SECTION 5: CAAP EFFECTIVENESS TRACKING

Background

The original CAAP was published in November of 2006, prior to the establishment of the San Pedro Bay Standards detailed in Section 2 of this CAAP update. At the time of adoption, the effectiveness of the plan was estimated based on forecasted growth of uncontrolled emissions as compared with forecasted growth of controlled emissions after implementing CAAP measures and applicable regulations. In Section 3.3 of the original CAAP, the ports identified several methods for tracking and measuring CAAP progress which included the annual emissions inventory updates.

In the original CAAP, the 2005 emissions were based on the 2001 POLA and 2002 POLB OGV and HDV emissions grown to 2005, and the draft 2005 CHE emissions from both ports. It is important to note that the CAAP was released prior to publishing of the 2005 emissions inventories, and only the draft 2005 CHE emission estimates were available at that time. Rail and harbor craft emissions were not included because of uncertainties in both fleet characteristics and control strategy implementation. Estimated controlled and uncontrolled emissions were forecasted for the years 2007, the first year of CAAP measure implementation, through 2011. Controlled emissions in the original CAAP were estimated with the application of CAAP measures and regulations adopted through May 2005. Uncontrolled emissions were forecasted with adopted regulations through May 2005, but without the effects of CAAP measures. The original comparisons of controlled and uncontrolled emissions have been widely publicized in the media, and it is commonly quoted that the CAAP will reduce 2011 DPM emissions by 47%, NOx emissions by 45%, and SOx emissions by 52%.

Since the publication of CAAP, there have been a number of developments in regulatory programs and inventory updates. Specifically, CARB has adopted several aggressive regulations controlling port-related sources. Also, the 2005 emissions inventories for both ports have been published along with updates in 2006, 2007, and 2008. Finally, with this CAAP Update, the San Pedro Bay Standards are established based on out-year emissions changes compared to the 2005 baseline of actual emissions from both ports.

Therefore, the original comparisons of controlled to uncontrolled emissions within each outer year, based on preliminary baseline information and adopted regulations through May 2005, are no longer applicable. However, for completeness, a detailed evaluation of the CAAP's progress against the original comparisons is provided in Appendix C.

2009 CAAP Update Effectiveness

Now that the San Pedro Bay Standards have been established, ongoing CAAP progress and effectiveness will be measured against these Standards which consist of the following reductions as compared to the 2005 published inventories:

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

Both of these Standards are represented as a percentage reduction from the total published 2005 Emissions Inventories, based on grown activity and control measures that includes all five source categories, not just the original three source categories used in the original CAAP. The San Pedro Bay Standards are developed based on the published 2005 emissions, grown to 2014 and 2023 using the 2007 San Pedro Bay cargo forecast, and controlled with CAAP measures and applicable regulations.

The following sections present the CAAP's effectiveness with respect to the San Pedro Bay Standards based on the 2005 published inventory methods and 2007 San Pedro Bay cargo forecast. Reductions in future year emissions are compared to the 2005 CAAP baseline.

5.1 Emissions Reduction Standard Progress

As stated above, one of the primary goals of the CAAP is to reduce mass emissions associated with port-related operations. For this CAAP Update, progress is determined by applying the 2005 published inventory methods to applicable years. It is, however, the intention of the ports moving forward to track the CAAP's effectiveness and progress through annual updates to both ports' published emissions inventories using the latest emissions estimating methodologies, activity data, and assumptions, which are reviewed by the Technical Working Group. With each new inventory publication, there is a detailed discussion on what improvements have been made to the emissions estimation methodology from the previous year. Port activity from previous years is then re-modeled using the latest methods and assumptions.

It is important to note that when updating emission estimating and forecasting methodologies and assumptions, the absolute values of the mass emissions numbers may change when the previous activity data is run using the new method. However, as long as all years are modeled in the same manner, it is the difference in emissions between the modeled and baseline year that is important since the Standards are stated as percent reductions over the baseline. Modeling all years with the same methods and assumptions allows for apples-to-apples comparison of annual emissions and the effectiveness of the CAAP, while incorporating the latest methodologies and data.

In the annual inventory updates completed since the 2005 published inventory, the 2005 baseline emissions have changed due to improved methodologies and assumptions across all five source categories. However, these changes have been modest.

The following two subsections present the progress to-date and the projected future benefits from the implementation of the CAAP and applicable regulations.

