesel particulate filters)	New engine standards, Accelerate old engine retirement, LPG/LNG powered equipment
Railyards (primarily switching locomotives)	Railroads	Low sulfur fuels, Emulsified fuels, Biodiesel	Engine modifications, idle limiting devices	New engine standards, Accelerate old engine retirement, diesel-electric hybrids, Generator set (genset) switching engines
Construction Equipment	Construction firms	Low sulfur fuels, Emulsified fuels, Biodiesel	Pollution control systems (diesel oxidation catalysts, diesel particulate filters), Engine modifications	New engine standards, Accelerate old engine retirement

Regulations generally require the owners and operators of Port-related sources to apply one or more control technologies to reduce emissions of DPM, NO_X and other pollutants. These regulations are rigorous and do not leave much room for additional emissions reductions. Achieving the intended emissions reductions benefits will require enforcement by regulatory agencies including CARB and BAAQMD, with cooperation from the Port.

8.2 Operational and Design Efficiencies

In addition to equipment control technologies, operational changes can potentially improve the efficiency of Port operations and simultaneously reduce emissions. Emissions reductions are achieved by reducing the amount of activity required to move containers through the Port and within or near local neighborhoods. Some reductions can be achieved with regulations, such as restrictions on truck and locomotive idling time, but most activity reduction stems from

maritime-related businesses investing in more efficient equipment or operations. For example, the Port's Joint Intermodal Terminal, which provides near-dock rail access, was estimated to take 20,000 truck moves off I-80 when it began operating in 2002. Other examples of operational and design efficiencies that could be considered by the Port terminal operators, carriers and other tenants and maritime businesses include:

- The "virtual container yard" describes various information technologies that track the whereabouts and status of containers inside and outside the Port area. This system could allow more efficient use of container trucks by reducing the number of one-way trips made while empty.
- "Crane double cycling" describes a more efficient use of large electric cranes and other yard container equipment. Cranes typically unload and load vessels in separate operations. To the extent a crane can unload and load simultaneously, it can save time and vehicle emissions.
- Improvements in container yard layout and technology within a terminal can lead to faster cargo processing, thereby reducing the number of in-yard container movements. That means less waiting time for trucks, less truck idling and reduced emissions.
- Radio frequency identification (RFID) or global positioning satellite (GPS) technologies on Port trucks can also result in less waiting time and idling by allowing terminal operators to track arriving trucks and prepare for the container pick-up or drop-off.
- "Chassis pooling," a form of equipment sharing, is another means of increasing efficiency. Participating shipping lines provide their own chassis for use by the pool, which can be managed and maintained by a subsidiary of the participating terminals, or a third party. This allows drayage trucks to use pooled chassis to serve multiple carriers and reduces gate turn-times. Pooled chassis can also facilitate the implementation of virtual container yards.

8.3 Regulatory Compliance and Enforcement

Since education and enforcement are key to the success of air quality regulations, the Port intends to collaborate with CARB and the BAAQMD in their enforcement efforts. The Port will:

- coordinate with the agencies as they develop enforcement protocols for adopted port regulations,
- provide or participate in forums to educate maritime tenants on the regulations,
- remind tenants of regulatory compliance and reporting deadlines,
- coordinate with agency partners in designing and implementing incentive programs for tenants and maritime-related businesses to promote early actions to meet regulatory goals in advance of deadlines.

An overview of the Port's legal authority regarding enforcement is in Section 10.1.

8.4 Port of Oakland Control Measures and Strategies[1]

An extensive analysis of strategies to reduce emissions from port sources was provided in CARB's "Emissions Reduction Plan for Ports and Goods Movement in California" (2006)[2], with

[1] This is a new section in the Final MAQIP, prepared in response to many of the commentors on the Draft MAQIP, who asked for more detail on specific strategies and implementation plans.

updates in CARB staff's regular reports to the Board members. Most of the CARB strategies rely on implementation of state or federal regulations over the next decade to achieve the state's air quality health risk reduction goal. Summaries of those regulations are provided in Table 4-1 and in Appendix E.

The Port reviewed the strategies in the MAQIP air quality improvement initiatives (Section 9) and in CARB's Emissions Reduction Plan, along with emissions reduction strategies adopted by other ports, in light of the characteristics of the Port's maritime business, the Port's emissions and health risk profiles (Sections 5 and 6) and the Port's on-going and planned emissions reduction programs and projects (Section 9). The Port developed the set of current control measures in Table 8-2 based on all of these factors.

Table 8-2 Port of Oakland Emissions Control Measures and Strategies

Control Measures and Strategies	Implementation
Early action retrofit and/or replacement of port drayage trucks	Incentives, grant or other funding, lease or other implementation strategy, MOUs with regulatory agencies
Compliance with CARB's "shore power"[3] regulation	• Port-wide Shore Power Program • Pursue early actions through incentives, grant or other funding, lease or other implementation strategy, CEQA
Design and operational efficiencies	Voluntary, incentives, lease or other implementation strategy, CEQA
Participate in pilot and verification projects for NOx and DPM reduction strategies	Voluntary, incentives
Early action construction emissions reduction	Incentives, project specifications
Support enforcement of regulations by CARB and BAAQMD through coordination with tenants	Workshops, notices of deadlines, coordination on enforcement protocols
Accountability, monitoring and reporting	Stakeholder group, status reports, biannual emissions inventories, MAQIP Interagency Group, reconsideration of strategies (5 year intervals)

8.4.1 Details of Control Measures and Strategies

More detailed descriptions and target dates of the Port's control measures and other strategies in Table 8-2 are provided in this section.

[2] CARB's "Emissions Reduction Plan for Ports and Goods Movement in California" (2006) and staff updates are available at: http://www.arb.ca.gov/planning/gmerp/gmerp.htm

[3] "Shore power" refers to CARB's "Regulations to Reduce Emissions from Diesel Auxiliary Engines on Ocean-Going Vessels While at Berth at a California Port", even though the regulation allows for emissions reduction measures other than a shore power system. The term "shore power" used here does not assume any particular technology.

Early action retrofit and/or replacement of port drayage trucks

The Port will target replacements or retrofits of port drayage trucks according to the following schedule of deadlines:

By June 30, 2009: Retrofit 1,000 model year 1994 through 2003 trucks, in partnership with the BAAQMD and CARB,

OR

Retrofit 1994 through 2003 trucks or replace eligible trucks, in partnership with the BAAQMD and CARB. The number of retrofits or replacements (meeting 2007 engine standards) has not yet been determined, and will depend on the most cost-effective use of the $15 million budget. In fiscal year 2008-2009, the Port authorized payment of $5 million from its operating budget towards this truck program.

2009-2013 Replace eligible Port drayage trucks to meet 2007/2010 engine standards, in partnership with the BAAQMD and CARB. The number of replacements and details of this early action program will depend on funding through grants and proposed user fees.

Compliance with CARB's "shore power" regulation

The Port will support and promote identification and development of future projects to assist regulated Port customers to comply with CARB's shore power regulation according to the following schedule of deadlines:

By Dec. 31, 2008: Meet with terminal operators and/or carriers to request their approaches to compliance with the shore power regulation.

By June 30, 2009: Develop a Port-wide Shore Power Program to:

- Meet with terminal operators and/or carriers to share information about potential investments in infrastructure and/or equipment, and otherwise prepare for compliance with the shore power regulation.
- Pursue early action implementation of the regulation, including use of grant and other available funds.

Design and operational efficiencies

The Port and its tenants will design terminal layouts, security systems and other goods movement infrastructure so greater efficiencies can be achieved. Improvements in technology, yard layout, traffic patterns and gate configuration can result in faster cargo processing, with shorter waits for trucks in line or inside the terminal. Less waiting means less truck idling and reduced emissions. The Port will continue to negotiate with current and prospective tenants on incorporating improvements into projects.

Participate in pilot and verification projects for NOx and DPM reduction strategies

In partnership with its tenants and customers, the Port will seek to participate in pilot and CARB verification projects to test equipment used in the maritime industry. The priority will be for

projects targeted to NOx reduction, with a secondary emphasis on DPM reduction, since strategies to control NOx are not as well developed as those targeting DPM. The expected schedule is:

By March 1, 2009: Contact tenant and customer groups to inform them of the Port's interest in coordinating participation in pilot and equipment verification projects.

By March 1, 2009: Contact CARB, industry groups and other ports to solicit opportunities to participate in pilot and equipment verification projects.

Early action construction emissions reduction

The Port will continue its early action pilot program to reduce construction equipment emissions through available mechanisms, including financial incentives, if available, and by including the program in project specifications.

2008 Initiated early action construction emissions incentive program

Support enforcement of regulations by CARB and BAAQMD through coordination with tenants

Through either informal or formal agreements, the Port will support CARB and BAAQMD in their enforcement of seaport-related emissions reduction regulations. Support will include coordination on protocols, tenant and customer group workshops, courtesy reminders to tenants and customers of reporting and other deadlines, and similar measures.

By Dec. 31, 2008: Schedule a meeting with CARB and BAAQMD to discuss the nature of the assistance that is needed from the Port.

Accountability, monitoring and reporting

To ensure the Port's accountability on progress towards the MAQIP health risk and emissions reduction goals, to provide opportunities for community participation, and to communicate regularly with the Port's stakeholders, the Port will:

- Convene a maritime stakeholder group, which will serve as a forum for sharing the status of projects during development and execution and discussing issues associated with projects.
- Prepare a written status report to stakeholders on MAQIP projects at least annually.
- Present periodic air quality status reports to the Board of Port Commissioners or one of its committees; the reports will be made available to the community on the Port's web site.
- Prepare biannual emissions inventories with health risk updates based on CARB's 2008 report.
- Continue to meet regularly with tenants and customers to educate them on air quality regulations and community concerns; request updates from tenants on their programs and projects to include in status reports.
- Continue to participate in agency-only discussions on air quality and health risk via an Interagency Group.
- Reconvene the MAQIP Task Force in five and ten years to review progress towards the plan's goals and reconsider strategies if they need modification.

9 AIR QUALITY IMPROVEMENT INITIATIVES

Over the next decade, state and federal regulations are expected to produce substantial reductions in air emissions from equipment used in Port operations. Many of those regulations, however, depend on equipment turnover to realize their full emissions reduction benefits. Therefore, the MAQIP Task Force developed a process to select, screen and categorize air quality initiatives with goals of achieving:

(1) emissions reductions above and beyond those required by law to meet the MAQIP goals, and
(2) emissions reductions earlier than required by regulations ("early actions").

Current Port emissions reduction strategies are aligned with many of the MAQIP initiatives, and future Port projects will be selected from those or from additional initiatives recommended by the Port's maritime stakeholder group. The Port will ensure that its tenants and other business stakeholders are informed of the MAQIP air quality goals, and will recommend that they follow the initiative development techniques outlined in this plan for selection of their emissions reduction programs and projects.

9.1 Initiative Development

To select air quality initiatives with a potential to achieve emissions and risk reductions beyond regulatory requirements, the MAQIP Task Force developed an initiative screening process depicted in the flow chart in Figure 9-1. Only initiatives with a direct relationship to emission and risk reductions were eventually selected.

9.1.1 Original List of Potential Initiatives

The Source Document Work Team of the MAQIP Task Force reviewed a wide range of existing documents (Table 9-1) to compile an initial list of air quality initiatives for the full Task Force to consider. The list was supplemented with initiatives provided by Task Force members and members of the public at the September 27, 2007 MAQIP meeting, resulting in a final list of 355 potential initiatives.

9.1.2 Screening Process and Criteria

An eleven-member Work Team of the Task Force, with support from Port staff and technical consultants, stakeholder technical consultants, and BAAQMD staff, reviewed the 355 initiatives from the original list to identify those that directly reduce air emissions and health risk.

The 225 initiatives that did not meet that first round of screening were grouped into categories (e.g., Policy, Funding, Health Risk, etc.) and included in Appendix I.

To evaluate the remaining 128 initiatives for further consideration, "screening criteria" were adopted by the Task Force on September 27, 2007 (Table 9-2; the full report is provided in Appendix C.) The screening criteria were developed to assist in selecting initiatives with potential benefits, and were not intended to establish a framework for funding, implementing, monitoring, or tracking the initiatives. The air quality initiatives selected and prioritized through this process were intended to achieve emission reductions above and beyond those required by law.

