ANNUAL REPORT ON VOLATILE ORGANIC COMPOUND EMISSIONS FROM PESTICIDES: EMISSIONS FOR 1990 – 2009

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EXECUTIVE SUMMARY

Preface

This report fulfills the requirements of Title 3, California Code of Regulations (3 CCR), section 6452.4 which requires the Director of Department of Pesticide Regulation (DPR) to issue an annual emissions inventory report for the Sacramento Metro, San Joaquin Valley, South Coast, Southeast Desert, and Ventura ozone nonattainment areas (NAAs). This report presents data reported to or produced by DPR from May 1, 2009, to October 31, 2009, the peak ozone season in California. In addition, data from the same months in 1990 are included for baseline comparisons, and from 2006, 2007 and 2008 for trend analysis.

Background

Under the federal Clean Air Act, California must meet national standards for airborne pollutants and must specify how it plans to achieve these goals in a federally approved State Implementation Plan (SIP). Five regions in California – the Sacramento Metro area, the San Joaquin Valley, the Southeast Desert region, Ventura County and the South Coast area - exceed federal ozone standards and are therefore designated NAAs. SIPs require the control of emissions of nitrogen oxides and volatile organic compounds (VOCs) because they are precursors to ozone. Under California's SIP, approved by the U.S. Environmental Protection Agency (U.S. EPA) in 1997, DPR must track and control VOC emissions from pesticide products used in agriculture and by commercial structural applicators in these five NAAs. Under the SIP, California is expected to reduce pesticide VOCs by 12 percent in the San Joaquin Valley and 20 percent in the other four NAAs, compared to 1990 levels.

DPR's VOC emission inventory database includes only pesticide applications that are made between May 1 and October 31, the peak ozone season in California. The database is updated when annual pesticide use report data from the previous year becomes available, and contains data for every year since 1990. Each year contains about 2.5 million pesticide use records (PUR) and emission potential (EP) values for approximately 5,000 products. The EP is that fraction of a product that is assumed to contribute to atmospheric VOCs.

Beginning in 2008 DPR adopted regulations to reduce VOC emissions from fumigant pesticides. Section 6452.2, 3 CCR, includes specific emission target levels (VOC regulation benchmarks) for each of the five NAAs, equivalent to the SIP obligation of a 12 percent or 20 percent reduction. The regulations reduce VOC emissions by requiring low-emission fumigation methods in certain NAAs. In all NAAs but Ventura, if, in spite of these application method requirements, pesticide VOC emissions exceed 80 percent of the benchmark for a NAA, DPR will, as specified by the regulations, ensure that the benchmark is achieved by establishing a fumigant limit beginning in 2011. A fumigant limit is required at least through 2011 in Ventura. The fumigant limit is determined by subtracting the estimated nonfumigant emissions from the regulatory benchmark, basing the nonfumigant emissions estimate on VOC emission inventory data from previous years.

Report Summary

- Sacramento Metro NAA: VOC emissions increased between 2005 and 2006 but decreased in 2007, 2008 and 2009. Pesticide VOC emissions in 2009 were 66 percent lower than the 1990 base year and remain well in compliance with the SIP goal and the VOC regulation benchmark. In 2009, 87 percent of emissions were derived from nonfumigants.
- San Joaquin Valley NAA: VOC emissions increased in 2005 and 2006 and then decreased in 2007, 2008 and 2009. Pesticide VOC emissions in 2009 were 33 percent lower than the 1990 base year and comply with the SIP goal and VOC regulation benchmark. Approximately three-quarters of pesticide emissions are derived from nonfumigants.
- Southeast Desert NAA: Except for an increase in 2007, VOC emissions decreased over the last several years, including 2009. Pesticide VOC emissions in 2009 were 87 percent lower than the 1990 base year and comply with the SIP goal and VOC regulation benchmark. Emissions from fumigants account for less than one half of the total.
- Ventura NAA: The SIP goal and VOC regulation benchmark is phased in over several years for this NAA. VOC emissions increased in 2009 but continue to meet the SIP goal for 2009 as well as the final goal to be met beginning in 2012. Pesticide VOC emissions in 2009 were 52 percent lower than the 1990 base year. Seventy-five percent (75%) of emissions are derived from fumigants.
- South Coast NAA: VOC emissions decreased in 2009 and remain well below the emission targets. Pesticide VOC emissions in 2009 were 89 percent lower than the 1990 base year. Three quarters of emissions are derived from non fumigants

Section 6452.3 requires a 45-day public comment period of the draft report. No comments were received during the comment period (February 14, 2011 - April 1, 2011).

Abbreviations and Definitions

AI	Active Ingredient
APCD	Air Pollution Control District
AMAF	Application Method Adjustment Factor
ARB	California Air Resources Board
EP	Emission Potential
GIS	Geographic Information System
MUF	Method Use Fraction
NAA	nonattainment area
PUR	pesticide use report
SIP	state implementation plan
TGA	thermogravimetric analysis
tpd	tons per day
VOC	Volatile Organic Chemical

ACKNOWLEDGEMENTS

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DISCLAIMER

The mention of commercial products, their source, or their use in this report is not to be construed as either an actual or implied endorsement of such product.

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OVERVIEW

Introduction

The State Implementation Plan (SIP) for pesticides requires the California Department of Pesticide Regulation (DPR) to develop and maintain an emission inventory to track pesticide Volatile Organic Chemical (VOC) emissions and to reduce emissions by 20 percent from a base year in four out of five California nonattainment areas (NAA), and by 12 percent in the fifth NAA. These five NAAs are defined as areas that do not meet the National Ambient Air Quality Standards for ozone as designated in the Clean Air Act. The scope of the VOC inventory allows DPR to estimate VOC emissions from agricultural and commercial structural pesticide applications within the state. To do this DPR calculates emissions for each year beginning with 1990, and updates these calculations annually based on most recent data. The inventory focuses on the peak ozone period between May 1 and October 31 for each year.

The VOC emission inventory is estimated based on pesticide use reports (PURs) that are collected by DPR. The inventory includes applications that are made for agricultural and structural use as defined by law. Included are all applications with the exception of home use, industrial use, institutional use, applications made for vector control purposes and veterinarian uses. Production agricultural use covers applications to approximately 400 commodities/crops. Non-production agricultural use includes applications to approximately 20 sites including cemeteries, golf courses, parks, rights of way, etc. Structural use includes all applications by structural pest control businesses, regardless of site treated.

The key pesticide use report data used to calculate VOC emissions is given in Table 1. There are seven counties that are partially within NAAs. Because the location of non-production agricultural and non-agricultural applications are only given down to the county level, these types of applications need to be allocated to the portions of those seven counties so that their contribution to NAA emissions can be accurately determined. Using a Geographic Information System (GIS) and surrogate data such as population, roadways, waterways and power lines, proportional estimates have been derived for structural and rights-of-way applications. Commodity fumigations are allocated based on information provided by the California County Agricultural Commissioners.

Table 1. Key information included in pesticide use reports that form the basis of DPR's VOC emission inventory.

Information	Production Agriculture Report (Each Application)	Non-Production Agriculture Report and Non Agricultural Reports (Monthly Summary of Applications)
Product Applied	Yes	Yes
Crop/Site Treated	Yes	Yes
Amount Applied	Yes – each application	Monthly Total
Date Applied	Date and Time	Month
Application Method	Yes	No
Acres/Units Treated	Yes	Monthly Total
Location of Application	Township/Range/Section	County

California's five ozone NAAs are Sacramento Metro (1), San Joaquin Valley (2), Southeast Desert (3), Ventura (4), and South Coast (5). The boundaries of these NAAs, as defined by CFR 40 Part 81, and a listing of counties that fall within the boundaries are shown in Figure 1 and Table 2, respectively.

In January 2008, DPR adopted 3 CCR section 6452.3 requiring an annual VOC emissions inventory report that includes the following information:

- report total agricultural and structural pesticide VOC emissions for the previous years,
- evaluate compliance with SIP goals (benchmarks specified in section 6452.2),
- establish fumigant emission limits for the upcoming year if necessary, according to section 6452.2, and
- establish an emission rating (or application method adjustment factor, the percentage of fumigant applied emitted to air) for each fumigation method

Section 6452.3 also requires a 45-day public comment period of the draft report. This report contains all of the information specified above, including emission estimates for 1990–2009 and fumigant limits for 2011.