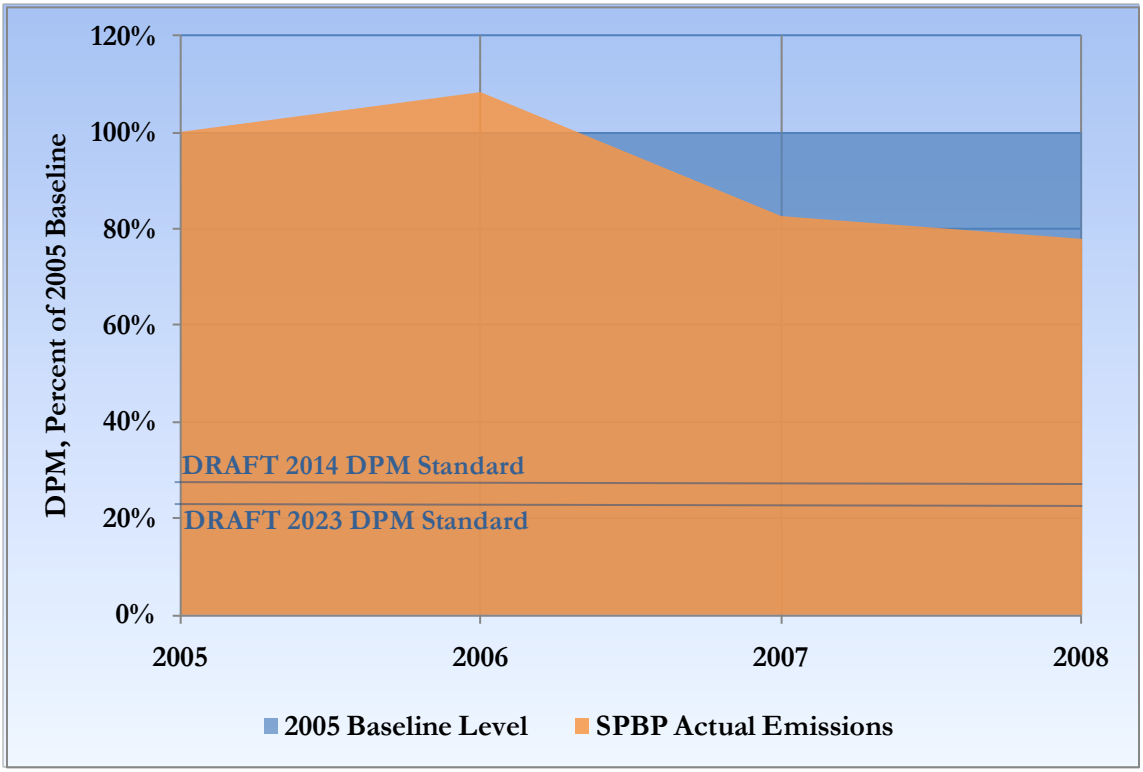
5.1.1 Progress to Date

To be consistent with the methods used in the emissions forecasting for the Standards, the progress to date for this CAAP update is shown based on the 2005 inventory methods and assumptions. Accordingly, for determining progress to date for this CAAP update, actual annual activity data for 2006 through 2008 from both ports were modeled using the 2005 methodology and assumptions to develop comparable emissions for these years. Tables 5.1 to 5.3 show the normalized estimates of emissions by source category for calendar years 2005 through 2008. Figures 5.1 through 5.3 present the 2005 baseline emissions and the year to year percent change in emissions with respect to the 2005 baseline emissions. This is different from those in the published annual inventories where previous years' activities are modeled with the latest methods to update the emission estimates.

Table 5.1: Emissions by Calendar Year and Source Category Using the 2005 EI Methodology (DPM in tons/year)

Category	2005	2006	2007	2008
OGV	1,206	1,283	811	870
HC	68	60	60	59
CHE	114	115	109	90
Rail	100	119	108	75
HDV	567	647	607	505
Total	**2,054**	**2,224**	**1,696**	**1,599**
% Cumulative Reduction		**-8%**	**17%**	**22%**

