EXECUTIVE SUMMARY

The Port of Los Angeles (the Port) shares San Pedro Bay with the neighboring Port of Long Beach (POLB). Together, the San Pedro Bay Ports comprise a significant regional and national economic engine for California and the United States (U.S.), through which more than 30% of all U.S. containerized trade flows. Although recent economic conditions have caused a near-term reduction in imports and exports, the latest economic forecasts still indicate that the demand for containerized cargo moving through the San Pedro Bay region will increase significantly over the next two decades. The Ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. Therefore, in November 2006, the San Pedro Bay Ports adopted their landmark, joint Clean Air Action Plan (CAAP) designed to reduce the air health risks and emissions associated with port-related operations, while allowing port development to continue. In order to track CAAP progress, the Port has committed to develop annual inventories.

The Port released its first activity-based emissions inventory in July 2005, documenting activity levels for the year 2001. In 2007, the Port released the 2005 Inventory of Air Emissions which was the first update since the 2001 inventory and also the first of the annual inventories to follow. In July 2008, the Port released the 2006 Inventory of Air Emissions which was the first emissions inventory report in which the Port included emission estimates for greenhouse gases (GHG). In December 2008, the Port released the 2007 Inventory of Air Emissions.

This study, the 2008 Inventory of Air Emissions, includes emissions estimates based on 2008 activity levels and a comparison with 2005, 2006 and 2007 emissions estimates to track CAAP progress. As in previous inventories, the following five source categories are included:

- Ocean-going vessels
- Harbor craft
- Cargo handling equipment
- Railroad locomotives
- Heavy-duty vehicles

Exhaust emissions of the following criteria pollutants (pollutants that can cause local impact) have been estimated:

- Particulate matter (PM) (10-micron, 2.5-micron)
- Diesel particulate matter (DPM)
- Oxides of nitrogen (NOx)
- Oxides of sulfur (SOx)
- Hydrocarbon - total (HC)
- Carbon monoxide (CO)

This study also includes emission estimates of greenhouse gases (GHGs) from port-related tenant operational sources. The following GHGs have been estimated:

- Carbon dioxide (CO2)
- Methane (CH4)
- Nitrous oxide (N2O)

Methodology Overview and Geographical Extent

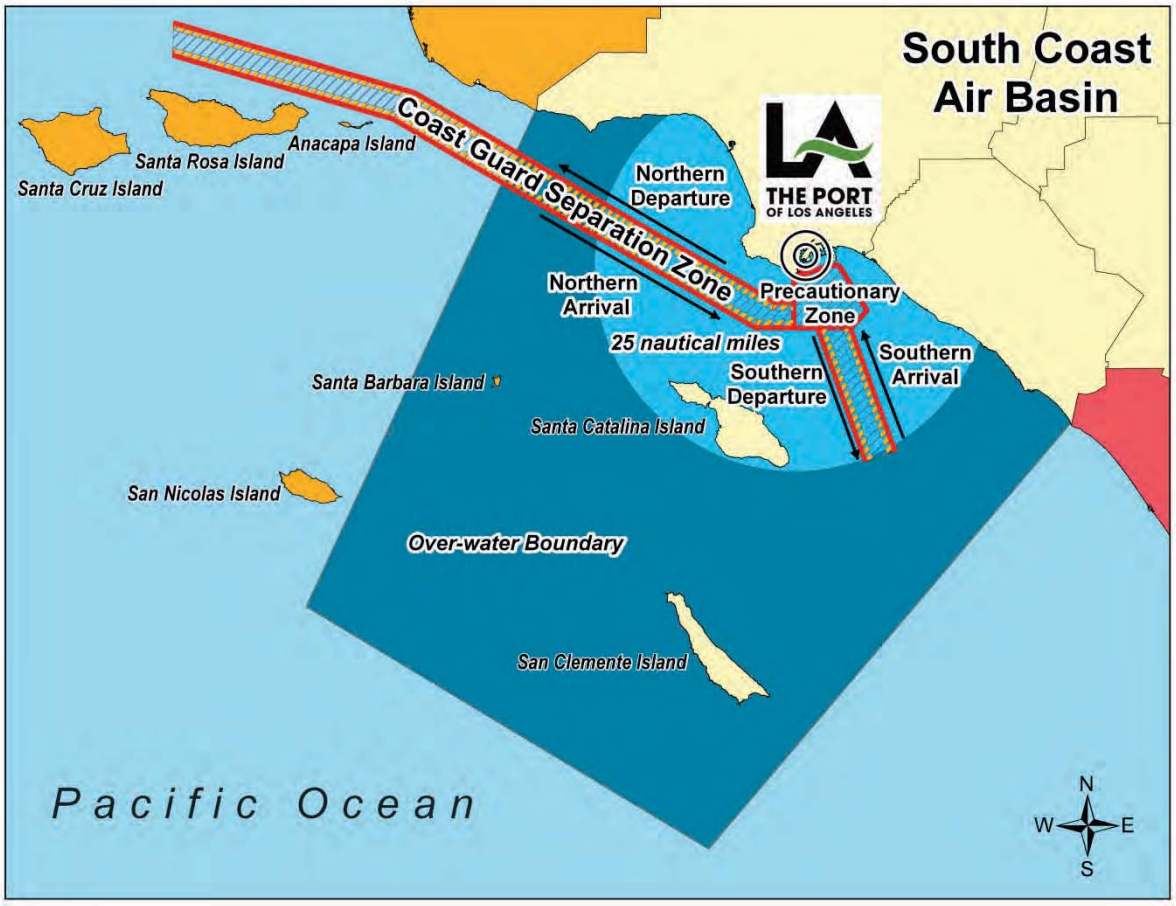
Port tenants and shipping lines play an essential role in the development of an activity-based emissions inventory (EI) by providing the most accurate activity and operational information available. Emissions estimates are developed for each of the various source categories in a manner consistent with the latest estimating methodologies agreed upon by the Port and the participating regulatory agencies. The information gathered, analyzed, and presented in this EI continues to improve the understanding of the nature and magnitude of Port-related emission sources. Development of this inventory was coordinated with the U.S. Environmental Protection Agency - Region 9 (EPA), California Air Resources Board (CARB), and the South Coast Air Quality Management District (SCAQMD).