Figure 9-1: MAQIP Initiative Screening Process Flowchart

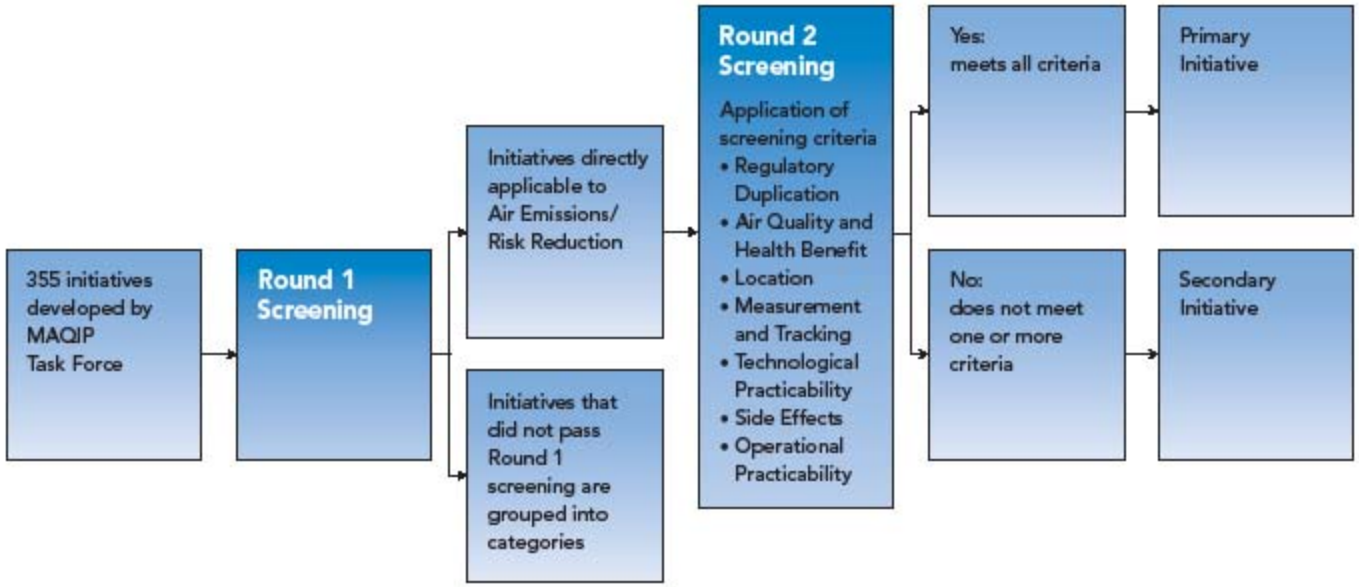


Table 9-1 Source Documents Used for Developing Initial List of MAQIP Initiatives

1	ARB/Railroad Statewide Agreement (MOU), 2005
2	ARB Resolution 6-14 (April 20, 2006)
3	BAAQMD CARE Phase 1 Findings and Recommendations, Sept. 2006
4	Boalt Hall School of Law Economic Justice Class Presentation to City of Oakland Port Task Force (April 18, 2007)
5	City of Oakland Community Task Force on Ports Recommendations
6	Ditching Dirty Diesel Collaborative and Pacific Institute, "Paying with our Health" (November, 2006)
7	EPA presentation on Hydraulic hybrids
8	Northwest Ports Clean Air Strategy (Draft May 16, 2007)
9	Pacific Institute "Clearing the Air", November 2003.
10	San Pedro Bay Ports Clean Air Action Plan – Overview
11	San Pedro Bay Ports Clean Air Action Plan – Proposed Clean Trucks Program Fact Sheet
12	San Pedro Bay Ports Clean Air Action Plan – Proposed Clean Trucks Program Q&A
13	State of California, California Goods Movement Action Plan, January 2007
14	Summary of studies, West Oakland Diesel Truck Emissions Reduction Initiative (May 1, 2003)
15	West Oakland Toxics Reduction Collaborative Recommendations (March 26, 2007)

Table 9-2 Screening Criteria Adopted by the MAQIP Task Force

Criterion	Description
1. Regulatory Duplication	Does the proposed initiative achieve "surplus" emission reductions, defined as emission reductions in advance of or beyond an existing regulation or other commitment (for example, an existing MOU)?
2. Air Quality and Health Benefit	Does the proposed initiative contribute to non-negligible local emission and health risk reduction and/or regional ambient air quality improvement?
3. Location	Does the benefit of the proposed initiative occur primarily in the designated "primary impact geographic area" of the MAQIP (i.e., West Oakland)?
4. Measurement and Tracking	Can the emission reductions from implementation of the proposed initiative be estimated quantitatively and therefore tracked over time?
5. Technological Practicability	Can the proposed initiative be implemented with existing or foreseeable technology?
6. Side Effects	Does the proposed initiative avoid or at least minimize foreseeable negative environmental, economic, or social side effects?
7. Operational Practicability	Can the proposed initiative be implemented without significant disruption to the movement of freight or compromising safety?

9.1.3 Primary and Secondary Initiatives

An eleven-member MAQIP work team applied the seven screening criteria presented in Table 9-2 to the remaining initiatives. This second round of screening categorized initiatives into two groups for achieving reductions above and beyond regulatory requirements:

- **Primary Interest Initiatives**: The initiative received a "*yes*" response to each of the

criterion from at least 8 of the 11 Work Team members. This list represents those initiatives that, according to the Work Team's review, are of primary interest for reducing emissions and health risks associated with Port seaport activities. This list is not exhaustive and presents an overview of the types of actions that may be taken by the Port and its maritime partners. The Work Team anticipated that, over time, other initiatives meeting all seven criteria could be suggested or pursued by the Port, its business partners, its agency partners, or other stakeholders.

- **Secondary Interest Initiatives**: The initiative received a *"no"* response to one or more of the criteria from at least 8 of the 11 Work Team members. These initiatives were identified as worthy of further evaluation although they did not meet all seven criteria. As with the Primary List, the Secondary List is intended to provide suggestions or guidance for actions that may be taken by the Port, its business partners, its agency partners, or other stakeholders.

Forty-nine primary and 35 secondary interest initiatives, as determined by the Work Team, were presented to the Task Force for confirmation (see Table 9-3). An additional 35 initiatives that duplicate existing regulatory or MOU requirements were also identified. These initiatives, organized by emission source category, represent potential opportunities for early implementation or exceedance of regulatory requirements. All initiatives will need to be evaluated for financial, legal, and technological feasibility prior to implementation.

9.2 MAQIP Task Force Initiatives

The rigorous screening that was applied to the proposed initiatives resulted in a document that described in detail the selection process and presented the final MAQIP Task Force initiatives as of January 30, 2008 (see Appendix D for the full document). Many hours of work and discussion went into choosing the initiatives, which are listed in Table 9-3. The work team's introduction indicates some of the limitations of their effort:[1]

> *The MAQIP Supplemental Work Team performed its review and categorization of the 355 initiatives to the best of its ability, given its combined knowledge and expertise. Additional development of the initiatives, some of which are currently drafted as general concepts, will be needed prior to any feasibility analysis and the implementation of any initiative on either the Primary or Secondary Lists of Initiatives is subject to economic, legal and technological feasibility. All the measures on this list are intended to represent actions that offer a potential to go beyond existing state and federal regulations and/or MOUs. Initiatives in the regulatory duplication section represent potential opportunities for early implementation (e.g. accelerate) or opportunities to build upon (e.g. 'exceed') regulatory requirements. Acceleration and/or exceedance are similarly subject to economic, legal and technological feasibility. The numbering of the initiatives within each category (e.g. Trucks) and sub-category (e.g. Primary List) does not indicate ranking or priority of any sort.*

[1] "Proposed Lists of Primary Interest and Secondary Interest Air Quality Initiatives for Potential Implementation", revised by the MAQIP Task Force on January 30, 2008. See Appemdix D for full document.

Table 9-3 Primary and Secondary Air Quality Initiatives for Potential Implementation and Initiatives Duplicating Existing Requirements[1]

No.	Initiative	Description
I. Emission Source Category: Truck		
A. Primary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Safety and Neighborhood Education	Institute a collaborative effort among the West Oakland community, the Oakland Police Department, trucking companies/truckers and the Port for increasing public, trucker, and terminal operator education on safety and neighborhood issues.
2.	Replace or Retrofit Trucks	State a goal of replacing or retrofitting 1,500-2,500 trucks over 5 years to meet a "clean truck" standard. Ban older trucks from Port terminals in a phased 5-year schedule. The owner of the old truck will be paid for the truck.
3.	Truck Buy-Back Program	Create a buy-back program for old trucks based on established criteria (buy worst trucks first) similar to or consistent with the Truck Incentives Working Group of the West Oakland Toxics Reduction Collaborative (WOTRC).
4.	Web-Based Reservations	Implement standardized mandatory web-based reservation systems.
5.	Gate and Roadway Efficiency	Continue to design and build terminal gate and roadway efficiencies for congestion relief, with input from all users.
6.	Fuel Saving Devices	Identify and retrofit in collaboration with various users fuel saving devices that would also reduce greenhouse gas emissions.
7.	Electrified Parking Spaces	Provide electrified parking spaces for trucks and/or for reefer units to reduce unnecessary idling.
8.	Enforce Truck Routes	Institute a collaborative effort among the West Oakland community, the Oakland Police Department, trucking companies/truckers and the Port to increase enforcement & penalties on prohibited truck routes in West Oakland and evaluate/establish alternate truck route to reduce emissions and exposure.
9.	Meet PM Standards and Be Cleanest for NOx	By 2011, require all trucks calling at the port frequently or semi-frequently to meet or exceed the EPA 2007 on-road particulate matter (PM) emissions standards (0.01 G/BHP-HR for PM), and be the cleanest available oxides of nitrogen (NOx) at the time of replacement or retrofit.
10.	Incentives for Early Implementation	Provide incentives for early implementation for cleaner trucks. An example incentive could be a decreased or increased concession fee.
11.	Modernize Private Trucks	Adopt and implement ARB rule to modernize (replace and/or retrofit) private truck fleet.
12.	Idle Reduction	Implement idle reduction education, technology, and policy program with provisions to assure terminal adherence to anti-idling policies and procedures (ref: AB 2650).
13.	Traffic Barriers	Install traffic Barriers on streets where trucks are prohibited (City of Oakland)
14.	Prohibit Overnight Truck Parking	Pass an ordinance prohibiting overnight truck parking in residential areas (City of Oakland).
15.	LNG & CNG Trucks	Support acquisition and use of more LNG & CNG trucks.
16.	Provide Services at Port	Provide truck services (fueling, truck repair, food and beverages) at the Port of Oakland.
B. Secondary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Virtual Container Yard	Develop a virtual container yard (off Port property) with compliance by all terminal operators to create more efficient movement of goods. This requires a 3rd coordinating party & central database to design & implement or a better relationship between data developers and the Port.
2.	Paperless Gate	Require terminal operators to implement "paperless gate;" such as RFID in combination with web-based booking systems to prevent gate congestion and idling and use OCR for gate efficiency.
3.	Pier Pass	Implement Pier Pass drayage truck fleet emission reduction program as implemented in LA/LB with extended gates & daytime congestion fee.
4.	Labor Work Rule Flexibility	Improve labor work rule flexibility to enable increased daily truck turns.
5.	Inland Container Pools	Establish inland container pools where trucks can drop-off and pick-up empty containers, to minimize deadhead truck runs (chassis

No.	Initiative	Description
		pool).
6.	Efficient Queues	Create more efficient queues; Call trucks to the Port when needed to reduce idle time.
7.	Electrified Truck Stop	Create an electrified truck stop (cold ironing the trucks) so that trucks do not idle in the queue.
8.	Software Upgrade	Accelerate software upgrade for trucks (i.e. adjust the software in certain trucks that are "gamed" to allow for greater emissions at higher speeds)
9.	Maintenance and Training Programs	If applicable, concessionaires will be required to establish maintenance and training programs to reduce emissions.
10.	Design and Operational Measures	Use design/operational measures such as parking, synchronized traffic signals, and driver training.
11.	Alternative Fuels	Encourage the use of biodiesel and other alternative fuels.
12.	Move More Containers by Rail	Decrease truck traffic by increasing the percentage of containers moved by rail.
13.	Trucker Mobility Program	Create a trucker mobility program so that they do not need to drive trucks out of the Port unnecessarily (i.e. - use a shuttle, BART, or other public transportation).
C. Duplication with Existing Regulatory or MOU Requirement:		
1.	Anti-Idling Rules	Pass anti-idling rules and enforce anti-idling at terminal gates.
2.	Limit Impact of Oakland Army Base Redevelopment	Take steps to limit the impact of Port construction operations related to the Oakland Army Base redevelopment.
3.	Vehicle Inspection and Maintenance Program	Develop a Port-run vehicle inspection and maintenance program for port drayage trucks. This would be periodic and random inspection program, and could also be imposed on terminal operators. (State has heavy duty truck inspection rule program).
4.	Retrofit Eligible Equipment	Identify and retrofit eligible equipment such as diesel particulate filters (DPF) or diesel oxidation catalysts (DOC).
5.	CA Low Sulfur Diesel	Utilize CA low sulfur diesel for trucks.
6.	Smoke Inspections	Conduct smoke inspections for trucks in communities.
7.	5-Minute Idling Limits	Enforce 5-minute idling limit for trucks.
8.	ARB Compliance for International Trucks	Adopt and implement ARB rule to require international trucks to meet US emission standards.
9.	Enforce CA TRU Rule	Enforce CA rule for transport refrigeration units on trucks, trains, and ships.
10.	Restrict Entry Unless PM Control Equipped	Restrict entry of trucks new to port service unless equipped with diesel PM controls.
II. Emission Source Category: Ocean Going Vessels		
A. Primary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Port Collaboration to Provide Incentives	Collaborate with other ports (LA/LB and/or Seattle) to coordinate the movement of clean ships through incentives rather than mandates.
2.	Best Technology in New Purchases	Ensure the best technologies are incorporated into new equipment purchases.
3.	Additional At-Dock and During Voyage Emission Control	Implement additional at-dock (e.g. stack after-treatment) and during voyage (e.g. electrification or scrubbing) emissions reduction options deemed viable.
4.	Control Devices on New Vessels and Frequent Callers	Use of diesel particulate matter (DPM) and/or NOx control devices on auxiliary and main engines on new vessel builds and existing frequent callers.
5.	Incentivize Cold Ironing	Create incentives for cold-ironing beyond regulations.
6.	Incentivize Low Sulfur Fuel	Create incentives for all ships to use low sulfur fuel (0.1%) in both vessel main and auxiliary engines.
7.	Support MARPOL Annex 6	Support ratification of MARPOL Annex 6 for international shipping.