Figure 5.1: DPM Reductions - Progress to Date

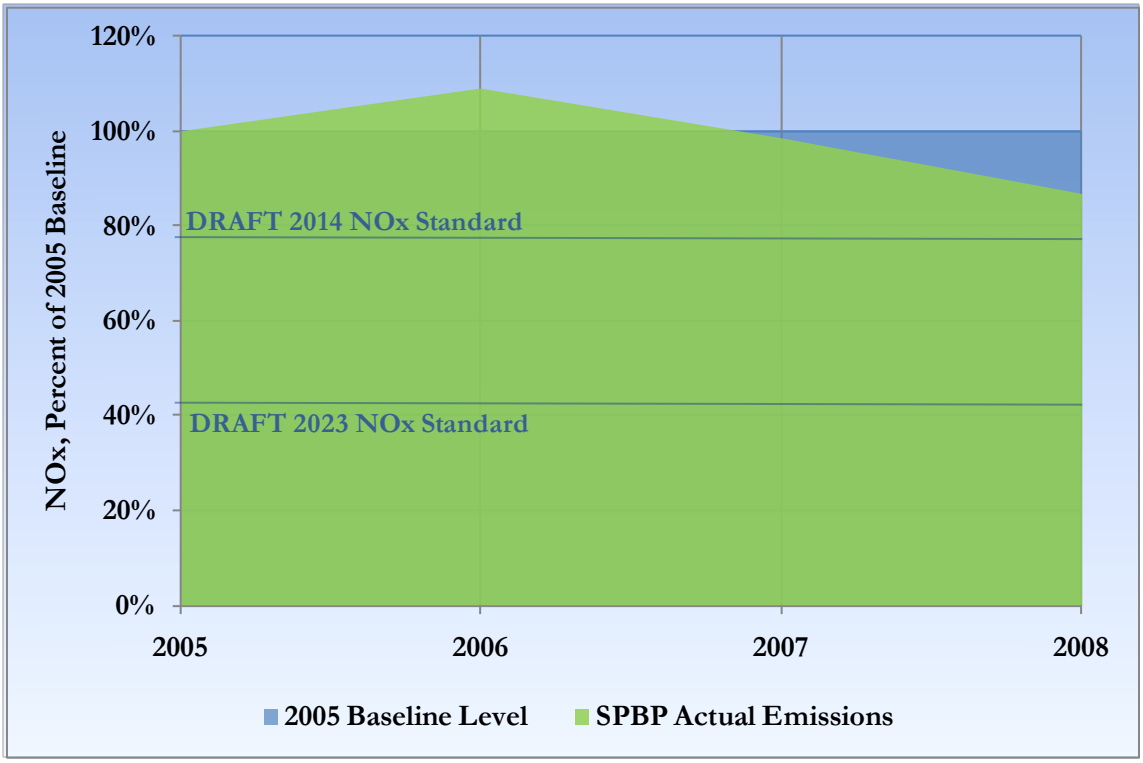


As presented above, by 2008 the ports were nearly a third of the way to meeting the 2014 DPM Emission Reduction Standards.

Table 5.2: Emissions by Calendar Year and Source Category Using the 2005 EI Methodology (NOx in tons/year)

Category	2005	2006	2007	2008
OGV	13,094	13,949	12,664	10,985
HC	2,263	2,146	2,187	2,095
CHE	3,727	4,250	3,926	3,104
Rail	2,985	3,428	3,011	2,469
HDV	12,327	13,743	12,121	11,206
Total	**34,396**	**37,515**	**33,909**	**29,859**
% Cumulative Reduction		-9%	1%	13%

Figure 5.2: NOx Reductions - Progress to Date

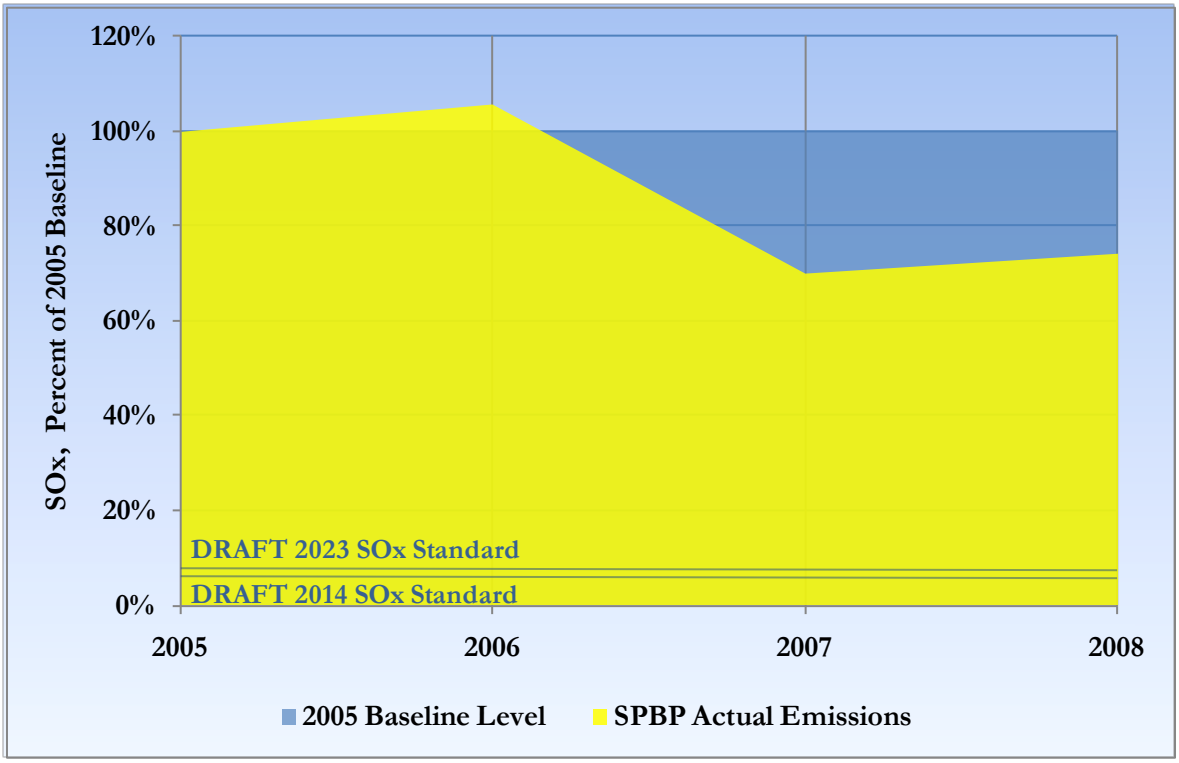


As presented above, the ports were nearly two-thirds on the way to meeting the 2014 NOx Emission Reduction Standard in 2008 and nearly a third of the way to meeting the 2023 Emission Reduction Standard.