The geographical extent of the inventory is described in Section 1 and in each source category section of the report. The geographical extent of the port-related emissions did not change from previous inventories and includes emissions from all source categories within the harbor district; emissions from rail locomotives and on-road trucks transporting cargo to or from the Port up to the cargo's first point of rest within the South Coast Air Basin (SoCAB) or up to the basin boundary, whichever comes first; and emissions from commercial marine vessels within the harbor and up to the study area boundary. Figure ES.1 shows the SoCAB boundary.

Figure ES.1: South Coast Air Basin Boundary

Figure ES.2 shows the geographical extent for the ocean-going vessels and harbor craft. The over-water boundary is bounded in the north by the southern Ventura County line at the coast and in the south with the southern Orange County line at the coast.

Figure ES.2: OGV Inventory Geographical Extent



Summary of 2008 Activity

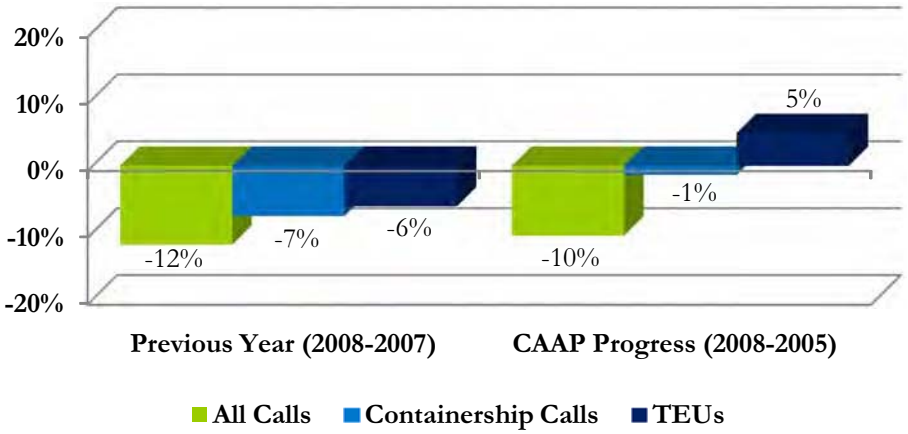
Table ES.1 lists the number of vessel calls and the container cargo throughputs for calendar years 2005 to 2008. The 2008 vessel calls were lower than the previous years, but the average twenty-foot equivalent unit (TEU)/call ratio has continued to increase which shows efficiency improvement (on average, more containerized cargo is moved during each vessel call). In Table ES.1, for a given year the total number of calls (arrivals) and the number of containership calls may be different from previously published reports due to an improved ocean-going vessel (OGV) data processing methodology that more thoroughly associates vessel movements with the port than in previous inventories.

Table ES.1: TEUs and Vessel Call Comparison, %

Year	All Calls	Containership Calls	TEUs	Average TEUs/Call
2008	2,239	1,459	7,849,985	5,380
2007	2,537	1,577	8,355,038	5,298
2006	2,701	1,632	8,469,853	5,190
2005	2,500	1,479	7,484,625	5,061
Previous Year (2008-2007)	**-12%**	**-7%**	**-6%**	**2%**
CAAP Progress (2008-2005)	**-10%**	**-1%**	**5%**	**6%**

Figure ES.3 shows the difference for the previous year (2008-2007) and CAAP progress (2008-2005). From 2007 to 2008, there was a 6% decrease in TEU throughput, the number of total calls decreased by 12% and containership calls decreased by 7%. From 2005 to 2008, there was a 5% increase in TEU throughput, the number of total calls decreased by 10% and containership calls decreased by 1%.