No.	Initiative	Description
8.	SECA Designation	Obtain SOx Emission Control Area (SECA) designation or alternative for North America.
9.	Retrofit Main Engines	Retrofit existing main engines on ships during major maintenance.
B. Secondary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Improve Operational Efficiency	Implement operational efficiency improvements during Port development to reduce time at anchor and at dock.
2.	Increase Destination Loading	Increase "destination loading" on ships from the Far East.
3.	Cleanest Vessels for CA	Dedicate cleanest vessels to California service.
C. Duplication with Existing Regulatory or MOU Requirement:		
1.	Implement ARB Low Sulfur Auxiliary Engine Rule	Implement ARB ship auxiliary engine rule to use lower sulfur fuel (0.1% by 2010) (OAL review) (note: rule currently under litigation)
2.	Cleaner Fuels for Auxiliary Engines at Anchor and Berth	100% use of cleaner fuels, such as 0.1% sulfur content, in the auxiliary engines at anchor and at dock for vessels with adequate tank capacity. Assess the feasibility for vessels other than frequent callers, including vessels at anchor and vessels with smaller tank capacity. This is a partial duplication of CARB's auxiliary engine fuel regulation currently under legal challenge but being temporarily enforced.
3.	Cleaner Fuels for Auxiliary Engines During Transit	Use < 0.2% Sulfur Marine Gas Oil (MGO) Fuel in vessel auxiliary engines at berth and during transit out to a specified distance from the Port. This is a partial duplication of CARB's auxiliary engine fuel regulation currently under legal challenge but being temporarily enforced.
4.	Use MGO During Transit and Maneuvering	Standardize the use of marine gas oil (MGO) (less than 1.5% Sulfur (S)) fuels in the main engines during transit and maneuvering out to a specified distance from the Port, moving towards a 0.1% S standard as appropriate fuels become available.
5.	Cold Ironing	Use "Cold-Ironing" technology to shut down auxiliary engines on ocean-going ships while in port by connecting to electrical power supplied at the dock, or equivalent alternative.
III. Emission Source Category: Harbor Vessels		
A. Primary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	ULSD and Bio-Fuel	Use ultra low sulfur diesel and/or bio-fuel blends for cleaner emissions (this is a partial duplication with CARB's ultra low sulfur fuel rule).
2.	Tighter EPA or ARB Standards	Adopt tighter USEPA or ARB emission standards for harbor craft.
3.	Implement Incentives	Implement incentives to accelerate introduction of new harbor craft engines.
B. Secondary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Subsidize Tugs Using Soy Diesel	Offer a subsidy for tugs that use cleaner-burning, but more expensive, soy diesel. Provide the subsidy if the equipment uses the fuel and stays in Oakland. This model could also be expanded to other businesses.
2.	ULSD and Bio-Fuel	Use ultra low sulfur diesel and/or bio-fuel blends for cleaner emissions (this is a partial duplication with CARB's ultra low sulfur fuel rule).
C. Duplication with Existing Regulatory or MOU Requirement:		
1.	Meet EPA Tier II Standards	Require all home-based harbor craft to meet most EPA Tier II standards for harbor craft of equivalent reductions.
2.	Retrofit and Repower Engines	By a specified time, require all previously re-powered home based harbor craft to be retrofitted with the most effective CARB verified NOx and/or PM emissions reduction technologies. When Tier III engines become available, all home based harbor craft will be re-powered with new engines.
3.	CA Low Sulfur Diesel	Utilize CA low sulfur diesel for harbor craft.
4.	Replace, Retrofit, Use Alternative Fuels	Clean up harbor craft through replacement, retrofit, or alternative fuels.
IV. Emission Source Category: Cargo Handling Equipment		
A. Primary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Accelerate Compliance with	Seek ways to accelerate compliance with CARB's Container Handling Equipment rule.

No.	Initiative	Description
	CARB's CHE Rule	
2.	Encourage Use of Clean Fuels	Encourage the use of ultra low-sulfur diesel and/or biofuel and promote the use of other cleaner fuels and lubricants where appropriate.
3.	Hybridization and Electrification	Increase fuel efficiency by using CHE with hybridization or full-electrification technologies, as feasible.
4.	Replace with Cleaner Equipment	Replace equipment with lighter, more efficient straddle carriers, rubber tired gantries (RTG), or fully-electric rail mounted gantry (RMG) cranes, and use Tier 4 engines for yard tractor fleet.
5.	Regenerative Energy Technologies	Identify opportunities for and maximize the use of regenerative energy technologies for CHE.
6.	Improve Efficiency and Design as Modifications Occur	Maximize operational efficiency and terminal design as port development occurs and negotiate cleaner alternatives at the time of major modifications and lease negotiations.
7.	Lease Measures and Project Reviews	Use lease measures and project reviews to drive continuous improvements and emissions reductions.
8.	Increase Electrification	Use electrification in much more Port/terminal operations equipment.
B. Secondary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Exhaust Treatment	Complete retrofits of suitable CHE with exhaust treatment equipment.
2.	Crankcase Emissions Reductions Systems	Use crankcase emission reduction systems equipment.
3.	Increase Zero Emission Equipment	Increase penetration of zero emission or near zero emission cargo handling equipment.
C. Duplication with Existing Regulatory or MOU Requirement:		
1.	ARB Inter-modal Cargo Equipment Rule	Finalize ARB inter-modal cargo equipment rule (OAL)
2.	Best Available Technology Fleet Upgrade	Complete full-scale fleet upgrade to the best available technology.
3.	Yard Tractors Meet Tier IV Standard	Require all yard tractors to meet a minimum EPA 2007 On-road or Tier IV engine standard by the end of 2010.
4.	CHE Meet Tier IV Standard, Equip CHE with VDECS	Require all CHE with engines with > 750 hp to meet, at a minimum, the EPA Tier IV of road standards by the end of 2014. Starting 2007, require all CHE with engines < 750 hp be equipped with cleanest available VDEC verified by CARB.
5.	Replace, Retrofit, Use Alternative Fuels	Implement ARB rule for cleaner cargo handling equipment through replacement, retrofit, or alternative fuels.
6.	ARB Forklift Rule	Adopt and implement ARB forklift rule for gas-fired equipment.
7.	Green Construction and Maintenance	Require green equipment for goods movement related construction and maintenance.
8.	Tier IV Standards	Implement US Tier 4 equipment emission standards.
9.	85%+ DPM Control on CHE	Upgrade cargo-handling equipment to 85% diesel PM control or better.
V. Emission Source Category: Rail		
A. Primary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Replace or Retrofit Switching Locomotives	Identify all existing switching locomotives in service at the Port of Oakland that may be potential candidates for replacement or retrofit.
2.	Implement Tier III Standards	Specify a date by which any new switch engine acquired must meet EPA Tier III standards.
3.	Implement Efficiency Improvements	Implement efficiency improvements to switchyards such as electrification of lift equipment and RFID system implementation when consistent with existing rail yard configuration and operations.

No.	Initiative	Description
4.	Cleanest Available Technology for New or Redesigned Yards	Require any new rail yards developed or significantly redesigned to operate the cleanest available rail yard technology.
5.	Lower Emitting Switch Engines	Use lower emitting switch engines within rail yards, where traditionally the oldest locomotives are used.
6.	Update Switcher Engines by 2010	Upgrade engines in switcher locomotives by 2010.
7.	Retrofit Engines with DPM Controls	Retrofit existing locomotive engines with diesel PM controls when certified by EPA and CARB.
B. Secondary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Freight Car Productivity Improvements	Implement freight car productivity improvements, incorporating technologies that reduce train resistance (drag).
2.	Increase Yard Efficiency and Identify Feasibility of On-Dock Rail	Increase port-wide rail and switching yard efficiencies and identify the feasibility of on-dock rail as alternative to near dock rail.
3.	Infrastructure for Rail Traveling North and East	Create infrastructure for another level of rail traveling North & East.
4.	More Rails for Long Haul	Utilize more rails for long haul.
5.	Tier III Locomotives in CA	Concentrate Tier 3 locomotives in California.
6.	Class I Long Haul Locomotives Transition to Tier III Fleet Average	Over a voluntary transition period, require the fleet average for Class I Long Haul Locomotives calling at port properties to be Tier III equivalent PM and NOx and to use 15 minute idle restrictors.
7.	Tier III/IV Line Haul Locomotives for New Engines and Rebuilds	Implement Tier 3/Tier 4 US standards for line haul locomotives at time of purchase (new engine and rebuild standards).
8.	Biofuel or Other Clean Fuels	Encourage the use of biofuel or other cleaner fuels in switchyard and line haul locomotive engines.
C. Duplication with Existing Regulatory or MOU Requirement:		
1.	CA Low Sulfur Diesel	Utilize CA low sulfur diesel for captive instate locomotives.
2.	Automatic Idling-Reduction Devices	Eliminate non-essential locomotive idling both inside and outside of rail yards by installing automatic idling-reduction devices on 99% of unequipped intrastate locomotives by June 30, 2008.
3.	Low Sulfur Diesel in 80% of CA Locomotives	Dispense lower-sulfur diesel in 80% of locomotives operating in California by January 1, 2007.
4.	Visible Emission Reduction and Repair Program	Ensure that the incidence of locomotives with excessive visible emissions is very low through the Visible Emission Reduction and Repair Program.
5.	Early Review of Emissions Impacts	Conduct early review of air emissions impacts from designated yards – with ensuing feasible mitigations.
6.	ULSD in Locomotive Engines	Use ultra low sulfur diesel in switchyard and line haul locomotive engines.
7.	2005 Statewide MOU	Implement 2005 Statewide MOU for Rail Yard Risk Reduction.
8.	Idling Restriction Training	Conduct training on locomotive idling restrictions.
VI. Emission Source Category: Other		
A. Primary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Biodiesel Consortium	Develop a biodiesel consortium (City of Oakland, Port of Oakland, City of Berkeley, West Oakland community).
2.	Sustainable Commuting	Establish employee programs to facilitate sustainable commuting.

No.	Initiative	Description
	Employee Programs	
B. Secondary List of Potential Initiatives Subject to Economic, Legal and Technological Feasibility:		
1.	Position for Public Health Officer at the Port	Create a position for a public health officer at the Port to take the lead on health impact assessment, and inform staff on community & worker health.
2.	Sponsor a Healthy Homes Project	Sponsor a Healthy Homes Project utilizing technology and design practices to reduce the amount of dangerous pollution residents breathe inside their homes. (Alameda County Public Health Department and the California Department of Health Services.)
3.	Pollution Mitigation and Prevention	Conduct mitigation and pollution prevention.
4.	Enforce Traffic and Vehicle Safety Laws	Increase enforcement of traffic and vehicle safety laws and regulations.
5.	Establish Construction Staging Areas	Establish construction staging areas in locations to minimize impact on local circulation with appointment system.
6.	Retrofit Freight Vehicles with Probes and Smart Sensors	Retrofit freight vehicles with probes and smart sensors to measure speed, weather, pollution, lane departure, cargo location, customs data, container RFID information, and vehicle/frame condition inspection dates.
C. Duplication with Existing Regulatory or MOU Requirement		
1.	Regulate Emissions from Stationary and Indirect Sources	Regulate criteria pollutant and toxic emissions from stationary sources and indirect sources based on Phase I findings.
2.	Enforce Adopted Commercial Vehicle Laws	Expand enforcement of commercial vehicle laws already adopted.
3.	Use Green Construction Equipment	Use green equipment for construction of infrastructure projects (as available).

9.3 Selected Initiatives

Since 1999, the Port has funded and supported innovative ways to reduce emissions from maritime operations. While the MAQIP Task Force was preparing the air quality master plan, the Port continued its commitment to clean air through a variety of emissions reduction projects that were already in the planning and implementation stages. Most of those projects are aligned with the MAQIP initiatives and were selected in consultation with community stakeholders through a public process. The Port intends to select its future emissions reduction programs and projects from the MAQIP initiatives, and to consider adding new initiatives according to the MAQIP screening process, in consultation with stakeholders.

As described in Section 1, the Port normally follows a planning continuum (Figure 1-1) that starts with a conceptual strategic or master plan (e.g., the MAQIP) that provides a framework for how to achieve the goals delineated in the plan. The next step is to develop the comprehensive programs that manage how the goals will be reached. Finally, the specific Port projects that reach the goal are implemented.

The programs and projects detailed in Table 9-4 provide a comprehensive look at the major emissions reduction efforts that the Port and its tenants and business partners are now working on or are considering. Nearly all of these efforts are intended to reduce emissions in advance of (i.e., early actions) or beyond regulatory emissions reduction requirements. Therefore, new equipment, fuel and infrastructure needed for direct compliance with regulations on the required schedule are not included in this table because of the obligatory nature of those projects.

Table 9-4 include projects that were recently completed, those currently underway or set for implementation in the next year or two, potential future projects, and projects planned or undertaken by entities other than the Port, as well as terminal design and operational efficiencies:

- **Completed** Some projects were implemented recently by the Port or by its business partners and tenants, and are continuing to reduce emissions in advance of (i.e., early actions) or beyond regulatory requirements. Most of the Port projects in this category were selected in consultation with community stakeholders through a public process.

- **Underway** Advanced planning for some programs and projects was already underway prior to the development of the MAQIP Task Force initiative screening process and final list. All of those strategies meet the MAQIP air quality goals, and support the primary and secondary initiatives. The projects are designed to reduce emissions in advance of (i.e., early actions) or beyond regulatory requirements. Most of the Port programs and projects in this category were selected in consultation with community stakeholders through a public process.