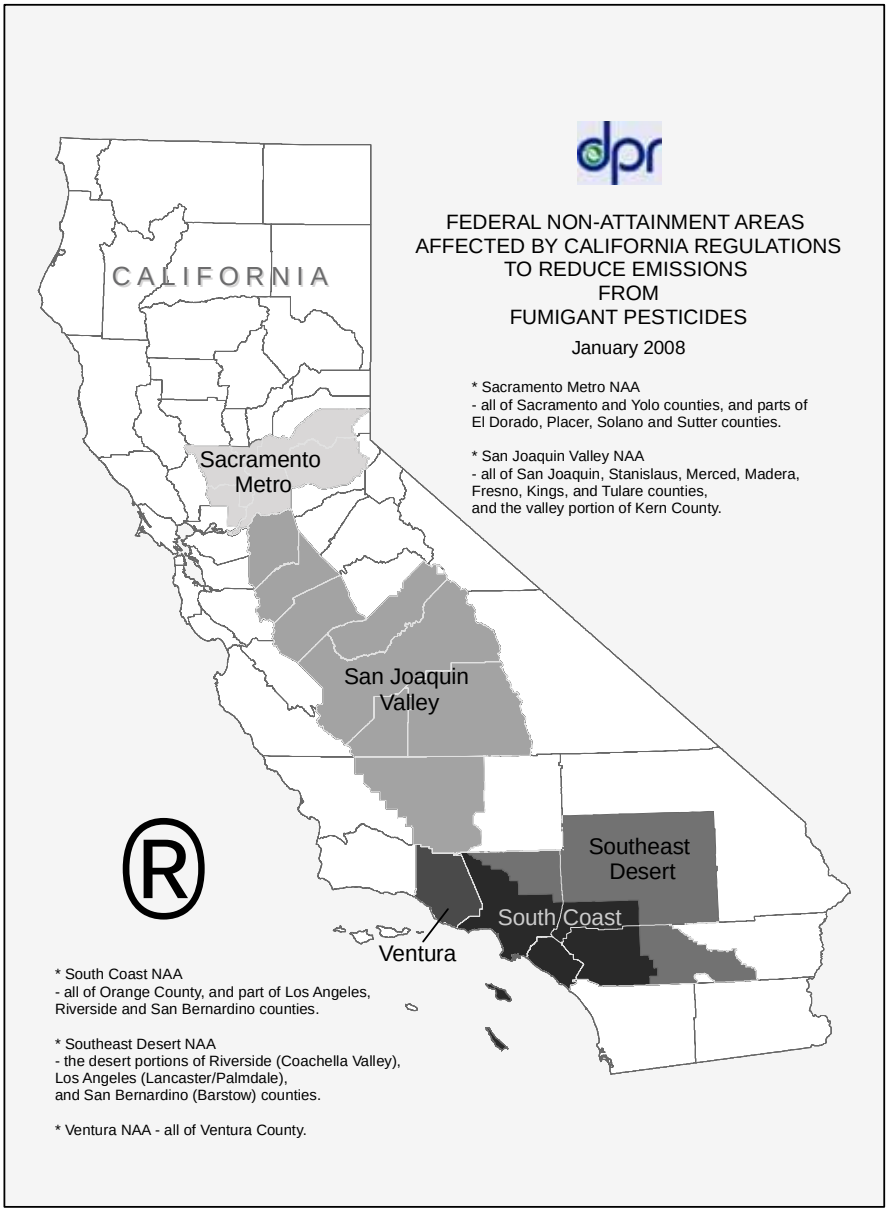


Figure 1. Federal nonattainment areas affected by California Regulations to reduce emissions from fumigant pesticides.

Table 2. A listing of counties wholly or partially within nonattainment areas in California.

NAA	Counties within the NAA
1 – Sacramento Metro	All of Sacramento, Yolo Parts of Sutter, Solano, Placer, El Dorado
2 – San Joaquin Valley	All of Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare Western Part of Kern
3 – Southeast Desert	Parts of Los Angeles, San Bernardino, Riverside
4 – Ventura	All of Ventura
5 – South Coast	All of Orange Western Parts of Los Angeles, San Bernardino, Riverside

Nonattainment Area Goals

The emissions in DPR's VOC inventory are compared to NAA goals listed in Table 3, which are described in California's original 1994 SIP (62 Fed. Reg. at 1170,1997) and Appendix H to the 2007 SIP (73 Fed. Reg. 41277, 2008). These "SIP goals" are a 20 percent reduction from 1990 for the Sacramento Metro, Southeast Desert, and South Coast NAAs; a 12 percent reduction from 1990 for the San Joaquin Valley NAA; and a phase-in of the reductions for the Ventura NAA, with a final reduction for Ventura of 20 percent from 1990 by 2012.

Table 3. Nonattainment Area Goals for 2008 – 2012.

NAA	SIP Goal (tons/day) 2008 - 2012				
1 – Sacramento Metro	2.2				
2 – San Joaquin Valley	18.1				
3 – Southeast Desert	0.92				
4 – Ventura	**2008**	**2009**	**2010**	**2011**	**2012**
	4.3	4.0	3.6	3.3	3.0
5 – South Coast	8.7				

Procedure For Calculating Unadjusted and Adjusted VOC Emissions

Prior to 2008, DPR reported an unadjusted emission inventory that assumed the entire volatile portion of a fumigant product eventually volatilizes, contributing to atmospheric VOC loadings. However, several dozen field studies have shown that actual emissions from soil-applied fumigants such as methyl bromide vary by application method and are generally less

than 100 percent. DPR has developed an adjustment procedure to account for the effect of application method on reducing fumigant VOC emissions.

The unadjusted inventory is based on the premise that the VOC emission from a single application of fumigant or nonfumigant product is equal to the amount used times the Emission Potential (EP) (Spurlock, 2002; 2006).

$$emission = lbs\ of\ product\ used \times EP$$

In the adjusted inventory the emission from a single application of a **fumigant** active ingredient (AI) is reduced by an additional factor called the Application Method Adjustment Factor (AMAF), also referred to as the emission rating. AMAFs have been determined from field study data and are AI and application method specific (Barry et al., 2007). Since the AMAFs are based on field measured data for specific application methods and fumigants, they yield more refined estimates of fumigant VOC emissions than the previous unadjusted emission estimates

$$emission = lbs\ of\ product\ used \times EP \times AMAF$$

In the adjusted inventory, **nonfumigant** product emissions are not currently adjusted for application method or other field factors due to a lack of data to support such adjustments. Consequently their emissions are calculated using the same procedure as the unadjusted inventory.

Usually there are several different types of application methods used for a particular fumigant in any particular NAA. Each method of use (e.g. drip, sprinkler, shank, tarp, etc.) represents a fraction of the total number of methods used and is referred to as the Method Use Fraction (MUF). The sum of all *MUFs* for any particular (NAA/fumigant AI) combination is one. Use practices change over time so that different *MUF*s are used for the baseline year (1990) as opposed to more recent inventory years. For 2007 and earlier years, *MUF*s are determined in a number of different ways. For 1,3-dichloropropene the *MUF*s are determined from use data collected by the registrant in support of DPR's township application caps; for metam sodium and metam potassium grower/applicator surveys were conducted to determine types of applications for different crops and areas. Methyl bromide and chloropicrin *MUF*s are based on expert opinion and regulatory history. Finally, *MUF*s for dazomet and sodium tetrathiocarbonate equal one because the *AMAF*s for each of these two fumigants are constant, independent of application method. A detailed discussion of how MUF and AMAFs were determined is given by Barry et al (2007).

The 2008 VOC regulations included a change to pesticide use reports that requires recording the specific application method for each fumigation within NAAs. The *MUFs* for 2008 and later years are calculated using the fumigation method documented in pesticide use reports rather than the surrogate data described above. Some pesticide use reports for 2008 and later years are missing the identification of the application method. In these cases, DPR assumed that

the application method with the highest AMAF allowed by the regulations for that fumigant was used. The AMAFs and method use fractions for 1990, 2005, 2006, 2007 and 2008 in each of the NAAs are included in the appendix of this document (Tables A1 – 1 to A1 - 26).

VOC emissions were calculated for each NAA and summed according to primary active ingredient, application site, and emission category as defined by the Air Resources Board (ARB). The primary active ingredient is defined as the pesticide active ingredient present at the highest percentage in a product. If a pesticide product contains 20 percent of active ingredient "A" and 10 percent of active ingredient "B", all estimated emissions from that product are assigned to the primary active ingredient "A". This approach prevents "double-counting" of emissions from products containing two active ingredients.

Both unadjusted and adjusted emission inventory data for the top ten primary active ingredients contributing to May-October ozone in 2005, 2006, 2007 and 2008 are included in this memo. Appendix 2 contains summaries of emissions attributable to specific application sites (or commodities). These summary data are provided only for *unadjusted* emissions because it is not possible to allocate adjusted emissions to specific application sites with the currently available data.

ARB defines four VOC emission categories: methyl bromide emissions from agricultural applications, non-methyl bromide emissions from agricultural applications, methyl bromide emissions from structural applications, and non-methyl bromide emissions from structural applications. Emissions were calculated for the May–October ozone season, and are reported as U.S. tons per day (tpd).

Data Revisions

DPR continually evaluates pesticide use report data, EP values, MUFs, and AMAFs to ensure the VOC inventory includes the most reliable data. Since the last annual report, DPR has revised the AMAF for one fumigation method. DPR received a study documenting the emissions from a metam-sodium application made at night using a shank injection/compaction method. Based on this study, DPR has revised the AMAF for this method (Table 4).

Table 4. Revised application method adjustment factors (emission ratings)

Method Description	Fumigation Method Code	Original AMAF (%)	Revised AMAF (%)
None			

VOC emissions from inert ingredients in glyphosate products have increased in the last few years in several NAAs. Most if not all of the increase in emissions is due to Roundup Powermax Herbicide, first registered in 2007. Due to a lack of thermogravimetric analysis data, DPR has assigned an EP of 35.28 percent for this product. Most other glyphosate products have EPs of 0 to 6 percent. DPR has requested that the registrant provide EP data for this product, and will update the emission inventory if and when this data is received.