Figure ES.3: TEUs and Vessel Call Comparison, %



In 2008, there was one significant change that impacted 2008 port-wide emissions. This change, which affected OGV emissions, was a combination of the initial CARB Fuel Regulation which was in place in 2007, but ended at the end of April 2008, and the Port's Fuel Incentive Program that was launched July 1, 2008 and lasted one year until the new CARB Fuel Regulation went into effect in mid-2009. Fuel switching has a large impact on SO_x emissions for OGV, which has an overall impact on the port-wide SO_x emissions since OGV are the source of 99% of the port-wide SO_x emissions. The following assumptions were made for OGV fuel switching in 2008:

- The percent of vessels that switched to a cleaner fuel for auxiliary engines at berth and within 24 nautical miles (nm) was 100% from January 2008 to the end of April 2008 when the CARB Fuel Regulation[1] was in effect and approximately 14% from July 2008 to December 31, 2008 due to the port's voluntary Fuel Incentive Program. For the months of May and June, 2008, it is assumed that the vessels did not switch fuels and the default intermediate fuel oil (IFO) 2.7% S residual fuel was burned in the auxiliary engines. The percent of fuel switchers for auxiliary engines was significantly lower in 2008 than 2007, therefore auxiliary engine emissions for OGV increased in 2008.

- The percent of vessel calls that switched to a cleaner fuel for main engines during transit was 14% from July 1, 2008 to December 31, 2008 and includes only those companies that voluntarily agreed to the port's Fuel Incentive Program.

[1] Per telephone and email contact with CARB (12 March 09), port's 100% assumed compliance is in agreement with CARB's own emission inventories and as part of Technical Working Group, CARB has reviewed and agreed with dates and compliance rate used for the CARB Fuel Regulation that was in place at beginning of 2008.

Summary of 2008 Emission Estimates

The results for the Port of Los Angeles 2008 Inventory of Air Emissions are presented in this section. Table ES.3 summarizes the 2008 total port-related emissions in the SoCAB by category in tons per year.

Table ES.3: 2008 Port-related Emissions by Category, tpy

Category	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
Ocean-going vessels	426	341	358	4,798	3,787	485	227
Harbor craft	56	51	56	1,284	1	374	91
Cargo handling equipment	34	32	33	1,169	2	739	47
Rail locomotives	42	38	42	1,366	9	226	74
Heavy-duty vehicles	300	276	300	6,606	5	2,227	398
Total	**857**	**738**	**788**	**15,223**	**3,804**	**4,052**	**837**

DB ID457

The total port-related tenant GHG emissions in the SoCAB are summarized below. The GHG emissions summarized in Table ES.4 are in metric tons per year (2,200 lbs/ton) instead of the short tons per year (2,000 lbs/ton) used for criteria pollutants. Throughout the report, GHG emissions are reported in metric tons per year. The CO_2 equivalent values are derived by multiplying the GHG emissions estimates for CO_2, N_2O, and CH_4 by their respective global warming potential (GWP)[2] values and then adding them together.

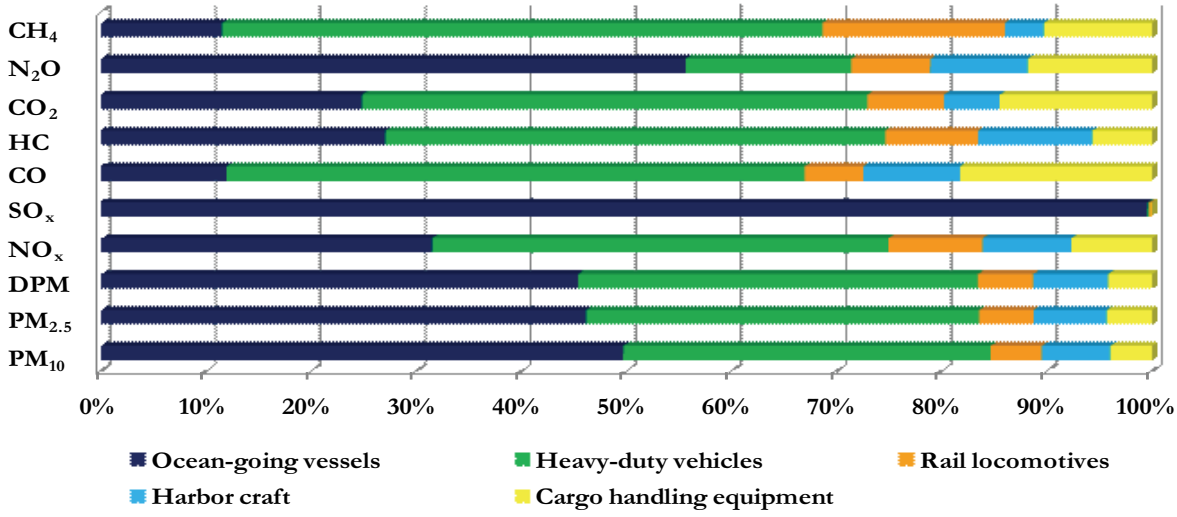
[2] U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006*, 15 April 2008.

Table ES.4: 2008 Port-related GHG Emissions by Category, metric tons per year

Category	CO_2 Equivalent	CO_2	N_2O	CH_4
Ocean-going vessels	262,176	257,483	15	4
Harbor craft	55,912	55,119	2	1
Cargo handling equipment	151,180	150,125	3	4
Rail locomotives	76,100	75,347	2	6
Heavy-duty vehicles	499,693	497,963	4	20
Total	**1,045,061**	**1,036,037**	**27**	**36**

Figure ES.4 shows the distribution of the 2008 total port-related emissions for each pollutant and source category. Ocean-going vessels (45 to 50%) and heavy-duty trucks (35 to 38%) contribute the highest percentage of particulate matter emissions among the port-related sources. Over 99% of the SO_x emissions are attributed to ocean-going vessels. Heavy-duty trucks (43%) and OGV (32%) account for the majority of NO_x emissions. Heavy-duty trucks (55%) and CHE (18%) account for the majority of CO emissions. Heavy-duty trucks (48%) and OGV (27%) account for the majority of hydrocarbon emissions.