- **Future** Some potential programs and projects are described, but are not scoped out in detail. The Port is committed to working with a maritime stakeholder group through a public process to design emissions reduction projects and programs based on the MAQIP initiatives. At that time, responsibilities, funding and schedules can be established. While some of these are early action measures, others encompass Port infrastructure improvements needed to indirectly support regulatory compliance.

- **Non-port projects and programs** Some tenants and business partners, such as ocean carriers, are voluntarily engaged in emissions reduction efforts in advance of (i.e., early actions) or or beyond regulatory requirements.

- **Operational efficiencies** Current and past projects that promote reduced use of fuel or equipment at the seaport, thereby resulting in lowered emissions, are included along with long-term opportunities for similar efficiencies.

Both programs and projects are presented in Table 9-4 to show their relationship to individual initiatives identified by the MAQIP Task Force, while Table 9-5 breaks out programs and projects by source category. Table 9-6 presents the PM and NOx lifetime emissions reductions from early action projects that the Port, tenants or customers have already completed or scheduled.

Table 9-4 Selected Emissions Reduction Programs and Projects Based on MAQIP Initiatives

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
TRUCKS	
Port of Oakland Comprehensive Truck Management Program (CTMP) The Comprehensive Truck Management Program (CTMP) is a broad program initiated by the Port of Oakland, with substantial multi-stakeholder collaboration. The objectives of the CTMP range from enhancing Port security and safety to improving air quality. Many of the MAQIP truck initiatives are potential features of the CTMP, including: a. clean trucks, b. provision of parking areas and support for the City of Oakland's efforts to enforce truck parking and operations restrictions on neighborhood streets, c. truck registration and tracking.	
CTMP: Provision of truck parking in Port area Fifteen acres of additional truck parking in the Port's maritime area are planned, likely adjacent to the 15 acres of parking that will be provided by the City of Oakland. The Port is providing interim parking on former Oakland Army Base sites until the lot is completed. Opportunities for truck driver education on idling and truck routes and for additional truck services at the site may exist and could be investigated by the private truck parking operator. This is in addition to truck parking that is already provided in the Port maritime area. In 2005, Port funding enabled the opening of a new Oakland Maritime Support Services facility, which provides overnight parking for about 20 trucking companies, custom-designed dispatching services, and other trucking services. Schedule: Interim parking is currently being provided Cost: TBD Funding: TBD Partners: Port (Maritime), with City of Oakland and private operator (OMSS)	**Trucks (Primary)** 1 – collaborate/educate 8 – truck route 12 – idling education 16 – truck services
CTMP: Enforcement of truck parking and operations restrictions on neighborhood streets While the Port already funds two City of Oakland police officers to enforce truck parking and operations restrictions in West Oakland, that agreement is under review to determine how enforcement could be more effective. Schedule: underway Cost: $300,000 annually Funding: Port funds Partners: Port (Community Relations), with City of Oakland Police Department	**Trucks (Primary)** 1 – collaborate/educate 8 – truck route

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
CTMP: Truck registration and tracking A key potential feature of the CTMP, this measure is in the design phase via an RFP Schedule: TBD Cost: TBD Funding: TBD Partners: Port (Maritime), with CTMP Technical Advisory Committee, truck owners	**Trucks (Primary)** 4 – terminal reservations 8 – truck route **Trucks (Secondary)** 1 – virtual container yard 2 – RFID gate 6 – efficient queues **Rail (Primary)** 3 – yard efficiencies
CTMP: Truck idling outreach and education The BAAQMD enforces port truck idling regulations at the Port of Oakland. A more coordinated program to educate truck drivers on the regulations and on local truck routes and parking restrictions is planned. To assist in this effort, the Port is providing the West Oakland Environmental Indicators Program (WOEIP) with a trailer in the maritime area to use for trucker outreach and education. Schedule: TBD Cost: TBD Funding: TBD Partners: BAAQMD, truckers, dispatchers, Oakland Police and Traffic, CHP, Port, tenants, WOEIP, community groups	**Trucks (Primary)** 1 – collaborate/educate 8 – truck route **Other (Secondary)** 4 – enforce traffic and safety
Retrofit and/or replacement of drayage trucks (Port, BAAQMD, CARB) In partnership with the BAAQMD and CARB, the Port plans to jointly fund retrofits (diesel particulate filters that are verified by CARB to reduce DPM by at least 85%) and/or replacements (2007 engine or better) for trucks that serve the Port's maritime activities. The project shall comply with California's GMERP Final Guidelines. Schedule: June 30, 2009 - Install DPFs on up to 1,000 trucks if technically feasible (Year 1), or assist with purchase of new trucks Cost: $15,000,000 Funding: $5 million – Port $5 million – CARB (Prop 1B, Year 1) $5 million – BAAQMD (TFCA) Partners will jointly fund the cost of DPFs and/or contribute to truck replacements according to the current plan. Partners: CTMP, Port (Environmental), BAAQMD and CARB, with DPF providers, truck owners, truck dealers	**Trucks (Primary)** 1 – collaborate/educate 2 (part) – retrofit/replace 8 – truck route 12 – idling education
Port Vision 2000 Drayage Truck Replacement The Port launched a Truck Replacement Program in late 2005 to provide subsidies to truckers to scrap older heavy-duty diesel trucks and replace with newer, cleaner burning vehicles. The Port offered truckers whose trips were mostly within the Port maritime area up to $40,000 per truck (model year 1993 or older) to replace them with 2000 or newer model year trucks with significantly lower emissions. Approximately 80 trucks were replaced, and close to $2.5 million in incentive funding was awarded. The older trucks are permanently taken off the road and scrapped. It is estimated that more than 72 tons of DPM, ROG, and NOx emissions are being reduced during the five years of the project life. Many replacement trucks will operate beyond five years, making future emissions reductions even greater. Schedule: 2005 through 2008 Cost: $2,500,000 Funding: Port (Vision 2000 Air Quality Mitigation Program funds) Partners: Port (Environmental), with truck dealers, truck owners, scrap yards, West Oakland Neighbors, Vision 2000 Technical Review Panel and Truck Technical Advisory Committee	**Trucks (Primary)** 1 – collaborate/educate 2 (part) – retrofit/replace 8 – truck route 12 – idling education
LNG equipment and infrastructure Replace diesel trucks with 9 LNG-fueled heavy-duty trucks and 2 mobile fueling stations. This equipment will operate in the Port area. Schedule: Project implementation underway, operational in 2009 Cost: $3 million Funding: $1.75 million – Caltrans CMAQ grant, through MTC; $0.4 million – Port (Vision 2000 Air Quality Mitigation Program) $0.9 million – private operator (Clean Air Logix) Partners: Port (Environmental) and Clean Air Logix, with Caltrans, MTC	**Trucks (Primary)** 15 – LNG/CNG trucks

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
Truck work groups Continue participation in established forums that share information on truck air quality and related issues, technologies, policies, programs and funding, such as: • MAQIP Interagency Group • West Coast Collaborative • West Oakland Toxic Reduction Collaborative (WOTRC), Truck Incentives Working Group • Port Accessibility Task Force (Bay Area World Trade Center) • Other Schedule: ongoing Cost: Port staff time Funding: Port Partners: Port (Environmental, Social Responsibility, Government Affairs), with EPA, BAAQMD, WOEIP, Alameda County Public Health Department, truckers, City of Oakland, BAWTC, other agencies	**Trucks (Primary)** 1 – collaborate/educate 8 – truck route
HARBORCRAFT	
Tugboat Engine Replacement In July 2000, the Port approved funding to replace two tugboat engines with new low emission diesel engines. This replacement eliminates 0.9 tons of PM and 26 tons of NOx annually, or 15.5 tons of PM and 431 tons of NOx over the sixteen year life of the project. Schedule: completed Cost: $443,966 Funding: Port (Vision 2000 Air Quality Mitigation Program funds) Partners: Port (Environmental), tug owner (Oscar Niemeth Towing), West Oakland Neighbors , Vision 2000 Technical Review Panel	**Early Action project: Supports MAQIP's emissions and health risk reduction goals**
CARGO HANDLING EQUIPMENT	
Electric-powered rail mounted gantry cranes Electric yard cranes are increasingly under consideration for marine terminal operations and railyards. Tenants are studying the feasibility of incorporating electrified rail mounted gantry cranes in their future operations. Schedule: TBD Cost: TBD Funding: Tenant Partners: Tenants, with Port (Maritime and Engineering), consultants	**Cargo handling (Primary)** 1 – early compliance 3, 8 – electrification 4 – electric RMG (part) **Rail (primary)** 3 – yard efficiencies
Container Terminal Equipment Retrofit and Replacement Program Beginning in 2000, the Port worked with APL, Maersk Inc., Marine Terminals Corporation, SSAT, TransBay Container Terminal, Inc., and Trans Pacific Container Service Corporation, to repower 83 pieces of diesel equipment and retrofit 178 pieces, mostly yard trucks. Schedule: 2000 to 2006 (first installations in 2002) Cost: $1,211,400 Funding: Port (Vision 2000 Air Quality Mitigation Program funds) Partners: Port (Environmental), marine terminal operators, West Oakland Neighbors , Vision 2000 Technical Review Panel	**Cargo handling (Primary)** 1 – early compliance
Electrification Projects All of the 37 container cranes on the Port's marine terminals are electric, and electric connections have been provided for refrigerated shipping containers on all of the Port terminals. In addition, the Port installed shoreside connections to power electric dredges engaged in the Port's channel and berth deepening projects. Schedule: cranes and reefer plugs – completed; dredging – ongoing Cost: n.a. Funding: Port, U.S. Army Corps of Engineers (share of electric dredges for channel) Partners: Port, marine terminal operators, U.S. Army Corps of Engineers	**Supports MAQIP's emissions and health risk reduction goals**

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
SHIPS	
APL/Eagle Marine Services shore power APL/Eagle Marine Services is planning to implement grid-based shore-side power at Berths 60-63. The project will provide the terminal infrastructure to enable ships to turn off their auxiliary engines and connect to shore-side power while at berth, and includes procurement and installation of a substation, underground cabling, connection to the electrical grid, and shore-side plugs for two berths. APL plans to plug in 25% of ship visits by 2011, 60% by 2014, and 90% by 2020. Each of these milestones represents acceleration from regulatory requirements by 3 years and additional emission reductions of 10% in each key year. Schedule: operational by December 2009 Cost: $4 million Funding: $2.9 million CARB I-bond funding $1.1 million private funds Partners: APL/Eagle Marine Services, with BAAQMD, CARB, Port	**Ships (Primary)** 6 (part) – Early action shore power
Alternative fuel shore power In 2007, the Port, BAAQMD, APL/Eagle Marine Services, PG&E and CleanAir Logix tested an LNG fueled mobile shore-side power technology designed to reduce emissions from ships while at berth. Future use of this technology (Wittmar DFMV™ Cold Ironing) will depend on operational functionality, cost and other aspects of feasibility. Schedule: test completed; future applications TBD by tenants Cost: $275,000 from Port for test of technology Funding: Port funds Partners: Port (Environmental) and CleanAir Logix, with BAAQMD, APL/Eagle Marine Services, PG&E	**Ships (Primary)** 6 (part) – Early action shore power
Infrastructure requirements for shore power Port staff is currently meeting with tenants to hear about their plans for compliance with CARB's regulation to reduce emissions from diesel auxiliary engines on ocean-going vessels while at berth at a California port ("shore power" rule), and to determine if there are any opportunities for early compliance with the regulation. As one alternative, Port staff is examining the electric infrastructure requirements for shore power, and likely capital investment costs. Schedule: TBD Cost: TBD Funding: TBD Partners: Tenants, with Port (Maritime)	**Ships (Primary)** 6 (part) – Early action shore power
Voluntary compliance with fuel regulations Many shipping lines calling at the Port of Oakland have offered to voluntarily use low sulfur fuel in their auxiliary engines, prior to implementation of the main engine and auxiliary engine low sulfur regulation. The Pacific Merchant Shipping Association (PMSA) has recommended that member companies use low-sulfur fuel in their auxiliary engines as an early action emissions reduction measure. Schedule: TBD Cost: TBD Funding: Shipping lines Partners: Shipping lines, PMSA	**Supports MAQIP's emissions and health risk reduction goals**