DPR has proposed a SIP revision with a commitment to ensure pesticide VOC emissions do not exceed 18.1 tons/day in the San Joaquin Valley NAA, equivalent to a 12 percent reduction from 1990 (Table 3). DPR will use the emissions estimation methodology described in this report to meet the SIP commitment. Emission ratings for application methods that were used in 1990 will not be modified, absent a SIP revision. Similarly, regarding nonfumigant pesticides, DPR will not revise the emission potentials of formulations that were used in the base year, absent a SIP revision.

VOLATILE ORGANIC COMPOUND INVENTORY RESULTS

The main text of this report summarizes the pesticide VOC emission inventory data for 2009 only. Adjusted and unadjusted emission data for 2006, 2007 and 2008, and unadjusted data for 2009 are summarized in Appendices 2 and 3. Previous inventory memos and the 2007 and 2008 reports included a summary of pesticide VOC emissions by commodity/site. At this time it is not possible to determine the breakdown of adjusted emissions by commodity, so only the *unadjusted* emissions are shown by commodity. Tables for emissions calculated for active ingredients (adjusted and unadjusted) and application sites (unadjusted) contain information for the top ten contributors only.

Figure 2 illustrates the changes in *unadjusted* VOC emissions from 1990 to 2009. These values are *unadjusted* and so do not take in to consideration MUFs and AMAFs that can only be applied to emissions in 2004 through 2009, and 1990. The figure is useful in that it compares emissions for the entire history of the inventory and shows trends in five NAAs.

Tables 5 and 6a and Figure 3 summarize the adjusted pesticide VOC emissions for 2004 through 2009, and compare them to the SIP goals that based a percentage reduction from the 1990. Table 6b compares the unadjusted and adjusted fumigant VOC emissions for 2004 through 2009. The emissions in the base year are also included to reflect the long term decrease or increase. Generally, what the tables and figure show can be summarized as follows:

- Adjusted emissions in 2009 in the Sacramento Metro (1) continue to decline and fell to below 1 ton per day. Nonfumigants represented 87 percent of the total, and the total remaining well below the SIP goal.
- Emissions in the South Coast NAA (5) also decreased slightly over 2008 values and remain well below the SIP goal. Three quarters of the total adjusted VOC emissions came from non-fumigants.
- In 2009, fumigants accounted for less than half of VOC emissions in the Southeast Desert (3), down slightly from 2008. Total VOC emissions in 2009 decreased by almost 50 percent from 2008 and continue to meet the SIP goal.
- 2009 VOC emissions in the Ventura NAA (4) increased by 0.072 tpd from the previous year but continue to meet the regulatory goal for 2010, 2011and 2012. Seventy five percent of emissions come from fumigants.
- In the San Joaquin Valley NAA (2), nonfumigants accounted for approximately three quarters of the total VOC emissions in 2009. In this NAA, VOC emissions decreased from 2008 to 2009 by about 7 percent, and continue to be below the SIP goal.

Figure 2. Annual ***unadjusted*** ozone season pesticide VOC emissions by NAA from 1990 to 2009, inclusive.

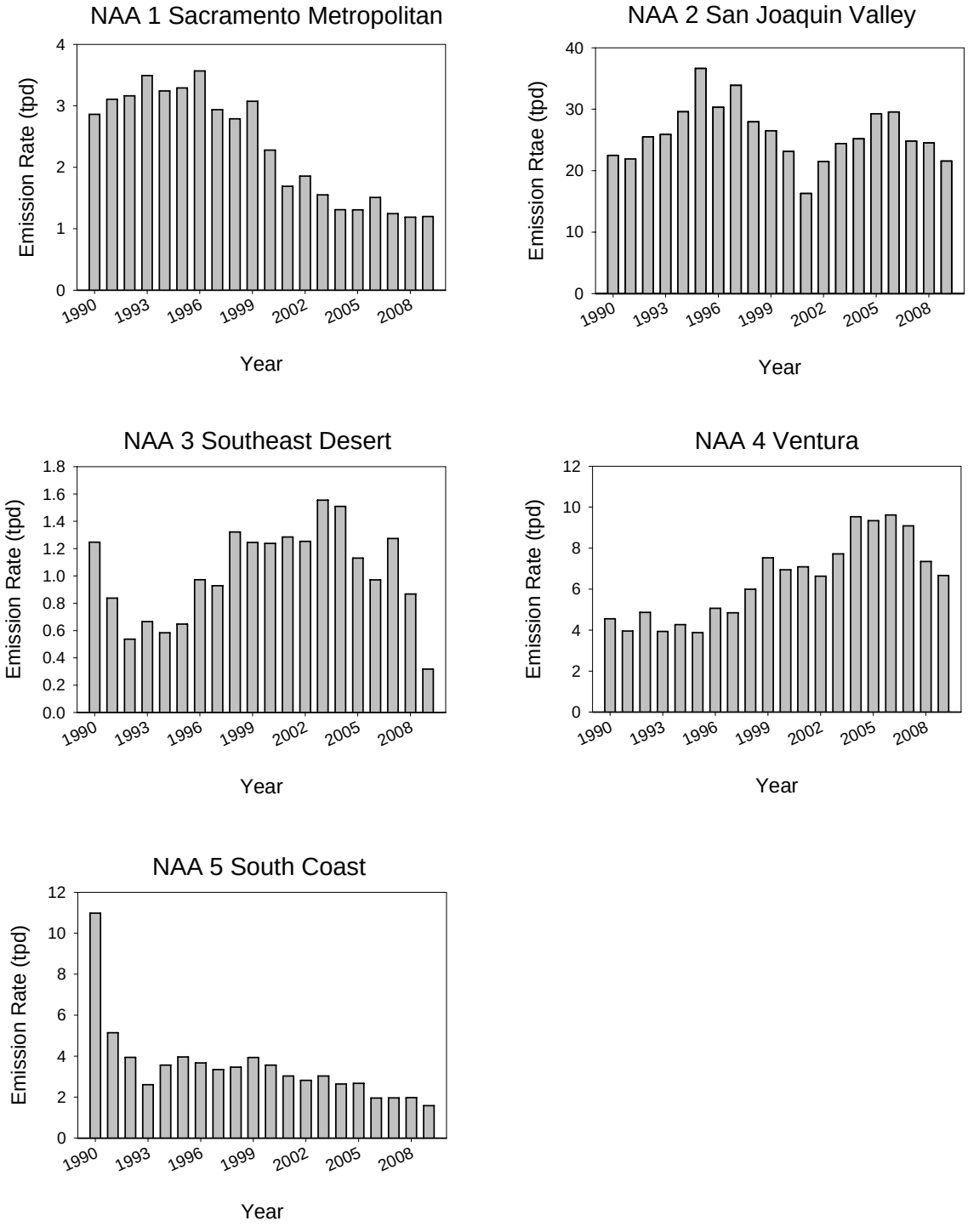


Table 5. May–October (ozone season) ***adjusted*** pesticide VOC emissions and goals.

NAA	1990 Emissions (tons/day)	SIP Goal (tons/day)	2004 Emissions (tons/day)	2005 Emissions (tons/day)	2006 Emissions (tons/day)	2007 Emissions (tons/day)	2008 Emissions (tons/day)	2009 Emissions (tons/day)
1 – Sacramento Metro	2.784	2.2	1.235	1.239	1.354	1.050	1.007	0.960
2 – San Joaquin Valley	20.517	18.1	17.322	20.740	21.305	17.164	15.116	13.773
3 – Southeast Desert	1.153	0.92	0.995	0.740	0.634	0.762	0.285	0.152
4 – Ventura	3.787	3.0 a	3.924	3.617	3.682	3.363	1.735	1.807
5 – South Coast	10.840	8.7	1.922	1.969	1.482	1.487	1.283	1.163

a These numbers reflect the SIP goal for 2012 in Ventura, and do not reflect the phase in of reductions between 2008 and 2012.