Figure ES.4: 2008 Port-related Emissions by Category, %



In order to put the Port-related emissions into context, the following figures compare the Port's contributions to the other sources in the South Coast Air Basin. The 2008 SoCAB emissions used for this comparison are based on the 2007 Air Quality Management Plan (AQMP).[3]

In the South Coast Air Basin, 9% of diesel particulate matter emissions, 5% of NO_x emissions, and 24% of SO_x emissions are attributed to port-related emissions from the Port of Los Angeles. The Port's percent contribution of DPM and NO_x within the SoCAB remained the same in 2008 as compared to 2007, while SO_x emissions increased by 2% from 2007. When compared to 2005, the port's percent contribution of DPM, NO_x and SO_x emissions within the SoCAB decreased in 2008.

Figure ES.5: 2008 DPM Emissions in the South Coast Air Basin, %

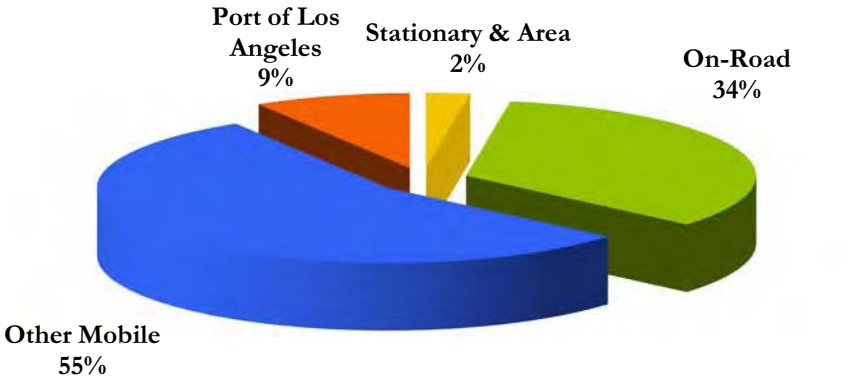
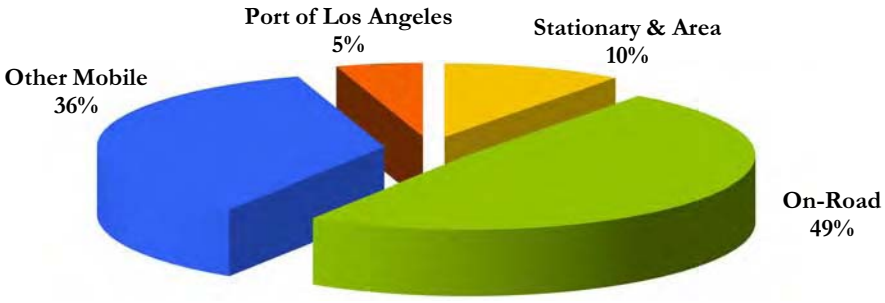


Figure ES.6: 2008 NO_x Emissions in the South Coast Air Basin, %



[3] SCAQMD, *Final 2007 AQMP Appendix III, Base & Future Year Emissions Inventories*, June 2007.

Figure ES.7: 2008 SO_x Emissions in the South Coast Air Basin, %

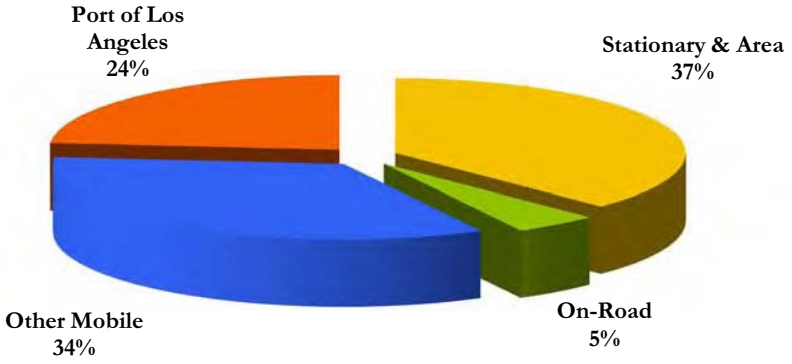


Table ES.5 presents the total net change in emissions for all source categories in 2008 as compared to previous years. The percent change is shown for the previous year (2007) and the CAAP progress (2005).