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
Voluntary use of low sulfur fuel In December 2005, A. P. Moller-Maersk (APM) announced a voluntary pilot initiative to switch fuel in both the main and auxiliary engines on all of its vessels calling at California ports to use a marine gas-oil (MGO) with sulfur content below 0.2%. A 2007 study of the results of this program at the Ports of Oakland and Los Angeles showed encouraging results[2]. Ships were switched over from bunker fuel, with a 2.3% sulfur content, to MGO, with an average 0.13% sulfur content (even lower than expected), at 24 nautical miles (nm) from the California coast for auxiliary engines, and at 24 nm from the arrival port for the main engines. Emissions reductions in California waters for 2007 were: • SOx 95 % reduction • PM 86 % reduction • NOx 12 % reduction Schedule: 2006 - present Cost: n.a. Funding: APM Partners: APM	**Supports MAQIP's emissions and health risk reduction goals**
RAIL	
Clean Switcher Locomotive Engines The Port is leveraging funding to assist BNSF (the Port's rail tenant) with the replacement of older yard locomotives with two new clean burning genset switcher locomotives at the Oakland International Gateway (OIG). These engines are committed to Oakland service. Schedule: Project implementation underway, operational in 2009 Cost: $3.0 million for 2 units Funding: $1.3 million – Port $1.7 million – BNSF Partners: Port (Environmental) and BNSF	**Rail (primary)** 1 – switcher ID 6 – switcher replacement
OTHER EQUIPMENT AND FUELS	
Low-emissions Construction Equipment In 2007, the Port launched an incentive pilot project to encourage contractors to use lower emissions construction equipment. Incentives were incorporated into the specifications for two projects to date with the intention of promoting the use of clean construction equipment ahead of the implementation schedule required by the CARB in-use off-road diesel vehicle rule. Schedule: pilot project is underway Cost: $175,000 in incentives for two projects (estimated) Funding: Port Partners: Port (Engineering), with construction contractors	**Supports MAQIP's diesel PM reduction goals**
Port-Owned Vehicle Fleet The Port is gradually replacing its own fleet of 200 cars and trucks with hybrid, CNG-fueled, or electric vehicles. To date, the Port has replaced or eliminated 25% of its fleet and is on track to replace the rest within the next five years. The Port is also planning to test an ethanol biofuel (O2 diesel) in three Port vehicles. Schedule: underway; 25% completed by 2007; 100% completed by 2013 Cost: TBD Funding: Port funds Partners: Port (Maritime)	**Trucks (Primary)** 15 – LNG/CNG trucks (support) **Trucks (Secondary)** 11 – alternative fuel
Ethanol Pilot Program The Port is planning to test an ethanol biofuel (O2 diesel) in three Port vehicles. Schedule: Project implementation underway, operational in 2009 Cost: TBD Funding: Port funds Partners: Port (Maritime)	

[2] (APM, 2008). "Maersk Pilot Fuel Switch Initiative", presentation by Jim Flanagan, APM, at Future Ports Program: Air Quality – Are We Making Progress?, May 16, 2008, http://www.futureports.org/events/airquality/aq-flanagan-ppt.pdf

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
CNG station In 2007, the Port, the City of Oakland and other partners assisted Clean Energy Corporation in construction of a CNG station at 205 Brush Street, adjacent to the Port's maritime area. The station can be used for fueling both trucks and passenger vehicles, and is open to the public 7 days a week/ 24 hours a day. The Port donated land, and the City secured grants from BAAQMD and the California Energy Commission to assist in construction. Schedule: complete and operational Cost: Unknown Funding: $166,100 – value of Port property (2005) $375,000 – grant from California Energy Commission and Alameda County Congestion Management Agency, through the City of Oakland Remaining costs – Clean Energy Corporation Partners: Clean Energy Corporation and Port (Maritime and Environmental), with City of Oakland, BAAQMD, and the California Energy Commission, Alameda County Congestion Management Agency	**Trucks (Primary)** 15 – LNG/CNG trucks (support) **Trucks (Secondary)** 11 – alternative fuel
Repower and retrofit West Oakland buses In 1999, the Port gave money to AC Transit to help repower and retrofit 28 buses assigned to routes in West Oakland and neighboring communities. Schedule: complete and operational in 2001 Cost: $659,000 Funding: Port (Vision 2000 Air Quality Mitigation Program funds) Partners: Port, AC Transit, West Oakland Neighbors	**Supports MAQIP's emissions and health risk reduction goals**
OPERATIONAL EFFICIENCIES	
Marine Terminal Improvements The Port and its tenants routinely search for ways to improve terminal design, security systems and other goods movement infrastructure so greater efficiencies can be achieved. Additional cargo growth through terminals would primarily be hauled by rail, instead of trucks, to inland destinations. Rail is a more efficient means of moving cargo over long distances, with fewer air emissions per ton of cargo moved per mile. Improvements in technology, yard layout, traffic patterns and gate configuration can result in faster cargo processing, with shorter waits for trucks in line or inside the terminal. Less waiting means less truck idling and reduced emissions. The Port will continue to negotiate with current and prospective tenants on incorporating improvements into terminal projects. Operational and design efficiencies are discussed in more detail in Section 8, "Emissions Reduction Strategies". The emission reduction benefits of such projects can be substantial. For example, TraPac reported that a recent container yard project led to a 25% decrease in truck turn times, despite a 25-30% increase in cargo throughput. Continued improvements should lead to even better truck turn times in the future.	**Trucks (Primary)** 5 – terminal efficiencies 7 – reefer plugs (part) **Trucks (Secondary)** 6 – efficient queues 12 – more rail cargo **Ships (Secondary)** 1 – terminal efficiencies **Cargo handling (Primary)** 6 – terminal efficiencies
Rail yard development and reconstruction The Port is evaluating redevelopment options for the former Oakland Army Base property, including rail yard development. Opportunities for operational efficiencies may include electrified yard cranes and improved track and yard layouts. Schedule: TBD Cost: $220 million Funding: $110 million – grant from Caltrans TCIF (Prop 1B funds) $110 million – Port funds Partners: Port (Maritime, Engineering and Environmental), UP with Caltrans	**Rail (Primary)** 3 – yard efficiencies **Rail (Secondary)** 2 – yard efficiencies 4 – more rail cargo **Trucks (Primary)** 5 – terminal efficiencies
Near-dock rail yard (OIG) The Oakland International Gateway (OIG), a new near-dock rail terminal, opened in 2002, effectively removing up to 20,000 trucks hauling containers off I-80 between the Port of Oakland and BNSF's rail yard 12 miles away in Richmond, reducing both congestion and air emissions. Schedule: completed 2002 Cost: $38 million Funding: $22 million – federal grants through ISTEA and TEA-21 funding $16 million – Port funds Partners: Port, Alameda County Transportation Agency, Caltrans, BNSF	**Rail (Secondary)** 2 – yard efficiencies 4 – more rail cargo **Trucks (Primary)** 5 – terminal efficiencies

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
Maritime Materials Management Program (MMP) The Port's maritime Materials Management Program (MMP) diverts concrete, asphalt, and soil generated by seaport construction and demolition projects from landfills and off-site stockpiles to an on-Port facility for processing into construction aggregates and fill material. The processed material is then recycled back into the Port's and tenants' construction and redevelopment projects. This program eliminates repeated truck trips to and from suitable landfills, recycling centers or quarries that are located 10 to 71 round-trip miles from the Port. In the first 16 months of operation, the program demonstrated emissions reductions of: • SOx 0.01 tons • PM10 0.3 tons • NOx 12 tons The crushing contractor, Evans Brothers, will use only Tier III off-road equipment during all crushing activities, effective October 2008, resulting in an estimated 65% reduction in PM and 60% reduction in NOx from crushing operations. Schedule: on-going; began operations in March 2007 Cost: $0.2 million for start-up; Port staff time; net savings for construction projects Funding: Port; program will eventually generate net revenue Partners: Port; contractors	**Other (Secondary)** 5 – establish construction staging areas
AIR QUALITY POLICY AND EDUCATION	
Participate in public air quality policy and funding forums Continue participation in established forums that share information on maritime air quality issues, technologies, policies, programs and funding, such as: • MAQIP Interagency Group • West Coast Collaborative • West Oakland Toxic Reduction Collaborative (WOTRC) • CARB Goods Movement Local Entity Work Group Schedule: ongoing Cost: Port staff time Funding: Port Partners: Port (Environmental, Government Affairs, Maritime, Social Responsibility), EPA, BAAQMD, WOEIP, Alameda County Public Health Department, CARB, City of Oakland, tenants, other ports and agencies	**Ships (Primary)** 1 – W. Coast clean ships 8 – MARPOL 6 support 9 – SECA designation
Health risk assessment responsibility at the Port A Port Environmental Supervisor has been designated the health risk assessment coordinator for the Port. The current assigned staff person holds graduate degrees in public health and, as a Certified Industrial Hygienist, is experienced in analyzing and communicating health risks. Schedule: ongoing Cost: Port staff time Funding: Port Partners: Port (Environmental), with Alameda County Public Health Department	**Other** 1 – staff for health risk assessment (part)
Breathmobile support The Port is providing financial support to the Breathmobile, an "asthma clinic on wheels" sponsored by the Prescott-Joseph Center in West Oakland, which visits Oakland schools to provide convenient and free asthma services. Schedule: 2008 Cost: $50,000 from Port Funding: Port contribution to Breathmobile Partners: Prescott-Joseph Center, with funding partners including BAAQMD and the Port (Social Responsibility)	

Programs and Projects by Source Category	Link to Primary and Secondary MAQIP Initiatives (Table 9-3)
RESEARCH OPPORTUNITIES	
Investigate technologies and grants opportunities Investigate technologies and funding opportunities for additional potential emissions reductions strategies. Schedule: ongoing Cost: Port staff time, potential use of consultants Funding: Port Partners: TBD	
Participate in pilot programs for NOx and DPM reduction Participate in suitable equipment and control strategy pilot and verification projects, with an emphasis on NOx reduction. Schedule: TBD Cost: TBD Funding: TBD Partners: Port, tenants, maritime-related businesses, vendors, CARB, BAAQMD	
Track MAQIP progress through emissions inventories Update the Port's "2005 Seaport Air Emissions Inventory" to track the Port's progress towards meeting its emissions reduction goals. Schedule: Commence in 2009 with 2008 data. Repeat every 2 to 3 years thereafter. Cost: TBD Funding: Port Partners: Port (Environmental), with CARB, BAAQMD, tenants, consultant	

Table 9-5 Summary of Programs and Projects by Source Category

Programs

Trucks

- Comprehensive Truck Management Program (CTMP)
  - Provision of truck parking in Port area
  - Enforcement of truck parking and operations restrictions on neighborhood streets
  - Truck registration and tracking
- Truck idling outreach and education
- Truck work groups

Ships

- Infrastructure and equipment requirements for shore power
- Voluntary compliance with fuel regulations
- Voluntary use of low sulfur fuel (APM)

Operational Efficiencies

- Marine terminal improvements
- Rail yard development and reconstruction
- Near-dock rail yard (OIG)
- Maritime Materials Management Program

Policy and education

- Participate in air quality policy and funding forums
- Health risk assessment responsibility at the Port
- Breathmobile support

Research

- Investigate technologies and grants opportunities
- Participate in pilot programs for NOx and DPM reduction
- Track MAQIP progress through emissions inventories

Projects

Trucks

- Retrofit and replacement of drayage trucks (Port, BAAQMD, CARB)
- Port drayage truck replacements
- LNG equipment and infrastructure
- Ethanol pilot program

Rail

- Clean switcher locomotive engines

Ships

- APL/Eagle Marine Services shore power
- Alternative shore power

Harborcraft

- Tugboat engine replacement
- Electrification projects (electric dredgers)

Cargo handling equipment

- Electric-powered rail mounted gantry cranes
- Container Terminal Equipment Retrofit and Replacement Program (CTERRP)
- Electrification projects (container cranes, plugs for refrigerated containers)

Other equipment and fuels

- Low-emissions construction equipment
- Port-owned vehicle fleet
- CNG station
- Repowered and retrofitted West Oakland buses

Table 9-6 PM and NOx Emissions Reductions from Early Action Projects

Early Action Emissions Reduction Projects	Lifetime NOx reductions (tons)	Lifetime PM reductions (tons)	Project life (years)
TRUCKS			
CTMP: Retrofit or replacement of drayage trucks (Port, BAAQMD, CARB); a combination of retrofits and replacements may be selected • Retrofit of 1000 trucks with DPF	0	91	4
Port Vision 2000 drayage truck replacement	96	12	5
LNG equipment and infrastructure (Port, Caltrans, Clean Air Logix)	62	3	15
Ethanol pilot program	Not calculated	Not calculated	n.a.
SHIPS			
Voluntary compliance with fuel regulations (carriers)	Not calculated	Not calculated	n.a.
Voluntary use of low sulfur fuel (APM)	Not calculated (12% reduction)	Not calculated (86% reduction)	n.a.
APL/Eagle Marine Services shore power (APL/Eagle Marine, BAAQMD, CARB)	TBD	TBD	
RAIL			
Clean switcher locomotive engines (Port, BNSF)	190	10	15
HARBORCRAFT			
Tugboat engine replacements	431	16	16
Electrification projects (electric dredges)	537	13	4
CARGO HANDLING EQUIPMENT			
Container Terminal Equipment Retrofit and Replacement Program (CTERRP)	129	25	Various
Electrification projects (container cranes, refrigerated container plugs)	Not calculated	Not calculated	n.a.
OTHER EQUIPMENT AND FUELS			
Low-emissions construction equipment pilot program	Not calculated	Not calculated	n.a.
Port-owned vehicle fleet	Not calculated	Not calculated	n.a.
Repower and retrofit West Oakland buses	40	4	9
TOTAL EMISSIONS REDUCTIONS			
Total lifetime emissions reductions from selected projects	**1,485 tons of NOx**	**174 tons of PM**	

[1] All are Port-sponsored projects unless otherwise noted. Some emissions reductions were not calculated because the reductions were minimal or the necessary data were not yet available.

10 IMPLEMENTATION

This section discusses implementation of emissions reduction measures by the Port of Oakland. Due to the array of CARB and EPA regulations and standards affecting the maritime industry, most emissions reduction projects over the next decade will be undertaken by Port tenants and maritime-related businesses, not by the Port. The Port will ensure that its tenants and other business stakeholders are informed of the MAQIP air quality goals, and will recommend that they follow the initiative development techniques outlined in this plan for selection of their emissions reduction programs and projects.

