

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Memorandum

To: Chairperson Miley and Members
of the Maritime Sources and Ports Committee

From: Jack P. Broadbent
Executive Officer/APCO

Date: September 22, 2010

Re: Inventory of Emissions from Commercial Ports in the San Francisco
Bay Area

RECOMMENDED ACTION:

Accept and file the emission inventories for four commercial seaports in the San Francisco Bay Area Air Basin.

BACKGROUND

Commercial maritime activity in the San Francisco Bay Area Air Basin is diverse. The Bay Area has five active commercial ports, one cruise ship terminal, and several industrial wharves serving refineries, steel and chemical facilities. There are numerous small marinas that serve as home ports for the region's commercial and recreational fishing fleet. The five commercial ports are Oakland, Richmond, San Francisco, Benicia, and Redwood City. Cruise ship terminals are located at Piers 35 and 37 in San Francisco. The bay also has several main vessel anchorages designated by the United States Coast Guard to accommodate vessels transferring fuel, performing maintenance or changing crews. The main anchorage is located south of the Bay Bridge between Alameda and San Francisco. The bay is also the entry point for the inland ports of Sacramento and Stockton.

On November 19, 2008, the Board of Directors adopted a Green Ports Initiative to decrease emissions from commercial maritime activity in the Bay Area consisting of three interrelated elements:

- Enforcement of the California Air Resources Board (CARB) air toxic control regulations on mobile sources operating at or near ports;
- Grants to ports and their tenants for earlier or greater emission reductions than required by the CARB regulations;
- Evaluation of progress in reducing emissions through inventories, monitoring and public education.

In May 2009, as part of the third element of the Green Ports Initiative, the Air District signed a Memorandum of Agreement with the Bay Planning Coalition (BPC) and the five public commercial ports, for the preparation of a maritime emissions inventory for four Bay Area public ports. These port-specific inventories were compiled by Air District staff and two consulting

teams -- Moffatt & Nichols and ENVIRON – retained by the Bay Planning Coalition, and considered all major sources of emissions associated with port activities. Air District staff completed the harbor craft and locomotive emissions estimates in their entirety, and assisted with calculating ship emissions by compiling from private databases and CARB reports the characteristics of the vessels visiting each port.

To ensure a consistent set of inventories for all the public ports in the region, both the Air District staff and the Bay Planning Coalition’s consultant teams followed the methodologies used for a 2005 baseline inventory for the Port of Oakland. The inventories for the four commercial maritime seaports of Benicia, Redwood City, Richmond, and San Francisco are available on the District website at <http://www.baaqmd.gov/Divisions/Planning-and-Research/Emission-Inventory-and-Air-Quality-Related/Emission-Inventory/Small-Ports-Inventory.aspx>