Table 5.3: 2005 Emissions by Calendar Year and Source Category Using the 2005 EI Methodology (SOx in tons/year)

Category	2005	2006	2007	2008
OGV	12,940	13,677	9,123	9,767
HC	12	1	1	1
CHE	31	46	42	41
Rail	173	218	101	17
HDV	87	71	11	9
Total	**13,243**	**14,013**	**9,279**	**9,836**
% Cumulative Reduction		**-6%**	**30%**	**26%**

Figure 5.3: SOx Reductions - Progress to Date



As presented above, by 2008 the ports were over a quarter of the way to meeting the SOx Emission Reduction Standards.

As stated above, each year the ports update their annual emissions inventories utilizing the latest emission estimating methods, data, and assumptions, and compare the resulting emissions estimates to the 2005 CAAP baseline (this is the primary method for tracking CAAP progress). The approach and findings are reviewed by the TWG. In Section 9 of the POLA Emissions Inventory reports, the comparison includes the current year, the previous year and the 2005 baseline, using the activities from each year, modeled with the current year's methodology and assumptions. POLB provides a similar comparison in Section 8 of their Emissions Inventories. POLB's inventory compares the current year's emissions with the 2005 baseline emissions, based upon the activity data for each year and using the current year's methodology and assumptions.

5.1.2 Projected Future Benefits

In order to determine the projected benefits from the CAAP and applicable regulations, emissions are forecasted through 2013 based on the 2005 emissions inventory assumptions and the 2007 San Pedro Bay cargo forecast, consistent with the forecasting that was used to establish the San Pedro Bay Standards. Comparing the forecasted out-years to the 2005 baseline provides the projected benefits from 2009 through 2013. Benefits for 2005 through 2008 are based on the actual annual activity and the 2005 inventory methodology.

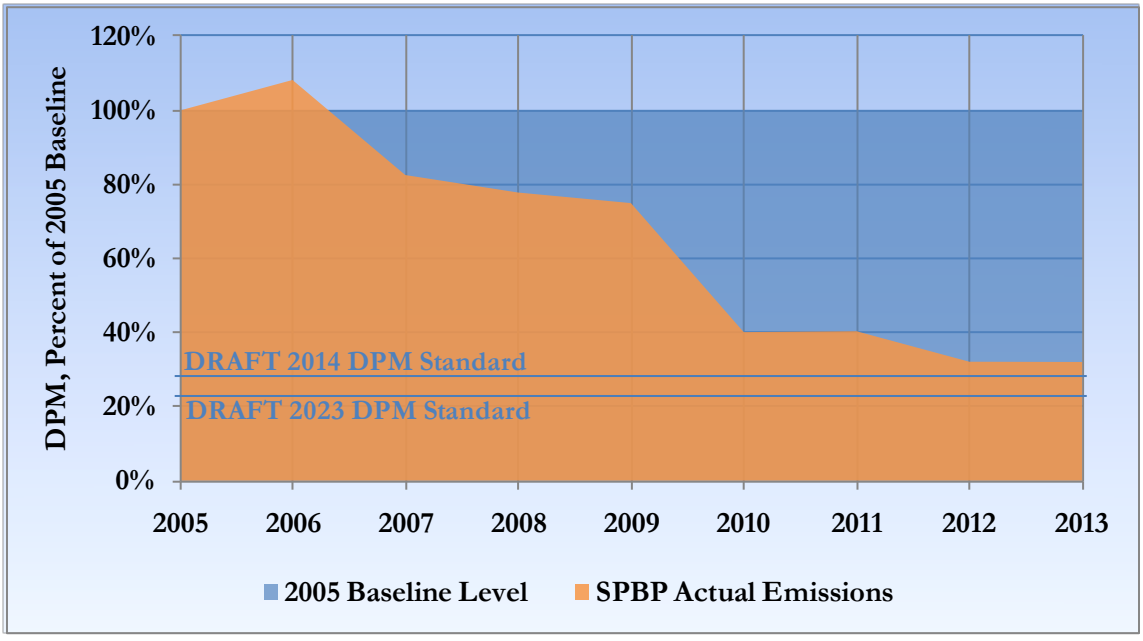
It should be noted that cargo forecasts vary along with changes in the financial markets. The 2007 San Pedro Bay cargo forecast used to establish the San Pedro Bay Standards was developed and published before the market collapse and ensuing recession and was based on previous year's cargo throughput changes. However, the forecasted volumes for 2007 through 2009 have not been realized at the ports. In fact, all the ports on the U.S. west coast have experienced significant cargo reductions during those two years due to the massive reductions in international trade volumes. The 2007 cargo forecast utilized for development of the Standards projected that the ports would continue to experience steady growth and reach cargo capacity (over 42 million twenty-foot equivalents (TEUs)) by 2023. In actuality however, the TEUs at the San Pedro Bay ports were flat in 2007 and reduced in 2008 and 2009. Therefore, the forecasted emissions presented in this section should not be considered definitive as they are subject to change to reflect updated cargo forecasts. These forecasts will be updated with each CAAP Update to reflect new forecast information.