The Port intends to implement selected emissions reduction programs and projects generally following the approaches described in this section, within its legal authority. Similar approaches apply to both programs and projects, but the term "project" is used throughout this section, because most programs lead to implementation of specific projects.

10.1 Overview of Port's Legal Authority[1]

When a state or federal agency (such as CARB) adopts regulations, it derives its power to adopt, implement and enforce such regulations from specific state or federal laws. In other words, it is an enforcement agency because it has enforcement powers derived by state and federal legislation. Such enforcement powers are not "passed on" to the Port. For example, in CARB's shore power regulations ("Operational Hour Limits and Other Requirements for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port"), the "Violations" section cites California Health and Safety Code Section 42400 that gives CARB the power to impose penalties, obtain injunctive relief and impose other remedies for violation of the Regulations. Moreover, the State legislature budgets and allocates money to CARB to carry out its enforcement functions. The Port has neither the legal authority nor the allocated resources to conduct investigations, hold hearings, determine violations or enforce such regulations.

The Port, in its capacity of landlord, may and does require its tenants to follow all state laws in their use of Port properties. For the violation of such lease condition, the Port may evict, impose rental penalties or even impose fines under its powers under the City Charter. However, the primary power and resources to investigate, to determine that a violation under a state or federal regulation has occurred, and to enforce lies with state or federal enforcement agencies with legal enforcement powers.

As a trustee of state property, the Port must use tidelands and assets for purposes that are beneficial to the state as a whole (for example, for harbor purposes). The "Tidelands Trust Doctrine" is rooted in the premise that the Port acts as a trustee of state-owned lands and assets when it manages the tidelands and all assets derived from such state lands. The Port is prohibited under the Doctrine to use the proceeds of the trust for "local purposes", "general municipal purposes" or "general municipal improvements"[2]. In adopting and implementing its air quality policies, plans and goals, the Port is administering the tidelands for the benefit of the state as a whole.

[1] Recommended by Kent Lewandowski, Sierra Club, June 19, 2008; addresses issues raised by Brian Beveridge, et al., West Oakland Environmental Indicators Project, July 14, 2008.
[2] City of Long Beach v. Morse, 31 Cal.2d 254 (1947)

The Port strictly enforces a policy of nondiscrimination[3] in carrying out all its projects, programs and activities, including the adoption and implementation of its air quality plans and goals.

10.2 Port Implementation Approaches

Most of the emissions reduction projects needed to reach the MAQIP goals will be initiated by the Port's tenants and related businesses in response to regulations and standards enacted by CARB, BAAQMD, EPA, and the IMO. Government agencies develop their regulations through a feasibility analysis and detailed design for implementation, along with a legal justification. Furthermore, agencies have the legal authority to enforce compliance with adopted regulations according to the regulatory deadlines.

The Port requires compliance with all federal, state and local laws, regulations and permits in its tariff, lease and other agreements, and routinely works with its tenants and business partners to monitor compliance and to address any concerns that may arise. Initiatives that are not required by regulations, but that assist in meeting the MAQIP goals, may be implemented by the Port through other means, including: (1) voluntary actions, (2) incentive programs, (3) lease or tariff provisions, (4) CEQA mitigation measures, and (5) other mechanisms. As described in Table 10-1, each approach may be appropriate, depending on the circumstances.

Table 10-1 MAQIP Implementation Approaches by the Port of Oakland

1. Voluntary Actions	Meet with tenants and business partners to encourage them to take voluntary actions to improve air quality. This could be undertaken at any time.
2. Incentive Programs	Develop incentive programs for tenants and business partners. This could be an effective way to encourage participation by tenants with long term leases in early action emissions reductions. Incentives may or may not be financial, and could be enacted through an MOU, tariff, lease supplement, contract or other mechanism. All incentives would be subject to a feasibility analysis and to the availability of funding for program administration and implementation.
3. Lease or Tariff Provisions	Negotiate with tenants when leases are open for renewal to provide an opportunity for commitments by tenants to specific measures. A proposal could be submitted by a tenant or requested by the Port when a lease expires. Once a tenant and the Port agree on lease terms, both parties must abide by the agreement, and the Port can use its existing authority to enforce lease provisions. However, not all business partners of the Port are subject to leases. The Port's tariff applies more widely to users of the Port's terminals, so is a more appropriate means for instituting seaport-wide measures.
4. CEQA mitigation measures	Include initiatives as part of a project description or as mitigation measures in a CEQA document covering maritime area development. Mitigation measures must be feasible and minimize the significant adverse impacts of a project. The measures may incorporate phasing and performance standards that may be accomplished in more than one specified way. The development project proponent is normally responsible for implementing and managing mitigation measures. Tenants, business partners or others responsible for air quality mitigations will be urged to select projects based on the MAQIP initiatives.
5. Other mechanisms	Undertake initiatives as Port-sponsored projects through grants and Port funding, such as a user fee, if available.

[3] Title VI under the Civil Rights Act of 1964 (42 USC 2000(d)-2000(d)(1)) declares it to be the policy of the United States that discrimination on the ground of race, color, or national origin shall not occur in connection with programs and activities receiving Federal financial assistance and authorizes and directs the appropriate Federal departments and agencies to take action to carry out this policy.

10.3 Port Organizational Capacity and Constraints

The Port and many of its business partners have demonstrated the ability to initiate, manage and complete emissions reductions projects. Clear coordination with all stakeholders is vital to ensure successful implementation and monitoring of projects and reporting on progress towards the MAQIP emissions and health risk reduction goals. As noted previously, this section addresses the Port's organizational capacity, and not that of its business partners.

The Port organization chart in Figure 10-1 identifies a preliminary schematic structure. As a first step, organization roles and responsibilities need to be assigned. The organization chart shows Port divisions with their primary roles and responsibilities as they pertain to implementation of the MAQIP goals, programs and projects. Each project requires participation to varying degrees from almost every division.

While the number of dedicated air quality staff at the Port does not approach that of the much larger Southern California ports, staff at all levels and across many divisions participate to varying degrees in air quality-related policy, programs, projects and related activities, demonstrating the value placed in the organizational culture on air quality:

- Executive
- Environmental Programs and Planning
- Maritime
- Social Responsibility
- Engineering
- Government Affairs
- Aviation
- Port Attorney
- Corporate Administrative Services (Media Relations)

Participation from beyond Port internal resources is needed, as illustrated in Figure 10-2. That figure shows the roles and responsibilities of both the Port and its tenant, business, community, environmental, and agency partners by the functional areas to which they can best contribute to realizing the MAQIP goals.

Some of the internal and organizational challenges that could affect timely implementation of projects and meeting goals are:

- Budget – The challenge of identifying sufficient timely funding sources is possibly the most serious barrier to early and extensive implementation of emissions reduction projects.
- Staffing – The coordination needed among Port divisions to implement projects can be impeded if staff are not available to assist when needed. For example, when grant opportunities are announced, there is usually a short period in which to investigate the guidelines, determine suitability, line up partners and prepare a grant application.
- Technical expertise – When staff do not possess the technical knowledge to conduct a project or program (e.g., health risk assessment), it is necessary to hire consultants with that experience. Besides the cost implications, it takes several months to find and hire appropriate firms through the mandatory contracting procedures.

The Board of Port Commissioners and the Port's Executive Director understand these potential challenges, and will work towards overcoming them in order to meet the Board's MAQIP-driven goal of reducing community health risk from seaport operations.

10.4 Port Project Selection

Initiation of an emissions reduction project (or program) at the Port requires:

- Identification of a project
- Screening and feasibility analysis of the project
- Recommendation and decision to undertake the project

The flow chart in Figure 10-3 maps out the expected steps needed to move Port MAQIP initiatives from proposals to successful implementation. It conceptually illustrates the stages from project identification through monitoring and adaptive management and indicates the primary responsibilities for each stage.

10.4.1 Identification of Port Projects

Most of the emissions reduction projects in the seaport area will be undertaken by the Port's tenants, customers and other maritime-related businesses. Within its funding capability, the Port will initiate some emissions reduction projects. The initiatives that were identified through the MAQIP development process (Table 9-3) are expected to comprise the source of most of the Port's selected air quality improvement projects initially. Later, members of a maritime stakeholders group (Section 11.5), including tenant and community representatives and Port staff, may propose new MAQIP initiatives. Ideas for initiatives could come from agency or private industry-sponsored research or pilot programs, from other ports or maritime-related businesses, and from environmental firms, among other sources. Projects emerging from the Ports of Los Angeles and Long Beach's Technology Advancement Program will be of particular interest.

10.4.2 Screening and Feasibility

Once a new initiative is proposed, it will go through a screening process and feasibility analysis. The screening criteria developed by the MAQIP Task Force (Table 9-2) will be used to assess the general potential for emissions and health risk reductions. Those criteria were used to screen and select the initiatives in Table 9-3. Tenants and maritime-related businesses will also be urged to use the screening criteria.

All projects under consideration for selection, including those emerging as new initiatives, will be evaluated for feasibility, including factors such as:

- Overall cost of a project including administration, availability of funding, return on investments, and similar financial considerations;
- Cost-effectiveness of the expected emissions reductions, based on the cost of the measure compared to the emissions reductions;
- Practicability of introducing new equipment, fuel or other measures;
- Availability of new technologies and compatibility with existing operations; and
- Legal feasibility.

The information and planning needed to conduct a feasibility analysis will also contribute to the preparation of a more detailed project description that can be used as the basis for making a decision about whether to proceed with a project.

10.4.3 Recommendation and Decision on Port Projects

A maritime stakeholder group will assist by reviewing proposed projects that have undergone a feasibility study, and advising on adoption. It is possible that some project opportunities could arise that require an immediate decision by the Port. Examples of such opportunities might be proposals from tenants to partner in a specific project that will support the emissions reduction goals or projects supported by federal, state or local grant funding programs with short-term deadlines. Such projects would be presented to maritime stakeholders for review at the earliest opportunity.

While it is up to Port management and the Board of Port Commissioners to decide whether to proceed with a project, the recommendations of an advisory group would be considered as part of their evaluations.

10.5 Port Project Management

All projects that the Port undertakes, including emissions reduction projects, are subject to a series of approvals and reviews to ensure that Port funds are used in compliance with the Port Charter and Board policies and that all actions comply with the law.

Some of the elements typically needed to initiate a project at the Port include:

- A recommendation and decision to undertake a project.
- Assigned staff to manage and conduct the work associated with the project (e.g., coordinate with internal and external stakeholders, manage consultants or contractors, conduct the project feasibility analysis, prepare application materials, apply for grants, prepare Board agenda reports, write and execute contracts, pay bills, review work products, prepare CEQA/NEPA documentation and permit applications, etc.)
- Funding from internal or external sources (e.g., annual operating budget, capital improvement budget, grants)
- Board of Port Commissioners review and authorization (e.g. for setting policy, for expenditure of Port funds, for execution of agreements (contracts, MOUs, leases, etc.), and for CEQA findings and acceptance of permit conditions, among other requirements).

Other agencies, private companies and non-profits have their own formal or informal processes for selecting and launching projects, but each is likely to require the same broad elements of decisions, staffing, funding and approvals.

Once projects are approved, project managers within the Port generally establish and track the budget, schedule, and progress towards completion, and work with the Port Attorney's Office on legal agreements, if required. Emissions reductions projects, such as the Port's Container Terminal Equipment Retrofit and Replacement Project and the Truck Replacement Program, usually require contracts with equipment providers, equipment recipients, and salvage yards depending on the purpose of the program. Grant funding normally requires agreements with granting agencies, as well as preparation of a program designed to comply with the terms of the grant.

For emissions reduction projects, guidelines are often prepared to clarify the purpose, eligibility requirements, cost-effectiveness criteria and participant obligations after funding. Examples of guidelines are the Port of Oakland Truck Replacement Program guidelines[4] and the BAAQMD

[4] http://portofoakland.com/pdf/envi_prog_06_2.pdf

Goods Movement Program's truck retrofit and replacement guidelines[5]. Communications and outreach plans are needed for projects targeted to external clients (e.g., truckers or terminal operators).

Tracking compliance with the established schedule is particularly important once an emissions reduction project is underway since delays could result in the loss of early action benefits. Furthermore, delays could indicate that a project is not yet technologically feasible, that clients perceive costs as outweighing benefits, or that unexpected complications must be managed. All of those reasons could trigger the need to redesign the project through adaptive management (see Section 11.1).

10.6 Funding and Investment

Achievement of the MAQIP goals by 2020 will be costly, with most of the costs borne by the Port's tenants and related businesses and customers as they upgrade equipment and take other steps to comply with state and federal air quality regulations.

With the phase-in of CARB's regulations over the next few years, Port-related businesses and tenants will be required to invest in cleaner equipment to meet new engine and emissions standards. Some of the air quality regulations require fleet-wide retrofits or engine or equipment replacements, so businesses may need to accelerate investment cycles, with a focus on eliminating the oldest equipment first. The costs of such equipment investment are assumed by each business.

To implement additional feasible initiatives that exceed regulatory requirements, the Port and its partners need to find additional sources of funding. The scale of costs can be estimated by looking at the Ports of Los Angeles and Long Beach's Clean Air Action Plan: funding from those ports, the South Coast Air Quality Management District, bonds and impact fees is anticipated to provide $2 billion over the next five years for emissions reduction measures. Given that benchmark, it is clear that new funding mechanisms and close partnerships with federal and state funding agencies are needed to pay for the Port's MAQIP goals. Realizing this need, BAAQMD launched its "Green Ports Initiative", with its emphasis on funding emissions reduction measures along with enforcement of air quality regulations.