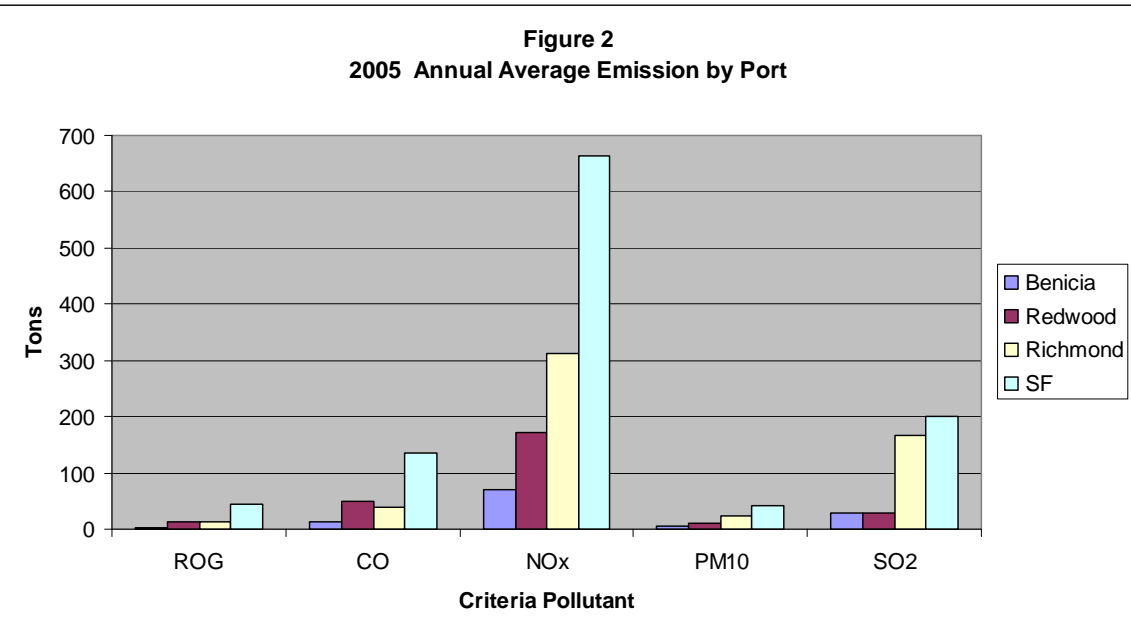
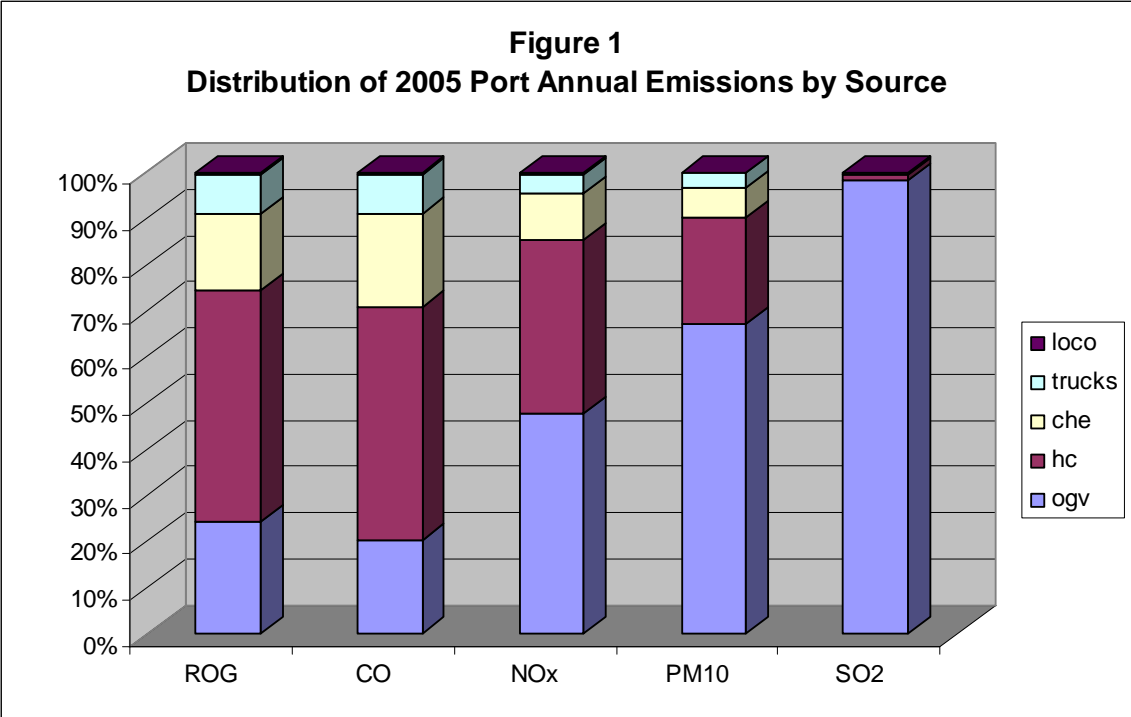
DISCUSSION