Table ES.5: Port-wide Emissions Comparison, tpy and % Change

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
2008	857	738	788	15,223	3,804	4,052	837
2007	855	744	760	16,553	3,611	4,308	906
2006	1,168	1,000	1,067	18,946	6,072	4,690	1,088
2005	1,059	904	971	16,789	5,585	4,040	957
Previous Year (2008-2007)	**0%**	**-1%**	**4%**	**-8%**	**5%**	**-6%**	**-8%**
CAAP Progress (2008-2005)	**-19%**	**-18%**	**-19%**	**-9%**	**-32%**	**0%**	**-13%**

From 2007 to 2008, NO_x, CO and HC emissions decreased, while DPM and SO_x emissions increased. The SO_x emissions increase is due to the CARB fuel auxiliary engine regulation that was in effect for the entire year in 2007, but it was only in effect for the first four months of 2008, thus the OGV SO_x emissions increased in 2008. In the latter part of 2008, the port had a voluntary Fuel Incentive Program for OGV that partially made up for the ending of the CARB auxiliary engine fuel regulation, but overall SO_x emissions increased slightly over 2007. The DPM emissions increase from 2007 is due in part to the fuel regulation being in force for all of 2007 but only part of 2008 as well as fewer tanker calls in 2008 than in 2007. Many tankers use boilers at higher rates than any other vessel types while at berth, and boilers do not have DPM emissions associated with them. When there are more tankers relative to other vessels (as in 2007) there is comparatively less DPM than PM_{10}. Since the number of tankers was lower in 2008, the DPM increased more than the PM_{10}, resulting in higher overall DPM in 2008 than other years due to less tanker activity. NO_x and HC emissions were reduced due to newer fleet of vessels and equipment which have cleaner and more fuel efficient engines.

From 2005 to 2008, all emissions were reduced despite the 5% increase in throughput, except for CO emissions which remained unchanged. Most of the emission reduction programs reduced particulate matter, thus the 19% PM emission reduction. The diesel engines are currently burning diesel fuel with lower sulfur content than in 2005, including the use of ultra-low sulfur diesel (ULSD) fuel by all source categories except OGV and line haul locomotives. The Port's voluntary Fuel Incentive Program and four months of CARB's Auxiliary Engine Fuel Rule for ocean-going vessels also had a direct impact on the SO_x emissions (32% reduction). NO_x and HC emissions were reduced due to newer fleet of vessels and equipment which have cleaner and more fuel efficient engines.

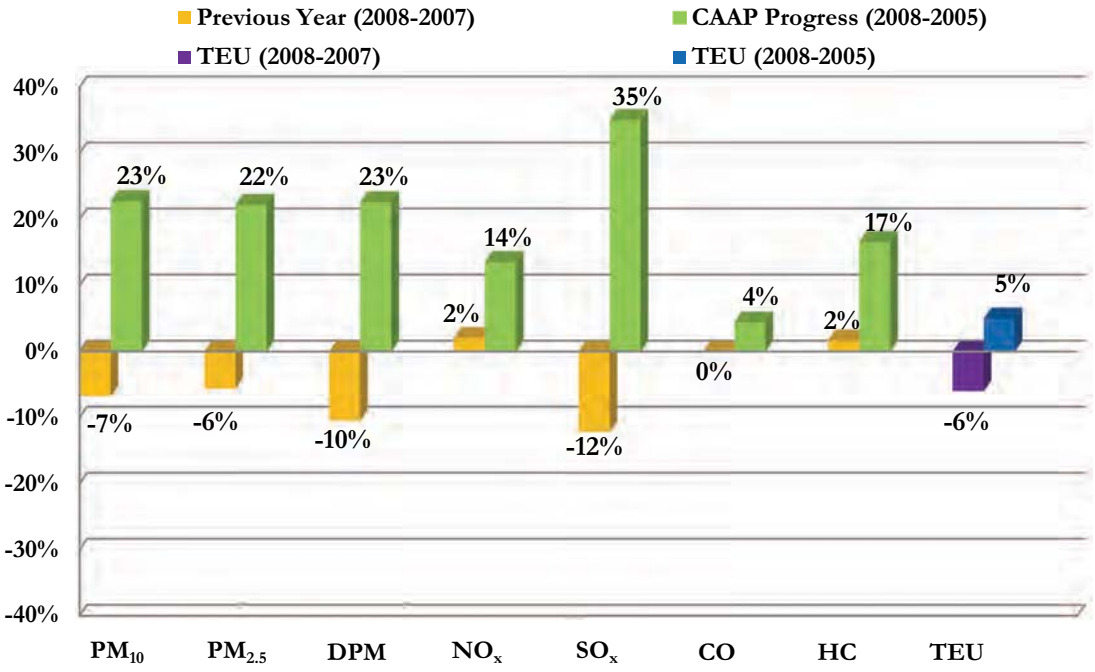
Table ES.6 summarizes the annualized emissions efficiencies (ie, emissions per container handled) of all five source categories in tons of pollutant per 10,000 TEU moved. In 2008, the overall port efficiency improved for all pollutants as compared to 2005. A positive percentage means an increase in emission efficiency in Table ES.6 and Figure ES.8.

Table ES.6: Emissions Efficiency Comparison, tpy and % Change

EI Year	PM_{10}	$PM_{2.5}$	DPM	NO_x	SO_x	CO	HC
2008	1.09	0.94	1.00	19.39	4.85	5.16	1.07
2007	1.02	0.89	0.91	19.80	4.32	5.15	1.08
2006	1.38	1.18	1.26	22.37	7.17	5.54	1.29
2005	1.41	1.21	1.30	22.43	7.46	5.40	1.28
Previous Year (2008-2007)	**-7%**	**-6%**	**-10%**	**2%**	**-12%**	**0%**	**2%**
CAAP Progress (2008-2005)	**23%**	**22%**	**23%**	**14%**	**35%**	**4%**	**17%**

Figure ES.8 compares emissions efficiency changes between 2008 and previous emission years. The purple bar represents TEU change from previous year (-6%) and the blue bar represents TEU change when compared to 2005 (5%). For 2008-2005, emissions efficiencies improved for all pollutants, except for CO which remained the same. For 2008-2007 comparison, emissions efficiencies improved for NO_x, CO and HC.