Tables 5.4 through 5.6 present the projected benefits of the CAAP measures and applicable regulations. Figures 5.4 through 5.6 present the 2005 baseline and the year to year percent change in the magnitude of emissions with respect to 2005 for the San Pedro Bay ports.

Table 5.4: Actual and Forecasted DPM Emissions & Benefits Using the 2005 EI Methodology

	2005	2006	2007	2008	2009	2010	2011	2012	2013
DPM, tons	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	1,206	1,283	811	870	847	457	448	342	348
HC	68	60	60	59	70	71	72	71	60
CHE	114	115	109	90	88	77	73	63	50
Rail	100	119	108	75	107	105	114	123	132
HDV	567	647	607	505	428	114	123	62	70
Total	2,054	2,224	1,696	1,599	1,540	825	829	660	659
DPM Reductions Compared to 2005, ton	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	0	-77	394	335	359	748	757	864	858
HC	0	8	8	9	-3	-3	-4	-3	8
CHE	0	-1	5	24	26	37	41	51	64
Rail	0	-20	-9	24	-7	-5	-14	-23	-32
HDV	0	-80	-40	62	139	453	444	505	497
Total	0	-170	358	455	514	1,229	1,225	1,394	1,395
DPM Reductions Compared to 2005	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	0%	-6%	33%	28%	30%	62%	63%	72%	71%
HC	0%	12%	11%	13%	-4%	-5%	-5%	-4%	12%
CHE	0%	-1%	5%	21%	23%	33%	36%	44%	56%
Rail	0%	-20%	-9%	24%	-7%	-5%	-14%	-23%	-32%
HDV	0%	-14%	-7%	11%	24%	80%	78%	89%	88%
Total	0%	-8%	17%	22%	25%	60%	60%	68%	68%

Figure 5.4: DPM Baseline & Forecasted Benefits

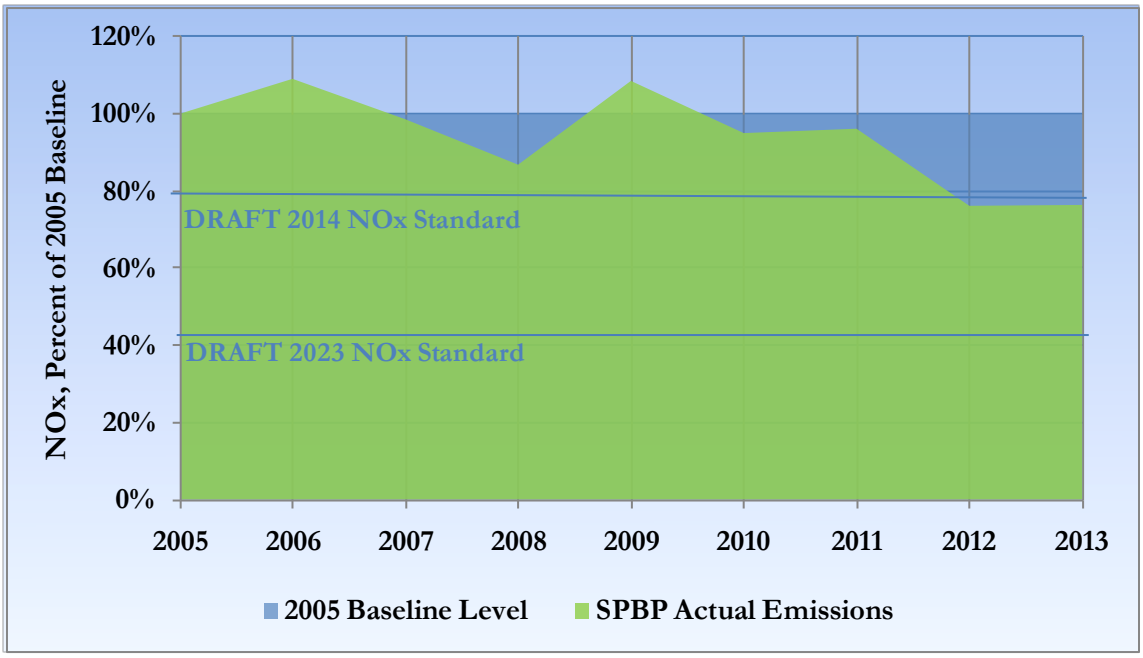


As presented on the previous page, with additional CAAP measures coming on line, the ports' 2008/2009 OGV fuel switch incentive program, CARB's OGV fuel switch regulation implemented in mid-2009, and the Clean Truck Program, it is anticipated that the reduction trend through 2008 will continue and sharpen slightly. By 2012, the ports are anticipated to be close to achieving their 2014 DPM emissions reduction Standard. Though significant progress has been made, significant challenges remain to achieve the goals.