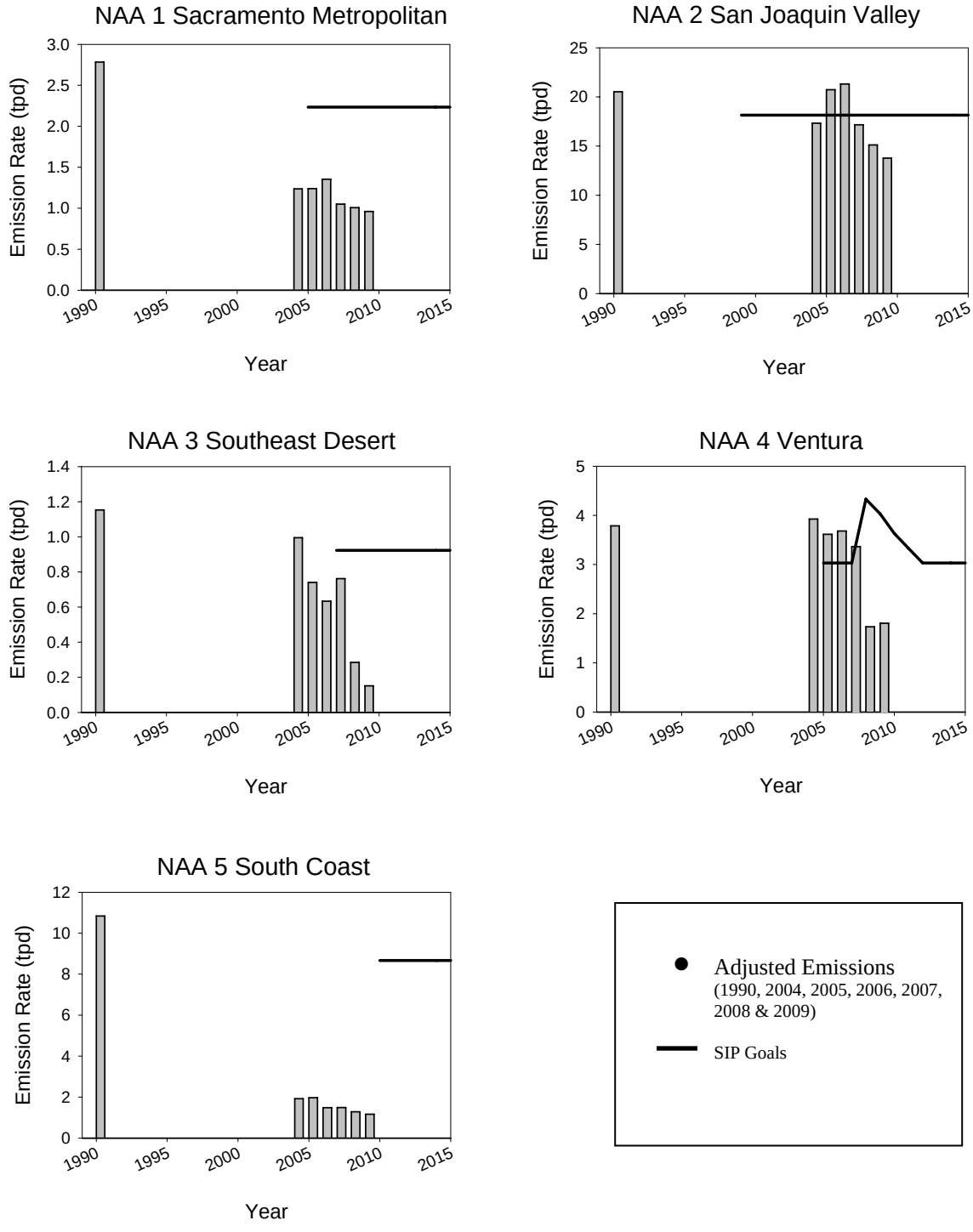
Table 6a. May–October (ozone season) ***adjusted*** fumigant and nonfumigant pesticide VOC emissions.

NAA	1990 Emissions (tons/day)		2004 Emissions (tons/day)		2005 Emissions (tons/day)		2006 Emissions (tons/day)		2007 Emissions (tons/day)		2008 Emissions (tons/day)		2009 Emissions (tons/day)	
1 – Sacramento Metro														
Fumigants	0.384	(14%)	0.111	(9%)	0.085	(7%)	0.162	(12%)	0.189	(18%)	0.064	(6%)	0.123	(13%)
Nonfumigants	2.400	(86%)	1.124	(91%)	1.154	(93%)	1.192	(88%)	0.861	(82%)	0.943	(94%)	0.837	(87%)
2 - San Joaquin Valley														
Fumigants	5.536	(27%)	6.362	(37%)	6.910	(33%)	6.808	(32%)	6.123	(36%)	3.367	(22%)	3.334	(24%)
Nonfumigants	14.981	(73%)	10.960	(63%)	13.831	(67%)	14.498	(68%)	11.041	(64%)	11.749	(78%)	10.439	(76%)
3 - Southeast Desert														
Fumigants	0.840	(73%)	0.762	(77%)	0.474	(64%)	0.413	(65%)	0.575	(75%)	0.119	(42%)	0.065	(43%)
Nonfumigants	0.313	(27%)	0.233	(23%)	0.266	(36%)	0.221	(35%)	0.187	(25%)	0.167	(58%)	0.087	(57%)
4 - Ventura														
Fumigants	3.140	(83%)	3.302	(84%)	3.119	(86%)	3.175	(86%)	2.935	(87%)	1.247	(72%)	1.355	(75%)
Nonfumigants	0.647	(17%)	0.622	(16%)	0.497	(14%)	0.508	(14%)	0.428	(13%)	0.488	(28%)	0.452	(25%)
5 – South Coast														
Fumigants	9.372	(86%)	0.702	(37%)	0.594	(30%)	0.422	(28%)	0.411	(28%)	0.377	(29%)	0.274	(24%)
Nonfumigants	1.468	(14%)	1.220	(63%)	1.375	(70%)	1.060	(72%)	1.075	(72%)	0.906	(71%)	0.889	(76%)

Table 6b. May–October (ozone season) ***unadjusted and adjusted*** fumigant pesticide VOC emissions.

NAA	1990 Emissions (tons/day)	2004 Emissions (tons/day)	2005 Emissions (tons/day)	2006 Emissions (tons/day)	2007 Emissions (tons/day)	2008 Emissions (tons/day)	2009 Emissions (tons/day)
1 – Sacramento Metro							
Unadjusted Fumigants	0.461	0.186	0.151	0.315	0.383	0.245	0.361
Adjusted Fumigants	0.384	0.111	0.085	0.162	0.189	0.064	0.123
2 - San Joaquin Valley							
Unadjusted Fumigants	7.491	14.213	15.400	15.034	13.750	12.762	11.096
Adjusted Fumigants	5.536	6.362	6.910	6.808	6.123	3.367	3.334
3 - Southeast Desert							
Unadjusted Fumigants	0.933	1.275	0.863	0.750	1.086	0.701	0.232
Adjusted Fumigants	0.840	0.762	0.474	0.413	0.575	0.119	0.065
4 - Ventura							
Unadjusted Fumigants	3.909	8.916	8.841	9.113	8.658	6.855	6.208
Adjusted Fumigants	3.140	3.302	3.119	3.175	2.935	1.247	1.355
5 – South Coast							
Unadjusted Fumigants	9.514	1.418	1.301	0.898	0.883	1.071	0.690
Adjusted Fumigants	9.372	0.702	0.594	0.422	0.411	0.377	0.274

Figure 3. Annual ozone season pesticide VOC emissions by NAA. These figures show adjusted emissions and SIP goals (reductions from 1990 emissions).



Sacramento Metro Area - NAA 1

The Sacramento Metro NAA (NAA 1) 2009 adjusted emissions are below those of the five previous years. Adjusted emissions in 2004 were 1.235 tpd, and these increased to 1.354 tpd in 2006, then decreased to 1.007 tpd in 2008. In 2009, 87 percent of emissions were attributable to nonfumigants. Fumigant emissions increased from seven percent (0.085 tpd) in 2005 to 18 percent in 2007 (0.189 tpd), were reduced to 7 percent (0.064 tpd) in 2008 but increased again in 2009 to 0.123 tpd (Tables 6a, 6b, Figure 3, 4). An increase in unadjusted fumigant emissions in 2009 resulted in an increase of total unadjusted emissions for this NAA. Total adjusted VOC emissions (0.960 tpd) continue to remain well below the SIP goal of 2.2 tpd.

Emissions from chlorpyrifos use decreased from 0.114 tpd in 2006 to 0.116 tpd in 2007, increased to 0.121 tpd in 2008 and decreased to 0.080 tpd in 2009, the latter accounting for over eight percent of the total emissions in 2009 (Table 7). Emissions from the use of 1,3-dichloropropene doubled from 0.031 tpd in 2008 to 0.063 tpd in 2009, accounting for 6.58 percent of emissions, and emissions from methyl bromide use increased from 0.020 tpd in 2008 to 0.029 tpd in 2009. Emissions derived from glyphosate (isopropylamine salt) use have increased every year from 0.017 tpd in 2005 to 0.075 tpd in 2009. (Tables 7, A3-1a to A3-1d, Figure 5).

In 2009 emissions from rice and wine grapes both increased from 2008 (0.161 tpd and 0.041 tpd) to 0.194 tpd and 0.179 tpd, respectively. These two commodities/sites accounted for over 30 percent of the total emissions, with processing tomatoes (0.129 tpd) and soil preplant fumigation (0.129 tpd) accounting for an additional 20 percent.. Emissions from almonds fell sharply from 0.120 tpd in 2008 to 0.032 tpd in 2009. Detailed analysis of the data indicates that the number of acres treated in 2009 with applications of glyphosate (isopropylamine salt) to processing tomatoes were nine times higher than in 2008 and doubled on several other commodities such as grapes, corn, prunes and alfalfa. The decrease in emissions from chlorpyrifos can be attributed to the decline in the number of acres of walnuts and almonds that were treated.(Tables 8, A2-1e to A2-1h, Figure 6).