It was agreed to limit the scope of the inventories to only those parts of the maritime ports directly controlled by the respective port authorities. To varying degrees, but particularly in Richmond, there are additional maritime activities that occur at terminals owned and operated by private companies. To provide the Board of Directors and the public a thorough accounting of maritime emissions at these waterfront locations, Air District staff completed a separate analysis of emissions from these private sources, following the same methodologies used for the public ports. The consolidated results of these separate analyses of the public and private facilities are provided below in Figures 1 and 2. Detailed summaries are provided in Tables A-1 through A-4 in Attachment A.

Emission estimates for each of the four ports are presented in the five main source categories. These include ocean-going vessels (ogv), harbor craft (hc), cargo handling equipment (che), trucks and locomotives (loco). Each of these source categories represents a port operation that is engaged primarily in the transport of maritime cargo. The inventories include only emissions from diesel engines used in port operations; the inventories do not account for other relatively minor sources, such as gasoline powered, light duty vehicles that may have operated at one of the ports. The inventories provide 2005 estimates in units of tons per year for the five criteria pollutants – reactive organic gases (ROG), carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM₁₀), and sulfur dioxide (SO₂).

As shown in see Figure 1, marine sources (ocean-going vessels and harbor craft) are the largest single source of criteria pollutant emissions. Overall, marine emissions accounted for over 99% of the SO₂ emissions and 90% of the PM₁₀ emissions of the total emissions from the four ports. The marine sources account for 85% of the NO_x and 74% of the ROG emissions, as well.

Figure 2 provides a summary of the total emissions from each of the four small ports. The Port of San Francisco was estimated to be the largest contributor, followed by the Port of Richmond. Both ports have a large inventory of marine activities, mainly harbor crafts and cruise ships for the Port of San Francisco, and ocean-going tankers for the Port of Richmond.



There are some limits to the scope of the emission inventories for the small ports, especially in making any comparison with regional emissions. The four port inventories account for both landside and offshore emissions. The landside emissions are those that occur only within the Port boundaries, while off-shore emissions are estimated from the berth to 11 miles off the Golden Gate. The Air District's regional inventory, however, estimates landside emissions to the Air District's boundaries, and ship emissions up to 100 nautical miles off the coast.

The inventory of the small ports provides a snapshot of emissions that likely occurred in 2005. Since then, all of the sources have been the subject of regulations adopted by the CARB;

regulations that will accelerate reductions in diesel particulate matter and oxides of nitrogen, and in the case of locomotives and ships, reductions in sulfur dioxide. With regards to ports, the two most significant regulations have already come into effective – diesel particulate controls on drayage trucks and low sulfur fuel on ships. The Air District is assisting CARB in compliance and enforcement of these important regulations.

NEXT STEPS

The completion of the 2005 emissions inventories for the four smaller commercial ports, along with the previously completed 2005 inventory for the Port of Oakland, provide a baseline for developing the most effective emission reduction strategies and from which progress in reducing emissions from maritime sources can be measured. Air District staff will continue its emission reduction activities and tracking of progress towards health goals in the port areas by:

- 1) Incorporating increased detail on each public port in future regional emissions inventories, using the methodologies followed in the 2005 inventories. A baseline inventory for 2008 is currently being developed by Air District staff. The Port of Oakland is also working to update its inventory to a 2008 baseline year.
- 2) Using the emissions estimates in the modeling of health risks from emissions around the ports and in the development of appropriate emission reduction strategies as part of Community Risk Reduction Plans, including examining the benefits from regulatory measures and other measures undertaken by local jurisdictions, the State, the federal government and international organizations.
- 3) Assisting CARB with compliance and enforcement of the State diesel air toxic control measures at the port facilities.
- 4) Seeking opportunities to accelerate emission reductions by targeting Air District grants and working with the ports and private terminals in seeking outside funding.