Table 5.5: Actual and Forecasted NOx Emissions & Benefits Using the 2005 EI Methodology

	2005	2006	2007	2008	2009	2010	2011	2012	2013
NOx, tons	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	13,094	13,949	12,664	10,985	14,386	14,086	13,939	13,903	14,125
HC	2,263	2,146	2,187	2,095	2,114	2,130	2,054	1,912	1,695
CHE	3,727	4,250	3,926	3,104	3,736	3,219	3,159	2,791	2,298
Rail	2,985	3,428	3,011	2,469	2,986	2,903	3,149	3,395	3,642
HDV	12,327	13,743	12,121	11,206	14,108	10,339	10,766	4,189	4,511
Total	34,396	37,515	33,909	29,859	37,331	32,676	33,068	26,191	26,270
NOx Reductions Compared to 2005, tons	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	0	-855	430	2,109	-1,292	-992	-845	-809	-1,031
HC	0	118	77	169	149	134	210	351	569
CHE	0	-523	-199	623	-10	508	567	935	1,429
Rail	0	-443	-26	515	-2	82	-164	-411	-657
HDV	0	-1,416	206	1,121	-1,781	1,988	1,561	8,138	7,816
Total	0	-3,120	487	4,537	-2,935	1,720	1,328	8,205	8,125
NOx Reductions Compared to 2005	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	0%	-7%	3%	16%	-10%	-8%	-6%	-6%	-8%
HC	0%	5%	3%	7%	7%	6%	9%	16%	25%
CHE	0%	-14%	-5%	17%	0%	14%	15%	25%	38%
Rail	0%	-15%	-1%	17%	0%	3%	-6%	-14%	-22%
HDV	0%	-11%	2%	9%	-14%	16%	13%	66%	63%
Total	0%	-9%	1%	13%	-9%	5%	4%	24%	24%