Since this NAA has complied with the SIP goal for several years, most provisions of the 2008 fumigant regulations do not apply. Therefore, the fumigant regulations had little or no impact on emissions in this NAA.

Using the ARB emission inventory classification, emissions from structural applications of methyl bromide remained steady at less than 0.001 tpd since 2006. Agricultural applications increased from 0.037 tpd in 2006 to 0.062 tpd in 2007, but have steadily decreased to 0.041 tpd in 2008 and 0.035 tpd in 2009. Non-methyl bromide emissions from structural applications continue to decline from approximately 0.218 tpd in 2006 and 2006 to 0.066 tpd in 2007, 0.062 tpd in 2008 and 0.053 tpd in 2009 (Tables 9, A2-1i - A2-1l).

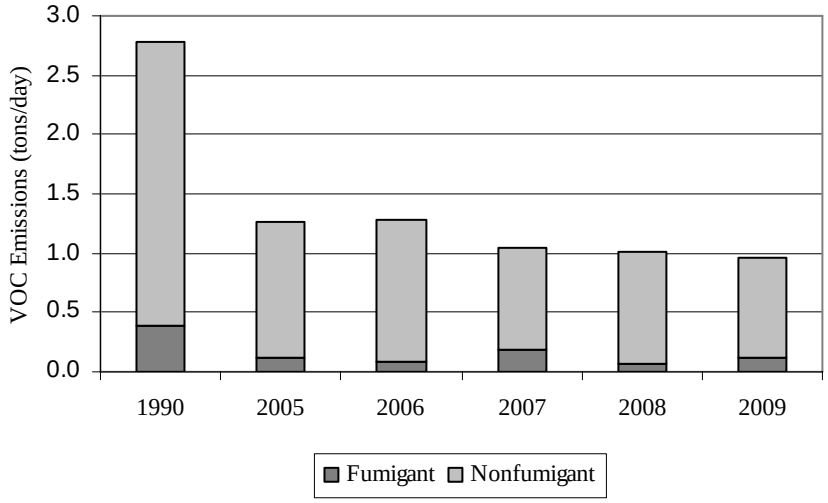


Figure 4. Pesticide VOC emissions for the Sacramento Metro NAA, May–October. Emissions for each year are divided into fumigants and nonfumigants. Fumigant emissions are *adjusted* to account for fumigation method.

Table 7. Top ten primary active ingredients contributing to **2009** May-October ozone season *adjusted* VOC emissions in NAA 1, the Sacramento Metro Area.

Primary AI	**Total Product Adjusted Emissions (tons/day)**	**Percent of All NAA 1 May – Oct 2009 Adjusted Emissions**
CHLORPYRIFOS	0.080	8.35
GLYPHOSATE, ISOPROPYLAMINE SALT	0.075	7.79
1,3-DICHLOROPROPENE	0.063	6.58
THIOBENCARB	0.052	5.46
PROPANIL	0.052	5.39
BIFENTHRIN	0.049	5.06
TRIFLURALIN	0.034	3.54
OXYFLUORFEN	0.032	3.35
METHYL BROMIDE	0.029	3.01
ETHALFLURALIN	0.023	2.40

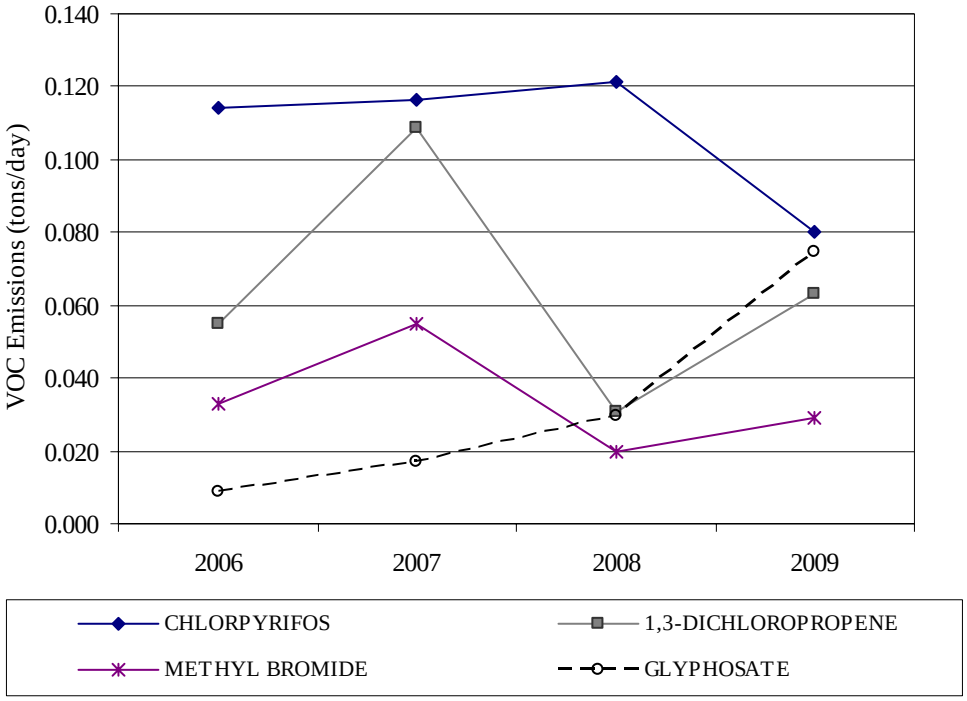


Figure 5. Changes in adjusted emissions of selected AIs in the Sacramento Metro NAA from 2006 to 2009.

Table 8. Top ten pesticide application sites contributing to **2009** May-October ozone season *unadjusted* VOC emissions in NAA 1.

Application Site	**Emissions (tons/day)**	**Percent of all NAA 1 May – Oct 2009 emissions**
RICE	0.194	16.19
GRAPES, WINE	0.179	14.94
TOMATOES, FOR PROCESSING/CANNING	0.129	10.77
SOIL APPLICATION, PREPLANT-OUTDOOR	0.129	10.77
WALNUT	0.116	9.72
STRUCTURAL PEST CONTROL	0.053	4.40
RIGHTS OF WAY	0.050	4.16
LANDSCAPE MAINTENANCE	0.041	3.44
ORNAMENTAL TURF	0.033	2.80
ALMOND	0.032	2.64

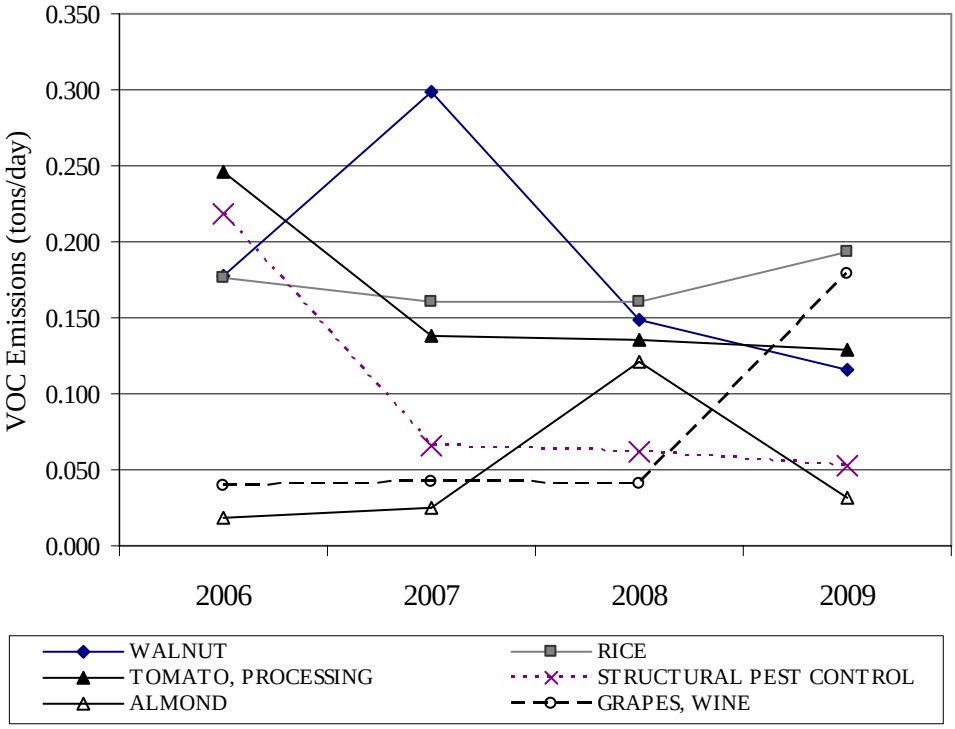


Figure 6. Changes in unadjusted emissions from selected commodities/sites in the Sacramento Metro NAA from 2006 to 2009.

Table 9. *Unadjusted* **2009** May–October VOC emissions in NAA1 by ARB emission inventory classification (tons per day, tpd).

NAA 1 - 2009	**Agricultural Applications**	**Structural Applications**
METHYL BROMIDE EMISSIONS	0.035	0.000
NON-METHYL BROMIDE EMISSIONS	1.106	0.053

San Joaquin Valley - NAA 2

Adjusted emissions in 2009 decreased from 15.166 tpd in 2008 to 13.773 tpd in 2009. As with the 2008 emissions, the 2009 emissions are below the SIP goal of 18.1 tpd (Tables 6a, 6b, Figure 3, 7).