Figure ES.8: Emissions Efficiency Comparison, % Change



CAAP Progress

One of the main purposes of the annual inventories is to provide a progress update on achieving the Clean Air Action Plan's San Pedro Bay Standards. These standards consist of the following reduction goals, compared to 2005 published inventories:

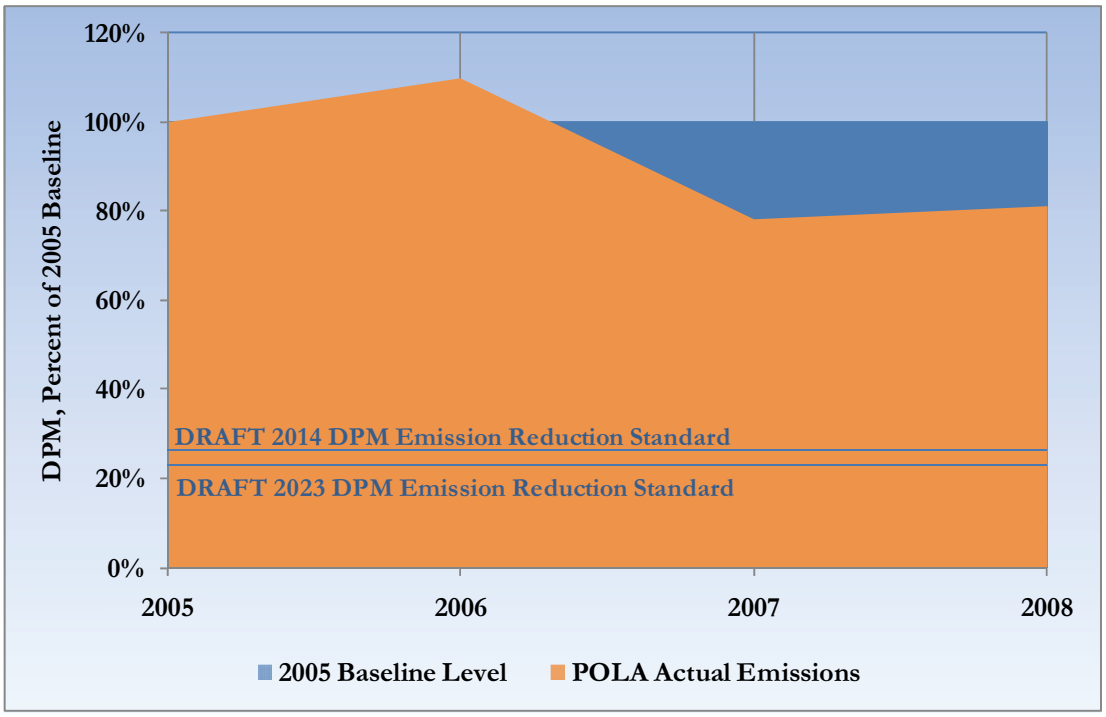
- Emission Reduction Standard:
  - By 2014, reduce emissions by 72% for DPM, 22% for NO_x, and 93% for SO_x
  - By 2023, reduce emissions by 77% for DPM, 59% for NO_x, and 92% for SO_x
- Health Risk Reduction Standard: 85% reduction by 2020

Note: At the time of publication of this document, the standards bulleted above are draft standards that have been released for public review but not formally adopted by the Board of Harbor Commissioners. It is anticipated that the standards will be presented to the Board in early 2010 as part of the CAAP Update process currently underway.