Figure 5.5: NOx Baseline & Forecasted Benefits

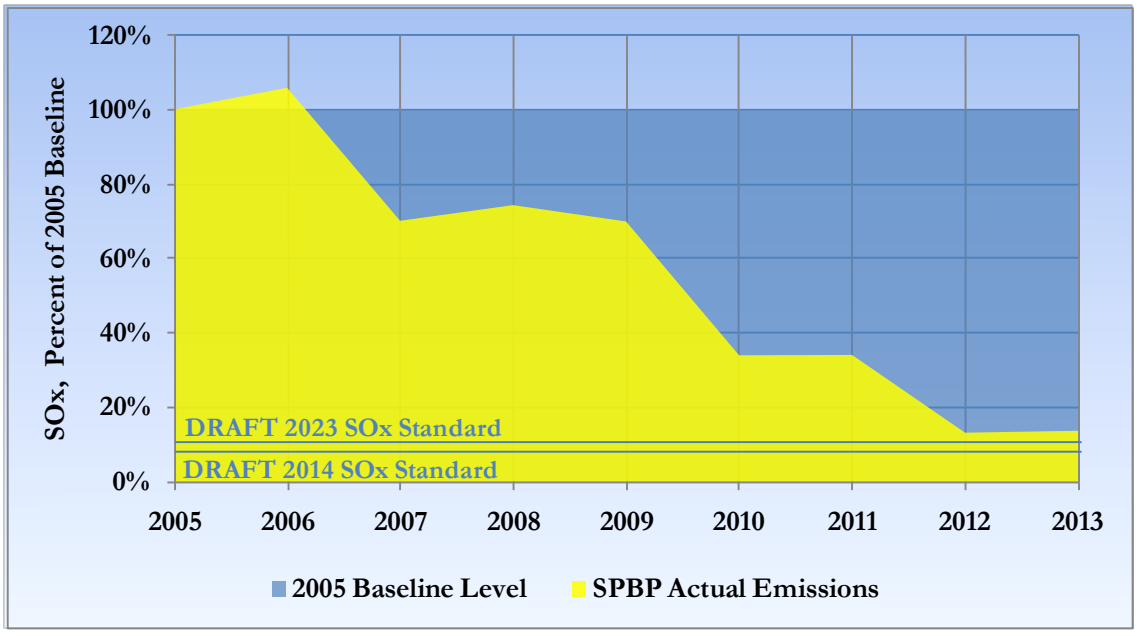


As presented above, it is anticipated with implementation of the CAAP measures, including the vessel speed reduction (VSR) program, shore-power, and the Clean Truck Program (CTP), the ports are on target with meeting the 2014 NOx standard. Increased participation in VSR out to 40 nm, increased use of shore power (or equivalent technologies) at berth and introduction of new control technologies on existing and new build OGVs will significantly help in meeting the 2023 NOx emissions reduction standard. Additionally, continued fleet turnover in other source categories will also contribute to NOx reductions. The increase in emission levels in 2009 is a manifestation of the cargo forecast compared to the actual cargo throughputs in the preceding years. Finally, the decrease in NOx emissions in 2009 is less than 2007 and 2008 because uncontrolled emissions for that year are based on the higher estimated growth from the 2007 cargo forecast, whereas controlled emissions in 2007 and 2008 reflect the actual decline in growth that occurred during those years.

Table 5.6: Actual and Forecasted SOx Emissions & Benefits Using the 2005 EI Methodology

	2005	2006	2007	2008	2009	2010	2011	2012	2013
SOx, tons	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	12,940	13,677	9,123	9,767	9,210	4,469	4,492	1,711	1,774
HC	12	1	1	1	2	2	2	2	2
CHE	31	46	42	41	6	6	6	7	7
Rail	173	218	101	17	26	3	3	4	4
HDV	87	71	11	9	11	12	12	13	13
Total	13,243	14,013	9,279	9,836	9,254	4,491	4,515	1,736	1,800
SOx Reductions Compared to 2005, tons	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	0	-737	3,817	3,173	3,730	8,471	8,448	11,229	11,166
HC	0	11	11	11	11	11	11	11	11
CHE	0	-14	-11	-9	25	25	25	24	24
Rail	0	-45	71	156	147	170	169	169	169
HDV	0	16	76	78	76	75	75	74	74
Total	0	-770	3,965	3,408	3,989	8,752	8,728	11,508	11,444
SOx Reductions Compared to 2005	*Based on Actual Activity Data*				*Based on Forecasted Activity Data*				
OGV	0%	-6%	29%	25%	29%	65%	65%	87%	86%
HC	0%	88%	88%	88%	87%	87%	87%	87%	87%
CHE	0%	-46%	-35%	-30%	82%	81%	80%	79%	77%
Rail	0%	-26%	41%	90%	85%	98%	98%	98%	98%
HDV	0%	18%	88%	89%	87%	86%	86%	85%	85%
Total	0%	-6%	30%	26%	30%	66%	66%	87%	86%

Figure 5.6: SOx Baseline & Forecasted Benefits



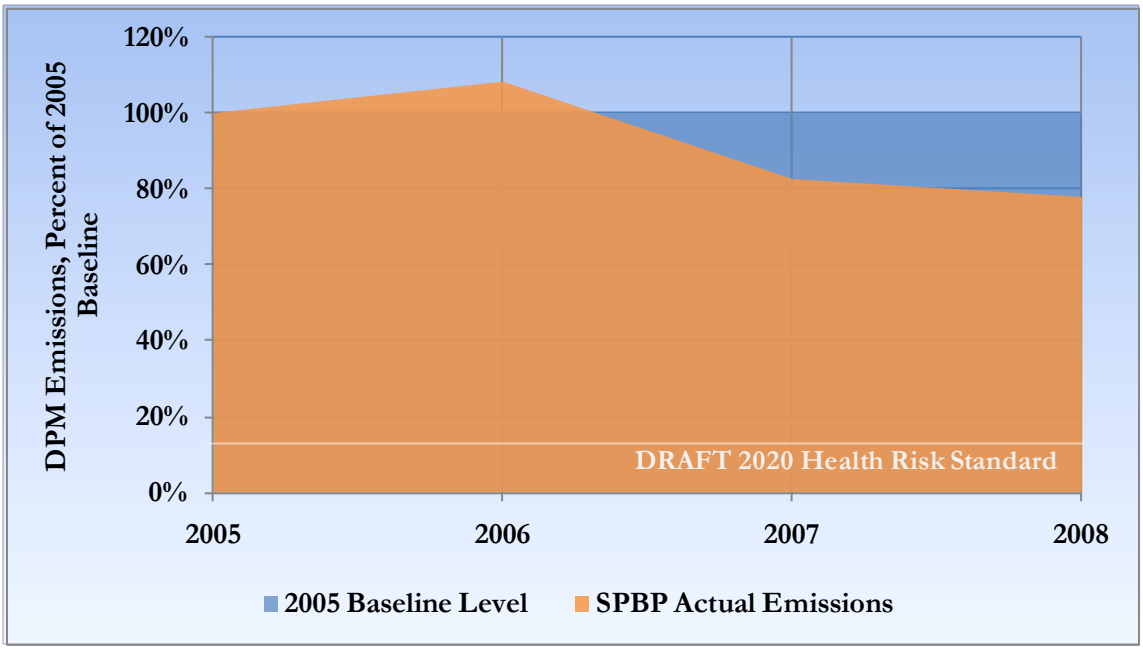
As presented on the previous page, with the implementation of additional CAAP measures, the ports' 2008/2009 OGV fuel switch incentive program and CARB's OGV fuel regulation implemented in mid-2009, it is anticipated that the high rate of SO_x reductions will continue in the coming years. The slight erosion of SO_x reductions from 2007 and 2008 was due to the injunction of the previous CARB OGV fuel rule in 2008. The plateau in 2009 is a manifestation of the cargo forecast. The ports are anticipated to be close to achieving their 2014 and 2023 SO_x emissions reduction standards by 2012. Significant challenges however remain with closing the final gap and sustaining these reductions.