Nonfumigants continue to account for the largest portion of adjusted emissions, with more than 76 percent of the total in 2009 (10.439 tpd). The top emission contributor for 2006 through 2009 was the nonfumigant, chlorpyrifos, which accounted for 3.990 tpd in 2006, 2.263 tpd in 2007, 2.220 tpd in 2008 and 1.325 tpd in 2009. (Tables 10, A3-2a to A3-2d, Figure 7). In 2009 almost 30 percent of emissions from chlorpyrifos came from use on almonds, with 18 percent from emissions on oranges and 17 percent from walnut. Fumigant use on carrots, in the form of metam-sodium, 1,3-dichloropropene and potassium N-methyldithiocarbamate, accounted for more than 99 percent of emissions from this commodity (Tables 11, A2- 2e to A2-2h, Figure 9). Total adjusted emissions from metam-sodium increased from 0.711 tpd in 2008 to 1.120 tpd in 2009 due to increased use on a variety of crops including melons, sweet potatoes and broccoli. Products containing fenpyroximate, an insecticide/miticide used primarily on almonds and grapes, declined by over 25 percent from 0.402 tpd in 2008 to 0.293 tpd in 2009. (Figure 8).

While VOC emissions from chlorpyrifos products remain the largest contributor, emissions declined by two-thirds between 2006 and 2009. The decrease is due to both a decrease in use, and a shift to a product with a lower EP. In 2005, DPR initiated a reevaluation (a registrant data request) for plans to reformulate certain products and lower the EPs. In July 2008, DPR registered a new chlorpyrifos product, Lorsban Advanced, with an EP of 18.45. Most other liquid chlorpyrifos products have EPs of approximately 50 percent. In 2009, Lorsban Advanced had the highest use of all chlorpyrifos products in this NAA, with corresponding decreases in the higher-EP chlorpyrifos products. This change to a lower-EP product contributed to the decrease in VOC emissions from chlorpyrifos products.

The 2008 fumigant regulations continued to maintain lower emissions from fumigants in 2009. Adjusted fumigant emissions decreased by 0.033 tpd between 2008 and 2009. Use (unadjusted emissions) of fumigants decreased by thirteen percent (Table 6b). Some of the decrease in emissions may also be due to more accurate estimates of the 2008 MUFs based on pesticide use reports instead of surveys or other surrogate data used for earlier years. However, the majority of the decrease in fumigant emissions was probably due the use of low-emission fumigation methods required by the 2008 regulations.

Using the ARB emission inventory classification, emissions from structural applications of methyl bromide showed a slight decrease in 2009 going from 0.014 tpd in 2008 to 0.012 tpd in 2009. Agricultural applications decreased by almost fifty percent from 1.737 tpd in 2008 to 0.908 tpd in 2009. Non-methyl bromide emissions from agricultural applications decreased 1.807 tpd in 2009 to 20.158 tpd , and structural applications decreased from 0.323 tpd in 2008 to 0.189 tpd in 2009. (Tables 12, A2-2i to A2-2l).

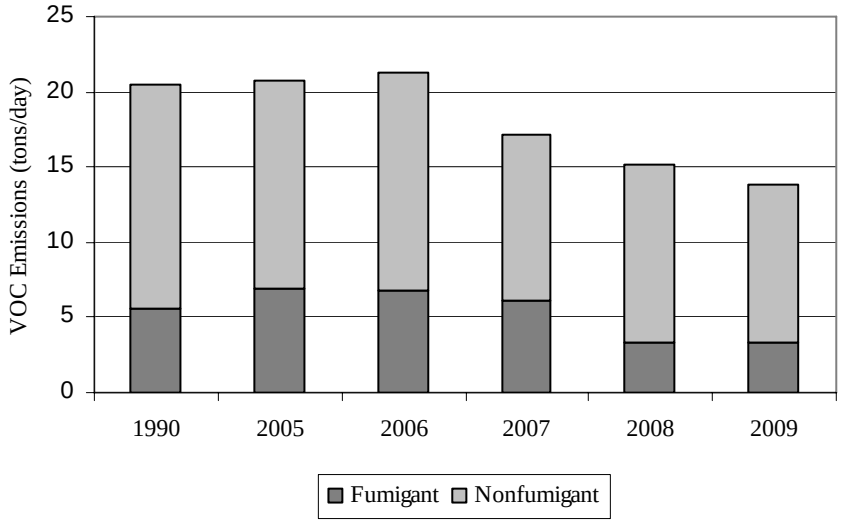


Figure 7. Pesticide VOC emissions for the San Joaquin Valley NAA, May–October. Emissions for each year are divided into fumigants and nonfumigants. Fumigant emissions are *adjusted* to account for fumigation method.

Table 10. Top ten primary active ingredients contributing to **2009** May-October ozone season *adjusted* VOC emissions in NAA 2, the San Joaquin Valley.

Primary AI	**Total Product Adjusted Emissions (tons/day)**	**Percent of All NAA 2 May – Oct 2009 Adjusted Emissions**
CHLORPYRIFOS	1.325	9.62
1,3-DICHLOROPROPENE	1.175	8.53
GLYPHOSATE, ISOPROPYLAMINE SALT	1.174	8.52
METAM-SODIUM	1.120	8.13
OXYFLUORFEN	0.740	5.37
GIBBERELLINS	0.685	4.97
ABAMECTIN	0.635	4.61
METHYL BROMIDE	0.548	3.98
DIMETHOATE	0.485	3.52
GLUFOSINATE-AMMONIUM	0.398	2.89

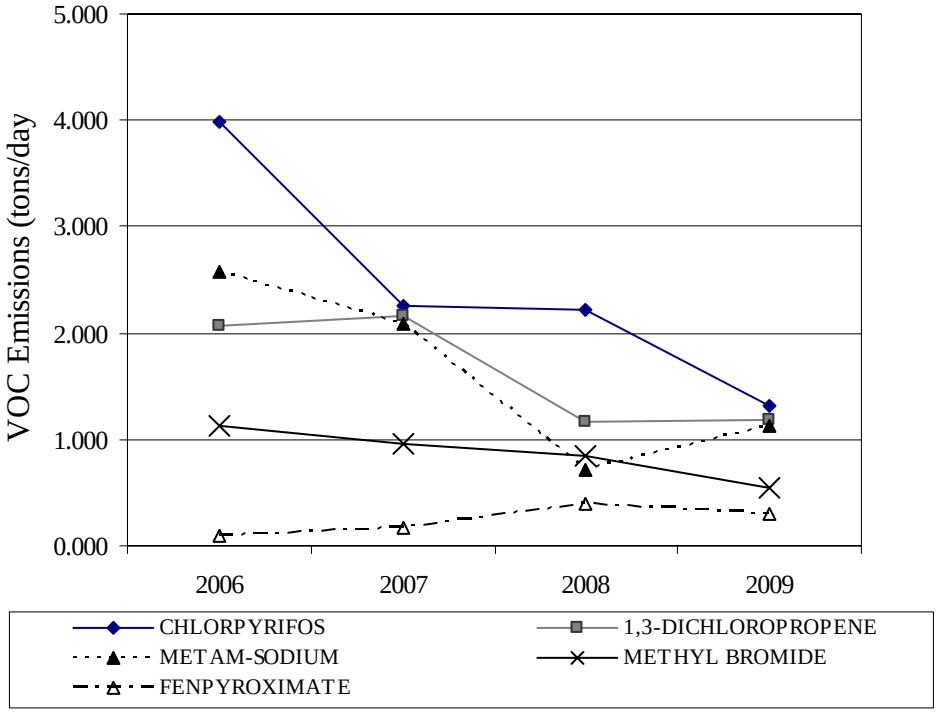


Figure 8. Changes in adjusted emissions of selected AIs in the San Joaquin Valley NAA from 2006 to 2009.

Table 11. Top ten pesticide application sites contributing to **2009** May-October ozone season *unadjusted* VOC emissions in NAA 2.