Emissions Reduction Progress

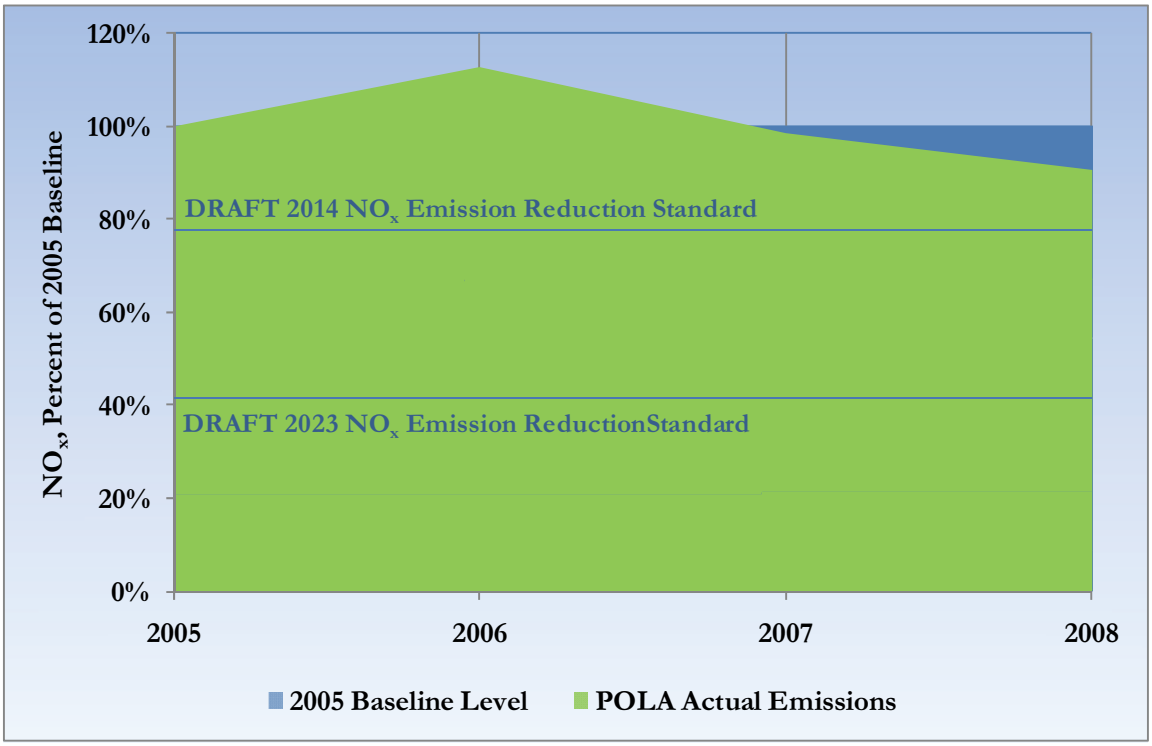
The Emissions Reduction Standards are represented as a percentage reduction of emissions from 2005 levels, and are tied to the future compliance dates of the South Coast AQMP. Figures ES.9 through ES.11 present the 2005 baseline emissions and the year to year percent change in emissions with respect to the 2005 baseline emissions as well as presenting the draft 2014 and 2023 standards to provide a snapshot of progress to-date towards meeting those standards.

Figure ES.9: DPM Reductions - Progress to Date Compared to 2005



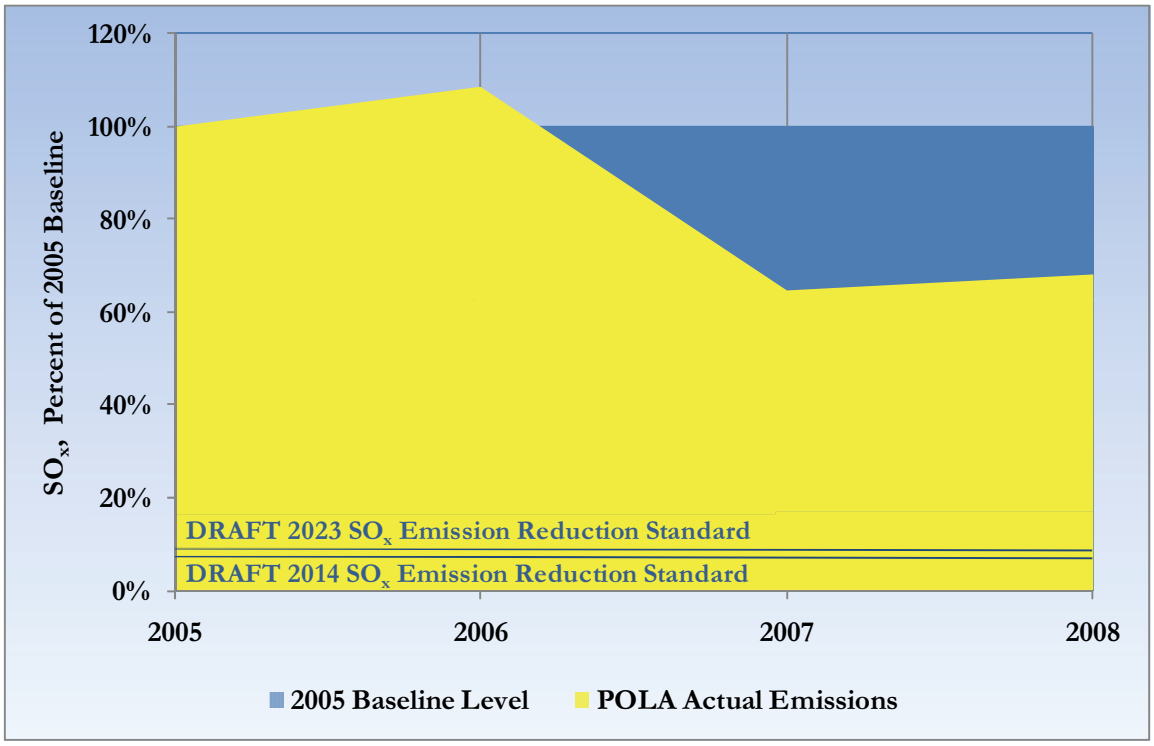
As presented above, by 2008 the port is over a quarter of the way towards meeting the DPM Emission Reduction Standard. With additional CAAP measures coming on-line in the subsequent years, the 2009 SPBP's OGV fuel switch incentive program, CARB's OGV fuel switch regulation implemented in 2009, and the Clean Truck Program (CTP), it is anticipated that the reduction trend 2006 to 2007 will resume in 2009.