BUDGET CONSIDERATION / FINANCIAL IMPACT:

Costs for completing the small ports inventories were included in the Air District's approved FY 2009/10 and 2010/11 budgets.

Respectfully submitted,

Jack P. Broadbent
Executive Director/APCO

Prepared by: Amir Fanai, Tan Dinh, Michael Murphy
Reviewed by: Henry Hilken

Attachment A – Consolidated Emission Inventory Tables

Attachment A
Consolidated Tables
2005 Emission Inventories

The tables below provide the emission inventories for the Ports of Benicia, Redwood City, Richmond and San Francisco, and are the source of Figures 1 and 2 in the staff report. The data presented in the “Public” columns are taken from Table ES-1 of each of the inventory reports. Data presented in the “Private” column were developed by Air District staff.

**Table A-1
Port of Benicia
2005 Emissions Summary by Source
(annual tons)**

Source Category	ROG		CO		NOx		PM10		SO2	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Ocean-Going Vessels	1.5	--	3.8		45.6		4.1	--	29.3	--
Harbor Craft	1.5	--	5.8		22.3		1.0	--	0.2	--
Cargo Handling Equip.	0.1	--	1.7		0.3		--	--	--	--
Trucks	0.1	0.1	0.5	0.2	0.4	0.4	--	--	--	--
Locomotives	n/a	--	n/a		n/a		n/a	--	n/a	--
Totals	3.2	0.1	11.8	0.2	68.6	0.4	5.1	--	29.5	--

**Table A-2
Port of Redwood City
2005 Emissions Summary by Source
(annual tons)**

Source Category	ROG		CO		NOx		PM10		SO2	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Ocean-Going Vessels	1.2	--	3.5	--	38.9	--	3.4	--	27.0	--
Harbor Craft	2.4	--	8.9	--	34.9	--	1.4	--	0.3	--
Cargo Handling Equip.	7.8	--	27.4	--	76.9	--	4.5	--	0.4	--
Trucks	2.2	0.12	8.4	0.5	18.5	1.4	1.1	0.1	0.1	--
Locomotives	0.2	--	0.4	--	2.2	--	0.1	--	0.0	--
Totals	13.8		48.5	0.5	171.4	1.4	10.4	0.1	27.8	--

**Table A-3
Port of Richmond
2005 Emissions Summary by Source
(annual tons)**

Source Category	ROG		CO		NOx		PM10		SO2	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Ocean-Going Vessels	2.2	5.4	5.3	15.4	60.5	192.4	6.0	15.3	42.7	124.4
Harbor Craft	0.8	1.7	3.0	5.8	11.9	22.5	0.5	0.9	0.1	0.2
Cargo Handling Equip.	0.1	0.9	0.6	4.9	0.2	8.6	--	0.4	--	0.1
Trucks	--	1.6	0.3	3.5	0.3	10.1	--	0.4	--	0.1
Locomotives	--	0.2	--	0.9	0.0	5.7	--	0.1	--	--
Totals	3.1	9.8	9.2	30.5	72.9	239.3	6.5	17.1	42.8	124.7

**Table A-4
Port of San Francisco
2005 Emissions Summary by Source
(annual tons)**

Source Category	ROG		CO		NOx		PM10		SO2	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Ocean-Going Vessels	7.6	--	19.9	--	246.1	--	25.5	--	195.5	--
Harbor Craft	31.1	--	96.4	--	361.8	--	14.8	--	4.1	--
Cargo Handling Equip.	3.1	--	13.0	--	40.3	--	0.3	--	1.5	--
Trucks *	2.1	0.1	6.6	0.4	13.6	0.9	0.8	0.1	0.1	--
Locomotives	--	--	0.1		0.2	--	--	--	--	--
Totals	43.9	0.1	135.9	0.4	662.0	0.9	41.5	0.1	201.2	--

* Includes emissions from Transportation Refrigeration Units