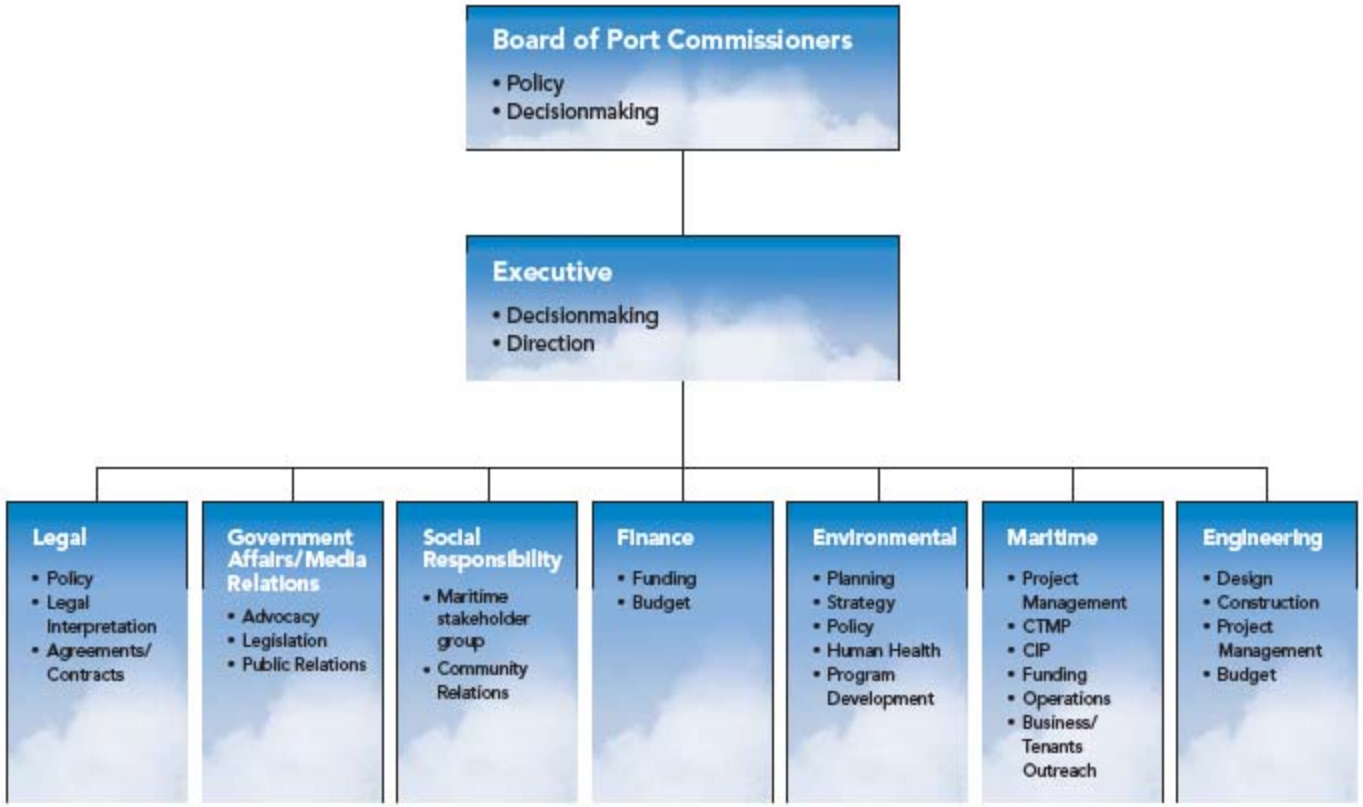
10.6.1 Port Funding Sources

Historically the Port's principal funding sources for maritime environmental improvement activities have been operational revenues and bond-funded capital project budgets. Because these revenue sources are insufficient to meet the needs of the MAQIP and of maritime development for the foreseeable future, the Port is turning to new funding and financing mechanisms.

Among other options, the Port is planning to implement a user fee. Fee revenues would potentially be used to generate matching funds for Proposition 1B grants and for other purposes that address key infrastructure and environmental projects, including but not limited to, projects identified in the MAQIP, for the sustainable growth of cargo into the future.

[5] http://www.baaqmd.gov/pln/grants_and_incentives/gm/index.htm

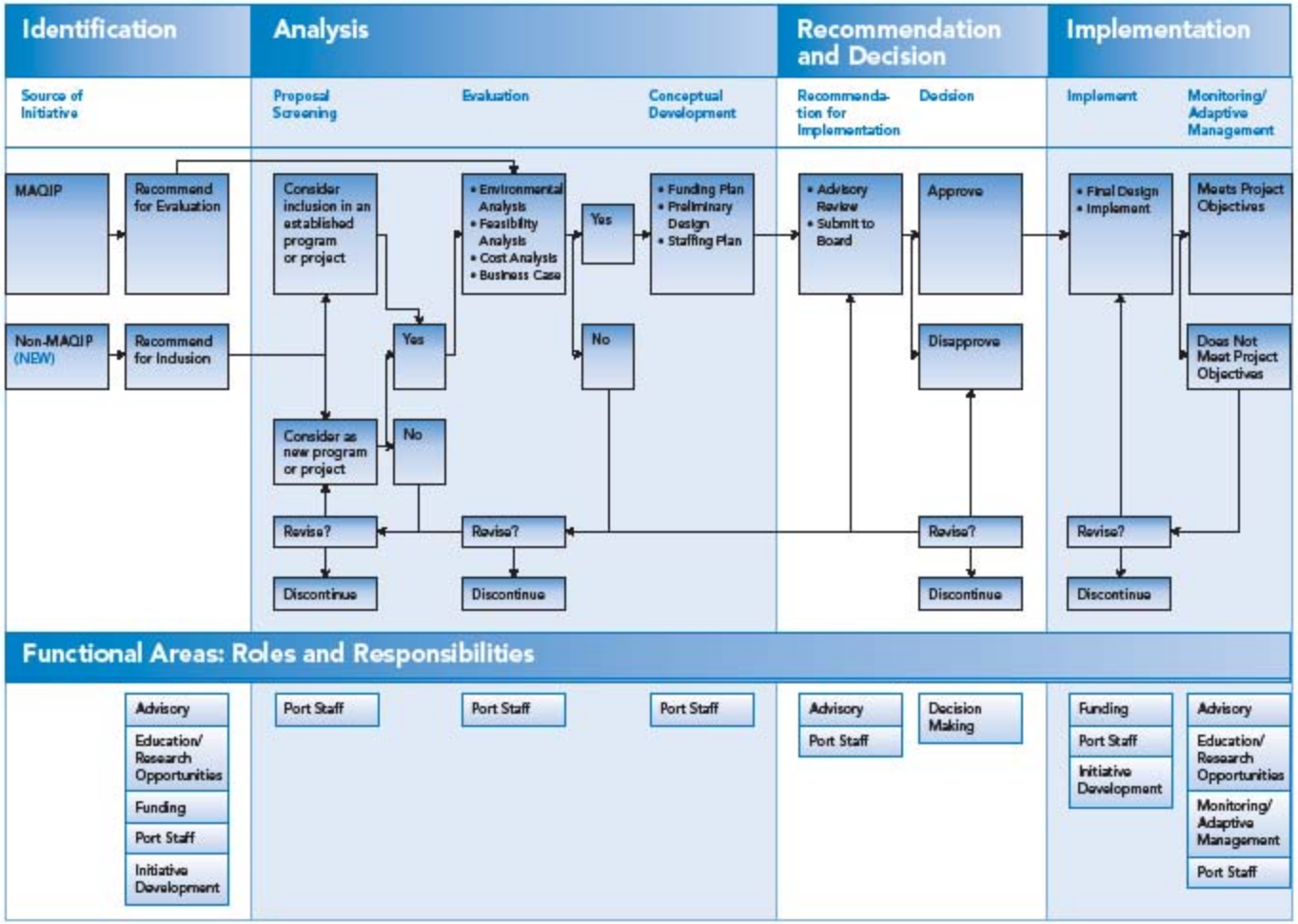
Figure 10-1: Port of Oakland MAQIP Organization Chart



Proposed Roles and Responsibilities

Figure 10-2: MAQIP Roles and Responsibilities

Figure 10-3: MAQIP Initiative Development Flowchart



By Resolution 08162 dated July 1, 2008, the Board of Port Commissioners directed staff to prepare an ordinance for a user fee in the amount of $12.50 per loaded twenty-foot equivalent unit (TEU), not to exceed $25 per loaded container. Of that $12.50, approximately $0.50 is currently intended to cover administrative costs of the fee program. Port staff currently anticipates presenting the ordinance to the Board at the same time the MAQIP is presented to the Board. The fee, if adopted by ordinance, would be imposed on loaded TEUs and paid by the beneficial cargo owners. Currently, the Port anticipates that fee collection would start in Fall 2009; however, the collection mechanism has not yet been determined.

Subject to adoption of the fee ordinance, timing of implementation, and fee collection mechanisms, the Port anticipates that, on average, about $25 million would be collected each year. By the end of 2020, a cumulative total of approximately $320 million would be collected.

Because projects funded through the user fee will be financed on a pay-as-you-go basis (i.e., the Port does not expect to be able to borrow against future fee revenues), the timing of fee collection will affect the pace of project implementation (for example, truck retrofits or replacements) and the Port's ability to generate funds to reduce the private match needed to leverage Prop 1B grants.

10.6.2 Grant Funding Sources

Grant funds are generally made available on an annual basis, through a competitive application process managed by the granting agency. Funding is normally subject to specific eligibility, usage and matching funds criteria that can be difficult to meet, particularly in the context of Port operations where the Port does not own or operate the equipment eligible for grant funding. The Port, public agencies, community groups and others can partner with private entities to obtain funds, but ultimately, it is the private owner or operator who must agree to meet the requirements of the grant (e.g., implementation deadlines, owner contributions, operational restrictions.)

The Port and its business partners may seek grants in the future for projects such as shore power infrastructure and truck replacements, depending on the availability of Port or other resources to provide any requisite financial matches.

Proposition 1B, the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 authorized $19.925 billion of state general obligation bonds for specified purposes, including high-priority transportation corridor improvements, trade infrastructure and port security projects. It also authorized the Legislature to appropriate $1 billion to CARB to reduce air pollution emissions and health risk from freight movement along California's priority trade corridors. The 2007-08 fiscal year budget included the first installment of $250 million for air pollution control projects. CARB adopted Program Guidelines in early 2008 to ensure that the funding program achieves its statutory objectives of "early and extra" emissions reductions. Emissions reduction projects from diesel engines in trucks, locomotives, ships, harbor craft, and cargo-handling equipment are potentially eligible for funding over the Proposition 1B funding period. The program can only fund emission reductions "not otherwise required by law or regulation."[6]

The Bay Area was awarded $3.4 million by CARB in early Proposition 1B grant allocations to retrofit trucks that operate at the Port and to install shore side power at two berths at the Port. An additional $5 million from CARB was awarded to the Bay Area to provide incentives to Port drayage trucks owners. Working collaboratively on this effort, the Port and BAAQMD are also

[6] Goods Movement Emission Reduction Program, California Health and Safety Code, 39625.5 (a)(1)

contributing $5 million each, with a goal of retrofitting up to 1,000 drayage trucks with the combined incentives. It is expected that Proposition 1B funding will be critical over the next few years to early implementation of projects at the Port, and to introduction of measures that reduce emissions beyond what is required by regulations.

The **Carl Moyer Memorial Air Quality Standards Attainment Program** provides incentive funds for the incremental cost of replacing older engines with newer and cleaner engines, adding control equipment like particle traps, and to purchase new vehicles that are cleaner than the law requires. Equipment owners must pay part of the cost. Eligible projects include cleaner on-road, off-road, marine, locomotive, and certain stationary and portable engines. CARB administers the program at the state level and allocates funds to local air pollution control districts. The BAAQMD sets priorities, reviews applications and awards funds in the Bay Area. A related funding program (AB923) allows air districts to increase motor vehicle registration fees by $2 to implement Carl Moyer Program projects. Highest priority will be given to highly impacted communities, including West Oakland. There are a number of eligibility criteria and restrictions that affect the ability of projects at the Port of Oakland to obtain funds.

The Transportation Fund for Clean Air (TFCA) is a grant program funded by a $4 surcharge on motor vehicles registered in the Bay Area. The surcharge generates approximately $22 million per year in revenues. The purpose of the TFCA program is to provide grants to implement the most cost-effective projects in the Bay Area that will decrease motor vehicle emissions, and thereby improve air quality. Because the TFCA program is aimed at reducing emissions from on-road vehicles, it is not likely to be a major source of funding for MAQIP projects, other than for clean truck programs.

The **West Coast Collaborative** is a program within the U.S. EPA's National Clean Diesel Campaign to coordinate diesel emissions reduction funding. The federal Diesel Emissions Reduction Act (DERA) authorized $200 million per year nationwide for 5 years for implementation of diesel emissions reduction projects. Perhaps more importantly, the West Coast Collaborative is also a forum for ports, businesses and agencies to discuss West Coast diesel technologies, challenges and successes.

10.7 Timeline

While individual projects benefit from detailed schedules as they approach implementation, a more conceptual timeline is appropriate for this air quality master plan. Table 10-2 outlines a general timeline for the strategies in Section 8. The strategies range from projects that are currently underway (with more detailed schedules in Table 9-4) to ambitious programs (such as CTMP). For some projects, the timeline is a best guess, based on an estimated schedule and expected funding availability. Many factors can affect the timely completion of projects, with the most common being funding and staffing limitations and technological feasibility (e.g., CARB verification of equipment, market availability of equipment and installers, unsuitability of equipment for a particular situation, and delays in research and development of promising technologies.)