Application Site	**Emissions (tons/day)**	**Percent of all NAA 2 May – Oct 2009 emissions**
CARROTS	3.534	16.41
ALMOND	3.207	14.89
ORANGE	1.319	6.13
GRAPES	1.129	5.24
N-OUTDR CONTAINER/FLD GRWN PLANTS	0.900	4.18
TOMATOES, FOR PROCESSING/CANNING	0.879	4.08
SOIL APPLICATION, PREPLANT-OUTDOOR	0.815	3.78
POTATO	0.774	3.60
COTTON	0.769	3.57
WALNUT	0.766	3.56

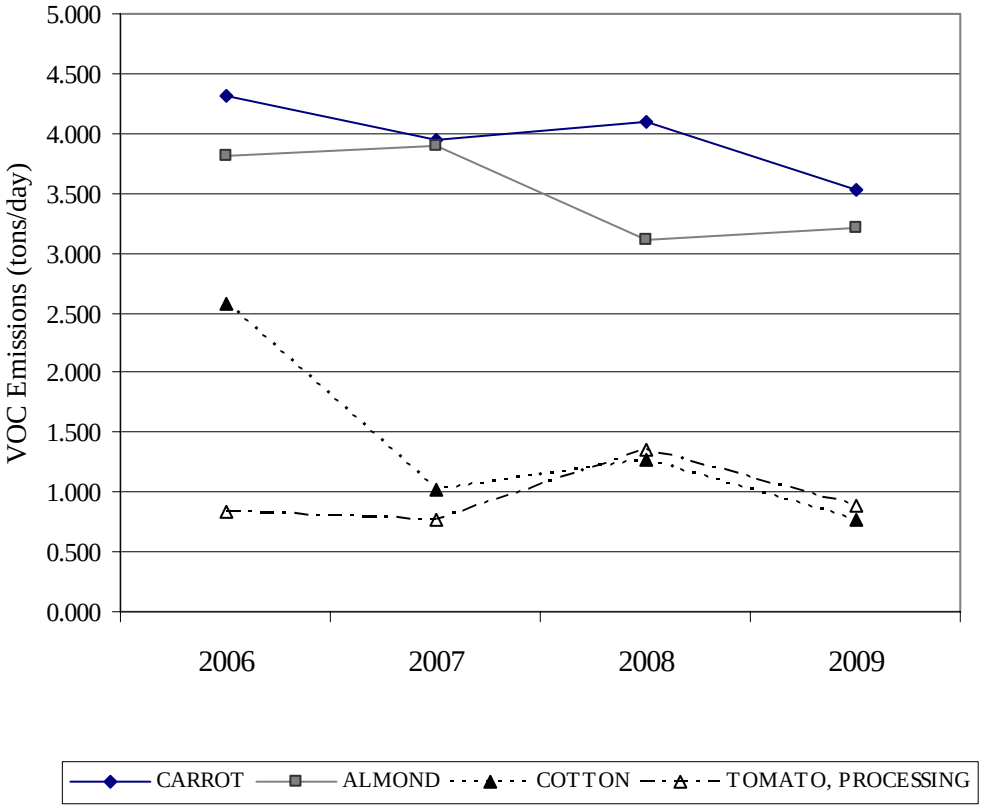


Figure 9. Changes in unadjusted emissions from selected commodities/sites in the San Joaquin Valley NAA from 2006 to 2009.

Table 12. *Unadjusted* **2009** May–October VOC emissions in NAA 2 by ARB emission inventory classification (tons per day, tpd).

NAA 2 - 2009	**Agricultural Applications**	**Structural Applications**
METHYL BROMIDE EMISSIONS	0.908	0.012
NON-METHYL BROMIDE EMISSIONS	20.158	0.189

Southeast Desert - NAA 3

In 2009 total adjusted emissions for the Southeast Desert continued to decline from 0.285 tpd in 2008 to 0.152 tpd in 2009. The 2009 rate is well below the SIP goal of 0.92 tpd, (Tables 6a, 6b, Figure 3, 10).

Fumigants account for 43 percent of the emissions in this NAA. Fumigant emissions increased from 18.84 percent in 2008, but are still below the average 46 percent of adjusted emissions over the previous four years. Metam-sodium continues to be the primary contributor, accounting for 25.02 percent of emissions in 2009 (0.038 tpd), but its use declined sharply from 2008 (0.054 tpd). Emissions from the use of dazomet increased from less than 0.002 tpd in 2008 to 0.016 tpd in 2009, almost a ten-fold increase which offset the decreases in emissions from methyl bromide (0.014 tpd in 2008 to 0.009 tpd in 2009) and 1,3- dichloropropene (0.032 tpd in 2008 to 0.001 tpd in 2009). (Tables 13, A3-3a to A3-3d, Figure 11). Unadjusted emissions from most commodities during the ozone season decreased in 2009. The use of dazomet on rights-of-way correlates to the increase in emissions from this fumigant (Tables 14, A2- 3d, A2-3e, A2-3f, Figure 12).

The 2008 fumigant regulations caused a decrease in emissions in Southeast Desert NAA. Fumigant emissions decreased by 45 percent between 2008 and 2009. Fumigants accounted for two-thirds to three-quarters of the pesticide emissions in years prior to 2008 for this NAA, but accounted for less than half the emissions in 2009 (Figure 10). Again, some of the decrease may be due to more accurate estimates of the 2008 MUFs based on pesticide use reports instead of surveys or other surrogate data used for earlier years. However, the majority of the decrease in fumigant emissions was probably due the use of low-emission fumigation methods required by the 2008 regulations.

Using the ARB emission inventory classification, emissions from structural applications of methyl bromide have been less than 0.001 tpd since 2005. Agricultural applications peaked at 0.286 tpd in 2007, and have since decreased to 0.009 tpd in 2009. These findings are consistent with the trend found for the decline in use of methyl bromide on turf/sod. Non-methyl bromide emissions from agricultural applications decreased by 65 percent from 0.792 tpd in 2008 to 0.273 tpd in 2009. Structural non-methyl bromide emissions also declined falling from 0.046 tpd in 2008 to 0.037 tpd in 2009 (Tables 15, A2-3i to A2-3l).

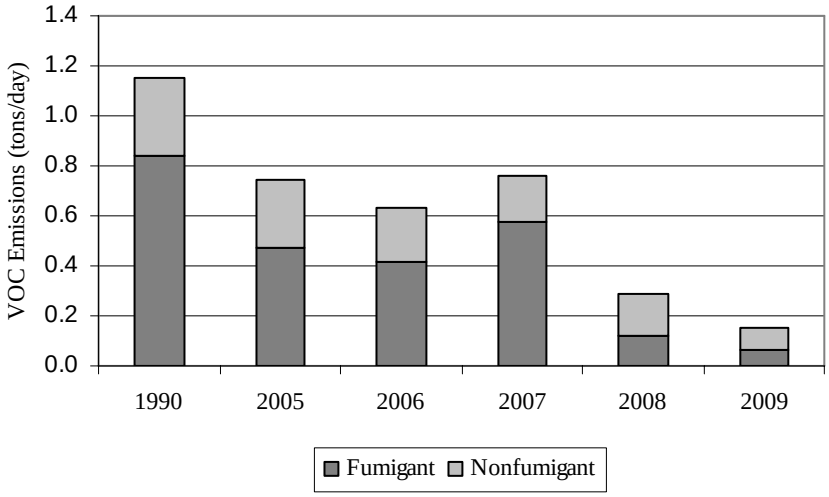


Figure 10. Pesticide VOC emissions for the Southeast Desert NAA, May–October. Emissions for each year are divided into fumigants and nonfumigants. Fumigant emissions are *adjusted* to account for fumigation method.

Table 13. Top ten primary active ingredients contributing to **2009** May-October ozone season *adjusted* VOC emissions in NAA 3, the Southeast Desert

Primary AI	**Total Product Adjusted Emissions (tons/day)**	**Percent of All NAA 3 May – Oct 2009 Adjusted Emissions**
METAM-SODIUM	0.038	25.02
DAZOMET	0.016	10.78
METHYL BROMIDE	0.009	5.93
PERMETHRIN	0.008	5.52
SULFUR	0.007	4.68
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE	0.004	2.48
GLYPHOSATE, ISOPROPYLAMINE SALT	0.003	2.17
CYPERMETHRIN	0.003	2.02
CYFLUTHRIN	0.003	1.87
LIMONENE	0.003	1.81

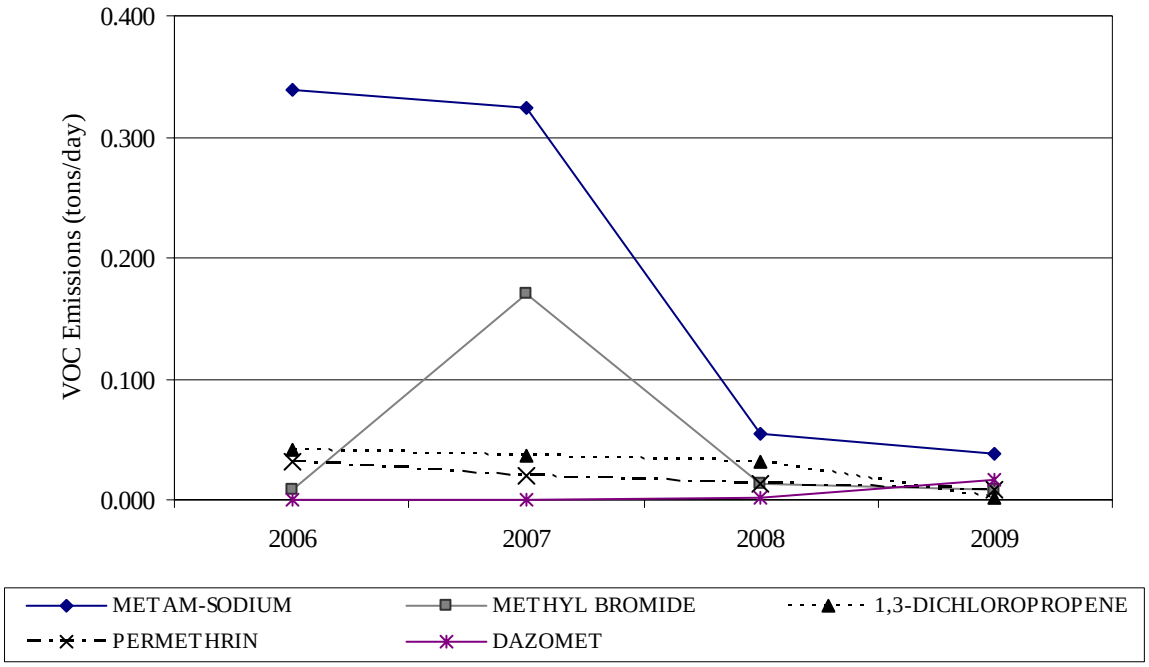


Figure 11. Changes in adjusted emissions of selected AIs in the Southeast Desert NAA from 2006 to 2009.