5.2 Health-Risk Reduction Standard Progress

As discussed in Section 2, the effectiveness of the CAAP's control measures and applicable regulations with respect to the population-weighted Health Risk Reduction Standard can be correlated to mass emission reductions in DPM from the 2005 baseline, as DPM emissions reductions track closely with reductions in DPM health risk. Since the Standard was based on geographically allocated forecasted DPM emissions, reductions in DPM mass emissions associated with CAAP measures and applicable regulations are therefore a representative surrogate for health risk reductions.

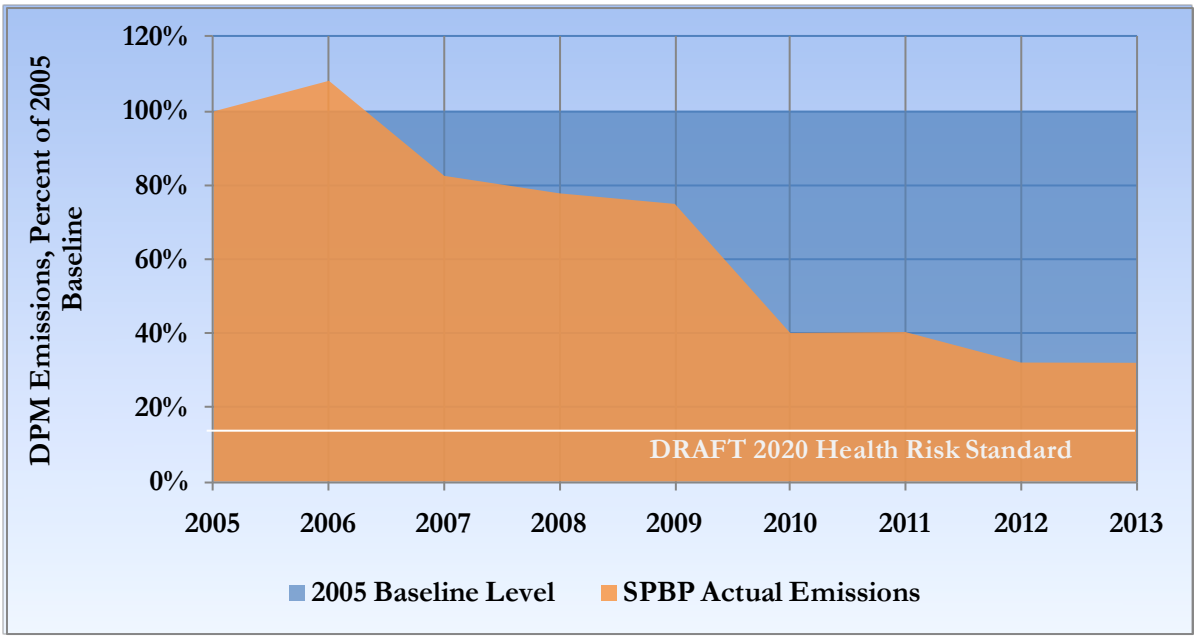
Progress to date and projected future benefits are determined by comparing the change in DPM mass emissions to the 2005 baseline. Figure 5.7 presents the progress to date and Figure 5.8 presents the projected future benefits anticipated from the CAAP and applicable regulations.

Figure 5.7: Health Risk Reduction Benefits - Progress To Date Using the 2005 EI Methodology



As presented above, by 2008 the ports were a quarter of the way to meeting the health risk standard, based upon the reduction in DPM emissions.

Figure 5.8: Forecasted Health Risk Benefits Using the 2005 EI Methodology



As presented above, with additional CAAP measures coming on line, the ports' 2008/2009 OGV fuel switch incentive program, CARB's OGV fuel switch regulation implemented in mid-2009, and the Clean Truck Program, it is anticipated that the reduction trend seen since 2006 will continue. Although it appears that the ports will be close to meeting the health risk reduction standard by 2013, closing the gap to achieve the Standard will be a significant challenge, since the remaining emission sources will be the hardest to mitigate.