Table 10-2 Timeline of Emissions Reduction Programs and Projects[1]

	Completed	Scheduled Implementation			Early Action for emissions reduction
		Underway	Near-term 2009-2012	Long-term 2013 & beyond	
TRUCKS					
Clean Trucks: retrofit and/or replacement of drayage trucks (Port, BAAQMD, CARB)		✓	✓		yes
Port Vision 2000 drayage truck replacement	✓				yes
Comprehensive Truck Management Program (CTMP)		✓	✓	✓	yes
• Provision of truck parking in Port area	✓	✓	✓	✓	
• Enforcement of truck parking and operations restrictions on neighborhood streets		✓	✓	✓	
• Truck registration and tracking			✓		
• Truck idling outreach and education		✓			
Truck work groups		✓	✓	✓	
LNG equipment and infrastructure		✓	✓		yes
Ethanol pilot program		✓	✓		yes
SHIPS					
Infrastructure/equipment requirements for shore power			✓	✓	
Voluntary compliance with fuel regulations (carriers)		✓	✓	✓	yes
Voluntary use of low sulfur fuel (APM)		✓	✓		yes
APL/Eagle Marine Services shore power			✓	✓	yes
Alternative fuel shore power (2007 pilot; future)	✓		✓	✓	
RAIL					
Clean switcher locomotive engines		✓	✓		yes
HARBORCRAFT					
Tugboat engine replacements	✓				yes
Electrification projects (electric dredgers)	✓				yes
CARGO HANDLING EQUIPMENT					
Electric-powered rail mounted gantry cranes				✓	
Container Terminal Equipment Retrofit and Replacement Program (CTERRP)	✓				yes
Electrification projects (container cranes, refrigerated container plugs)	✓				yes
OTHER EQUIPMENT AND FUELS					
Low-emissions construction equipment		✓	✓		yes
Port-owned vehicle fleet		✓			yes
CNG station	✓				
Repower and retrofit West Oakland buses	✓				yes
OPERATIONAL EFFICIENCIES					
Marine terminal and rail yard improvements			✓	✓	
Near-dock rail yard (OIG)	✓				
Maritime Materials Management Program		✓			
POLICY AND EDUCATION					
Participate in air quality policy and funding forums		✓			
Health risk assessment staffing at the Port		✓			
RESEARCH					
Investigate technologies and grants opportunities		✓			
Track MAQIP progress through periodic emissions inventories			✓		

[1] All dates are estimated. Includes Port, tenant and other stakeholder projects.

11 MONITORING, REPORTING AND NEXT STEPS

Monitoring takes on multiple meanings in this plan. It can mean:

- monitoring the execution of an emissions reduction project
- monitoring the results of an emissions reduction project
- monitoring the results of the MAQIP commitments

To monitor effectively, business partners, funding agencies, community members and other stakeholders need to be kept informed through reporting. Given the effort invested in developing the MAQIP by the Task Force members, it is important that those stakeholders, in particular, be kept informed on the Port's and tenants' progress towards meeting the MAQIP goals.

11.1 Project Execution Monitoring and Reporting

During the planning and execution of a Port-sponsored emissions reduction project, the staff project manager is responsible for providing periodic updates on the project status. For example, projects funded through the Vision 2000 Air Quality Mitigation Program are reported on formally through annual or more frequent written reports to West Oakland Neighbors and other community members. Informal status reports are provided verbally in meetings with air quality, community and maritime stakeholders or through e-mail communications. Those informal communications often provide an opportunity to discuss project issues and approaches with stakeholders. The planned maritime stakeholder group will be a dedicated forum for sharing the status of a project during development and execution and discussing issues associated with the project.

Projects sponsored by the Port's business partners may follow a similar monitoring and reporting process. The Port will continue to meet regularly with tenants and partners. Tenants will be asked to report periodically on the status of air quality improvements, regardless of whether they are participating in a Port or grant-funded incentive program.

Because of the acute interest by the residential and environmental communities in emissions reduction projects, the Port intends to provide a written status report on those projects at least annually. Reports will be presented to the Board of Port Commissioners or one of its committees, and will be made available to the community on the Port's web site. The Port will also request updates from tenants on their programs and projects to include in status reports. Informal reporting and discussions will continue through both existing and potentially new forums.

11.1.1 Project Adaptive Management

A benefit of discussing projects with knowledgeable stakeholders during the planning and early implementation stages is that problems can be detected and analyzed more readily than without their participation. Continually evaluating the progress and early results of a project, then adjusting actions accordingly can create a more successful effort than originally envisioned, or salvage a complicated project. Port staff have used adaptive management approaches that range from revising project guidelines (e.g., change the cost-effectiveness criteria or allowable engine years in a truck replacement project), to canceling a project entirely (e.g., when it didn't make financial sense for truckers to participate in an engine repower program.)

11.2 Project Results Monitoring and Reporting

Emissions reductions occurring as a result of a specific project can normally be estimated with some accuracy, especially if periodic reporting is required as part of the participation in the project (e.g., truck or container equipment replacement or retrofits). Collecting data periodically from project equipment recipients and estimating emissions reductions can provide milestones towards the goal of emissions reduction above and beyond those required by regulations. For consistency, the emissions calculator used to qualify a project could be used to estimate later emissions, although methodologies and emission factors are occasionally revised.

Results of follow-up monitoring will be reported through annual, or more frequent, written status reports to the Board and the community.

11.3 MAQIP Goal Monitoring and Reporting

Measuring the Port's overall progress towards meeting its goals requires periodically updating the Portwide emissions inventory for each source category (i.e., ships, harborcraft, terminal yard equipment, trucks and trains), then linking the Port's maritime emissions to its community health risk factors to estimate changes in health risk. Reports from the CARB, BAAQMD, and EPA on the results of their emissions reduction regulations will supplement the Port's emissions inventory, as will BAAQMD ambient air quality monitoring data.

The Port will reconvene the MAQIP Task Force in five and ten years to review progress towards the plan's goals.

11.3.1 Emissions Inventory

A key element in tracking implementation of the MAQIP involves development of regular updates to the Port emission inventory. The Port prepared a comprehensive inventory of pollutant emissions from Port related ships and associated harbor craft activity as well as cargo handling equipment, trucks, and locomotives operating on Port property that was representative of activity occurring in 2005. As new emission control technologies are introduced in response to regulations and other initiatives undertaken by the Port, its tenants or other groups, it will be necessary to track the resulting reductions in emissions with respect to the MAQIP goals. To accomplish this, the Port intends to update the emission inventory on a regular basis. Current plans call for inventory updates to be prepared at two to three year intervals, beginning with the calendar year 2008 emissions. Given the time it takes to compile the inventory, there will be a time lag of at least 12 months after the close of the inventory year before the inventory results can be reported. The frequency of the inventories is subject to change depending on prioritization of Port resources.

Development of a full inventory for sources at the Port is a complex process involving collection of data on all emission generating activities (ship calls, berthing times, truck trips, etc.), equipment (engine types and sizes, exhaust after treatment devices), operating parameters (engine loads, travel speeds, idling times, etc.), and associated emission factors. In order to provide regular emission updates with reasonable efficiency, the Port is evaluating the feasibility of developing a streamlined process by which the updated emissions can be more easily generated based on data to be supplied by the Port's tenants. The next inventory of the seaport will likely include an analysis of greenhouse gases and more detailed information on Port-related trucks.

11.3.2 Health Risk Reduction

With regularly updated emission inventories for Port sources, the process of tracking the degree of risk reduction in the West Oakland community relative to the Port's goal on an approximate basis is relatively straightforward. Results from CARB's West Oakland risk assessment study, as summarized in Table 5-3, provide the quantitative link between changes in emissions for each major source group and the excess cancer risk from exposure to DPM emissions experienced by West Oakland residents. The data in this table can be used to revise the estimated cancer risk based on the revised emission inventory. In this way, progress towards the diesel PM cancer risk reduction goal can be periodically tracked without repeating the resource-intensive health risk assessment effort.[1]

11.3.3 Ambient Air Monitoring

The BAAQMD air monitoring program program is aimed at collecting ambient air data to better understand relationships between emissions, pollutant concentrations in the air, exposure, and ultimately health risk. The Port will assist the BAAQMD in this program, where feasible.

11.3.4 Reconsideration of MAQIP Strategies[2]

To ensure that emissions and health risk reductions are occurring in the Port area at a pace to meet the MAQIP goals, the Port intends to provide annual reports to a maritime stakeholder group on progress towards achieving the MAQIP goals and will prepare biannual emissions inventories (see Section 10.3.1), among other reporting mechanisms. All three approaches to health risk reduction – early actions, regulatory compliance, and measures above and beyond regulatory requirements – will be included in the reports.

The Port will also reconvene the MAQIP Task Force (or a successor group) in five years upon completion of the 2012 emissions inventory to compare the results to the 2012 interim goals, and to review likely progress towards the 2020 goals. If it appears that the Port is not on track to meet the expected reduction targets, the Task Force will assist the Port in reconsidering and refining the MAQIP strategies. In the first five years, the focus will be on early action measures and on regulatory compliance.

The group will be reconvened in about ten years, as well, about two years before the 2020 planning horizon, for another review of progress, strategies, compliance success and new technologies. As 2020 approaches, the emphasis will be on regulatory compliance and on measures above and beyond regulatory requirements.

11.4 Report Summary

The Port commits to regular reporting as outlined in Table 11-1 to facilitate continued involvement of stakeholder and interagency groups, in addition to updating the community and public on emissions and risk monitoring. Major reporting tasks will include tracking growth of Port activity and emission reductions and documenting progress towards implementation of the MAQIP. The targeted frequency for some resource-intensive reports, such as the emissions inventory and health risk updates, may be delayed if budget and staff are not available.

[1] It should be noted that this approach will only yield an estimate of risk reduction because it does not account for changes in the spatial distribution of sources which may occur over time, for example, development of the former Oakland Army Base.

[2] This is a new section in response to a recommendation from Sandra Witt, Alameda County Health Care Services Agency, Public Health Department.

The Port will continue to meet regularly with tenants and partners. Tenants will be asked to report periodically on the status of air quality improvements, regardless of whether they are participating in a Port or grant-funded incentive program. The Port will continue to participate in agency-only discussions via an Interagency Group.

Table 11-1 MAQIP Reports

Report	Purpose	Frequency	Estimated Release Date
Reports to Maritime Stakeholder Group	Update Maritime Stakeholder Group on progress towards implementing the MAQIP and achieving the MAQIP goals	At least once per year	June 2009
Emission reduction projects and programs status reports	Update the Board and community on the status of emissions reduction projects and programs	Anticipated at least annually	December 2008
Emission Inventory Update	Provide regular updates on current levels of DPM, NOx and other pollutant emissions	Anticipated once every two to three years (first update may be for 2008 emissions)	2010 and every two to three years thereafter
Community health risk updates (using factors from 2005 West Oakland Health Risk Assessment)	Provide updates on community health risk reductions resulting from emission reductions at the Port	After emissions inventory releases.	2010 and every two to three years thereafter
Tenants' progress reports on emission reduction initiatives	Provide information on progress made by the Port's tenants in implementing emission reduction measures	Periodically, depending on extent of tenant projects.	Various
Port staff report to the MAQIP Interagency Group	Provides regulatory and other government agencies with regular updates on progress in MAQIP implementation	Quarterly 7/1/08 – 6/30/09 and at least annually thereafter	July 2008 (completed); October 2008 (scheduled)

11.5 Ongoing Stakeholder Input

Port staff is currently conducting an inventory and assessment of all of its stakeholder groups in an effort to create a comprehensive Maritime stakeholder group. This group would consider recommendations from the MAQIP, CTMP, Oakland Mayor's Task Force (2007) and the Oakland Partnership (sponsored by the Chamber of Commerce), and similar groups as they pertain to the Port and the neighboring community.

This Maritime stakeholder group will be comprised of Port stakeholders representing: customers (maritime tenants and other maritime related businesses), government (regulatory, policymakers and interagency), and community (residential, environmental advocacy, local business and other special interest groups). The group intends to establish a comprehensive stakeholder forum by providing one table where the Port can effectively inform its community and engage with its multiple stakeholders on Port Maritime projects, including MAQIP implementation and the CTMP.

This group will provide a formal opportunity for the Port and its stakeholders to meet on a regular basis. It is proposed that the group will meet quarterly or semi-annually.

The comprehensive Maritime stakeholder group may require smaller working groups to address topics such as monitoring of MAQIP implementation. Such working groups will be established as needed, and will be advisory to the Maritime stakeholder group. Below are some examples of what the stakeholder group is envisioned to address:

- **Research/Study**: Investigate technologies and funding opportunities for potential emissions reductions strategies identified in the MAQIP.
- **Policy, Advocacy and Funding**: Maritime stakeholders will be consulted as the Port plans for use of potential user fee revenue funds for air quality projects. Through the Interagency Group, continue efforts to identify, coordinate, and pursue funding sources, proposed policy and legislative initiatives and compliance with regulatory initiatives.
- **Monitoring:** Monitor implementation of specific MAQIP initiatives.
- **Community Outreach:** Assist with communicating the status of MAQIP projects with the local community.

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See also Table 9-1: Source Documents Used for Developing Initial List of MAQIP Initiatives.