Figure ES.10: NO_x Reductions - Progress to Date Compared to 2005



As shown above, the port is nearly halfway to meeting the 2014 NO_x Emission Reduction Standard in 2008. The SPBP Vessel Speed Reduction (VSR) program, Alternative Maritime Power (AMP), slide valves, and the CTP are the primary strategies for reducing NO_x emissions and meeting the 2014 NO_x standard. Increased participation in VSR out to 40 nm, increased use of AMP (or equivalent technologies) at berth will significantly help in meeting the 2023 standard. Additionally, continued fleet turnover in the CTP will also significantly contribute to NO_x reductions.

Figure ES.11: SO_x Reductions - Progress to Date Compared to 2005



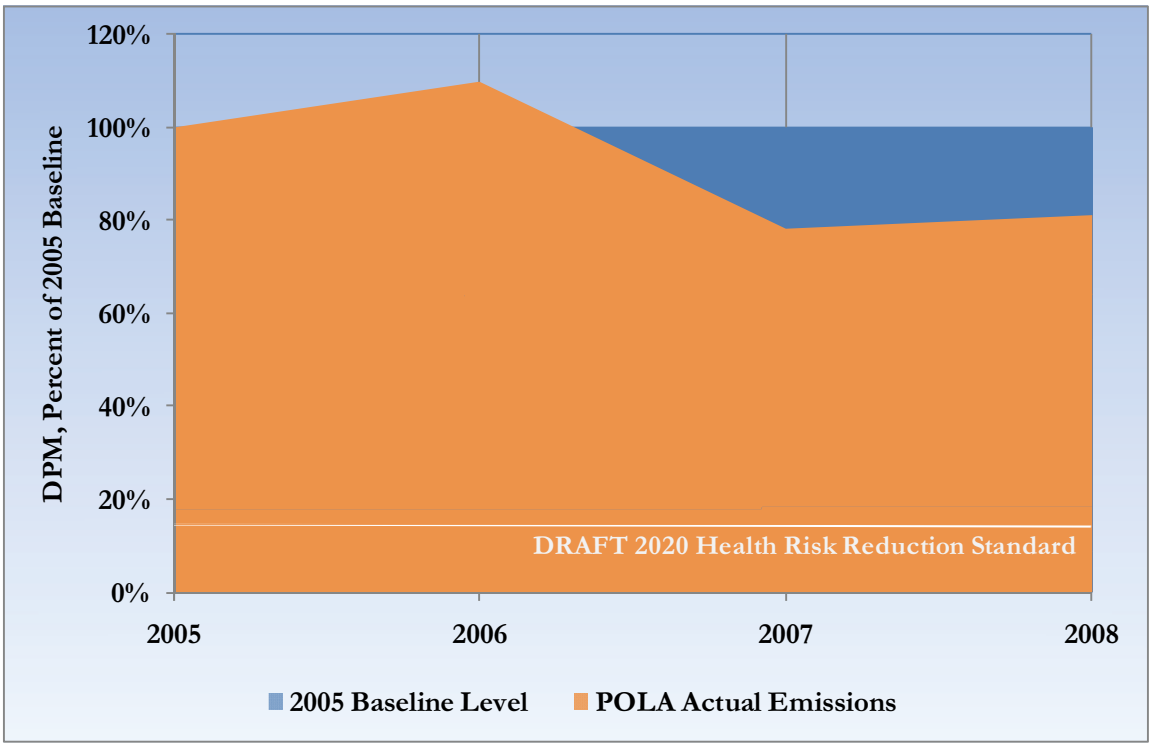
As shown above, by 2008 the port is a third of the way towards meeting the SO_x Emission Reduction Standard. With implementation of additional CAAP measures, the 2009 SPBP's OGV fuel switch incentive program and CARB's OGV fuel regulation implemented in 2009, it is anticipated that the high rate of SO_x reductions will continue in the coming years. The slight erosion of SO_x reductions from 2007 and 2008 was due to the injunction against the previous CARB OGV fuel rule in 2008.

Health Risk Reduction Progress

As described in Section 2 of the upcoming CAAP Update, the effectiveness of CAAP's control measures and applicable regulations with respect to the Health Risk Reduction Standard can be tracked by changes in mass emission reductions in DPM from the 2005 baseline. DPM is the predominant contributor to port-related health risk, and the Health Risk Reduction Standard was based on a health risk assessment study that used forecasted reductions in geographically allocated DPM emissions as the key input. Therefore, reductions in DPM mass emissions associated with CAAP measures and applicable regulations are a representative surrogate for health risk reductions.

Progress to-date on health risk reduction is determined by comparing the change in DPM mass emissions to the 2005 baseline. Figure ES.12 presents the progress of achieving the standard to date.

Figure ES.12: Health Risk Reduction Benefits - Progress To Date



As shown above, by 2008 the port is over a quarter of the way towards meeting the 2020 Health Risk Reduction Standard. With additional CAAP measures coming on line, the 2009 SPBP's OGV fuel switch incentive program, CARB's OGV fuel switch regulation implemented in 2009, and the continued fleet improvements coming from the Clean Truck Program, it is anticipated that the reduction trend 2006 to 2007 will resume in 2009.