Table 14. Top ten pesticide application sites contributing to **2009** May-October ozone season *unadjusted* VOC emissions in NAA 3.

Application Site	**Emissions (tons/day)**	**Percent of all NAA 3 May – Oct 2009 emissions**
CARROTS	0.120	37.56
PEPPERS	0.035	11.03
STRUCTURAL PEST CONTROL	0.034	10.82
WATERMELONS	0.024	7.50
RIGHTS OF WAY	0.022	6.88
UNCULTIVATED AGRICULTURAL AREAS *	0.016	5.00
LANDSCAPE MAINTENANCE	0.013	4.10
TOMATO	0.011	3.54
BERMUDAGRASS	0.007	2.30
ONION	0.006	1.92

* Treatment of an area prior to determining which crop will be planted.

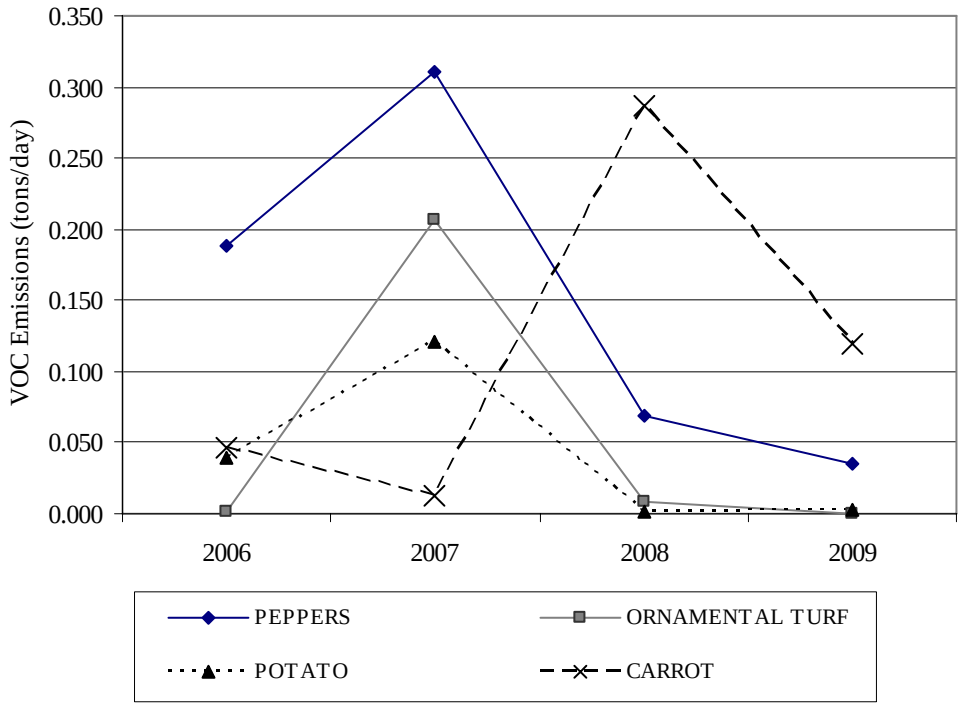


Figure 12. Changes in unadjusted emissions from selected commodities/sites in the Southeast Desert NAA from 2006 to 2009.

Table 15. *Unadjusted* **2009** May–October VOC emissions in NAA 3 by ARB emission inventory classification (tons per day, tpd).

NAA 3 - 2009	**Agricultural Applications**	**Structural Applications**
METHYL BROMIDE EMISSIONS	0.009	0.000
NON-METHYL BROMIDE EMISSIONS	0.273	0.037

Ventura - NAA 4

Ozone season adjusted emissions in the Ventura NAA (NAA 4) increased by 0.072 tpd from 1.735 tpd in 2008 to 1.807 tpd in 2009 (7 percent). Emissions continued to meet the SIP goal for 2012 (3.0 tpd). (Tables 6a, 6b, Figure 3, 13).

As in previous years, fumigants dominate the pesticide inventory for this NAA. In 2009 fumigants accounted for 75 percent of the emissions, which, as in 2008, continues to be at least 10 percent less than in 2004 to 2007. The most heavily used fumigants in NAA 4 in 2009 were chloropicrin, methyl bromide, and 1,3-dichloropropene, which together accounted for over 72 percent of emissions (Tables 16, A3-4a to A3-4d, Figure 14). Emissions from methyl bromide and chloropicrin increased in 2009, while emissions from 1,3-dichloropropene continued to decline. In 2009 over 98 percent of chloropicrin emissions and over 93 percent of methyl bromide emissions came from applications to strawberries or "soil application/preplant", It should be noted that the commodity/site description "soil fumigation/preplant" refers to applications that are made before the grower has made a decision about which commodity to plant. These sites may be re-identified at a later time as any number of commodities including strawberries, peppers, raspberries, herbs, etc., but it is beyond the scope of this inventory to be able to identify which commodities these are. Other major commodities/sites in 2008 include lemons, tomatoes, and raspberries (Tables 17, A2-4e to A2-4h, Figure 15).

In the Ventura NAA fumigant emissions increased by almost 8 percent between 2008 and 2009, while use (unadjusted emissions) of fumigants actually decreased by about 9 percent (Table 6b). The increase in emissions was due to increased use of methyl bromide (Figure 14). Methyl bromide has higher AMAFs in comparison to the other fumigants, accounting for the increase in fumigant emissions, but a decrease in fumigant use.

Using the ARB emission inventory classification, emissions from structural applications were below 0.001 tpd in 2009. Emissions from agricultural applications of methyl bromide increased from 0.577 tpd in 2008 to 1.129 tpd in 2009. These findings are consistent with the trend found for the use of methyl bromide to strawberries and soil fumigation/preplant. Non-methyl bromide emissions from agricultural applications decreased from 6.395 tpd in 2008 to 5.030 tpd in 2009, as reflected by the overall decreased use of nonfumigant products from 28 percent in 2008 to 25 percent in 2009. Structural non-methyl bromide emissions were less than 0.001tpd (Tables 18, A2-4i to A2-4l).

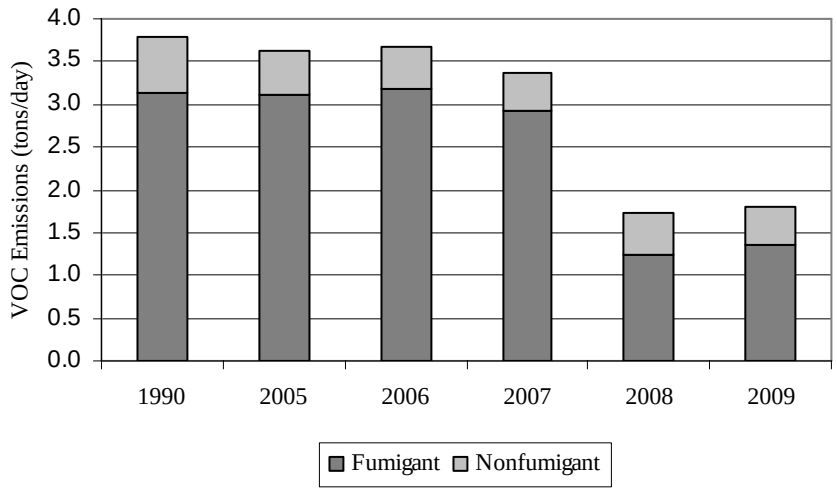


Figure 13. Pesticide VOC emissions for the Ventura NAA, May–October. Emissions for each year are divided into fumigants and nonfumigants. Fumigant emissions are *adjusted* to account for fumigation method.

Table 16. Top ten primary active ingredients contributing to **2009** May-October ozone season *adjusted* VOC emissions in NAA 4, Ventura.

Primary AI	**Total Product Adjusted Emissions (tons/day)**	**Percent of All NAA 4 May – Oct 2009 Adjusted Emissions**
CHLOROPICRIN	0.587	32.46
METHYL BROMIDE	0.544	30.11
1,3-DICHLOROPROPENE	0.183	10.14
CHLORPYRIFOS	0.067	3.69
MINERAL OIL	0.041	2.28
METAM-SODIUM	0.039	2.17
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	0.035	1.91
ABAMECTIN	0.031	1.72
OXAMYL	0.028	1.55
AZADIRACHTIN	0.022	1.22

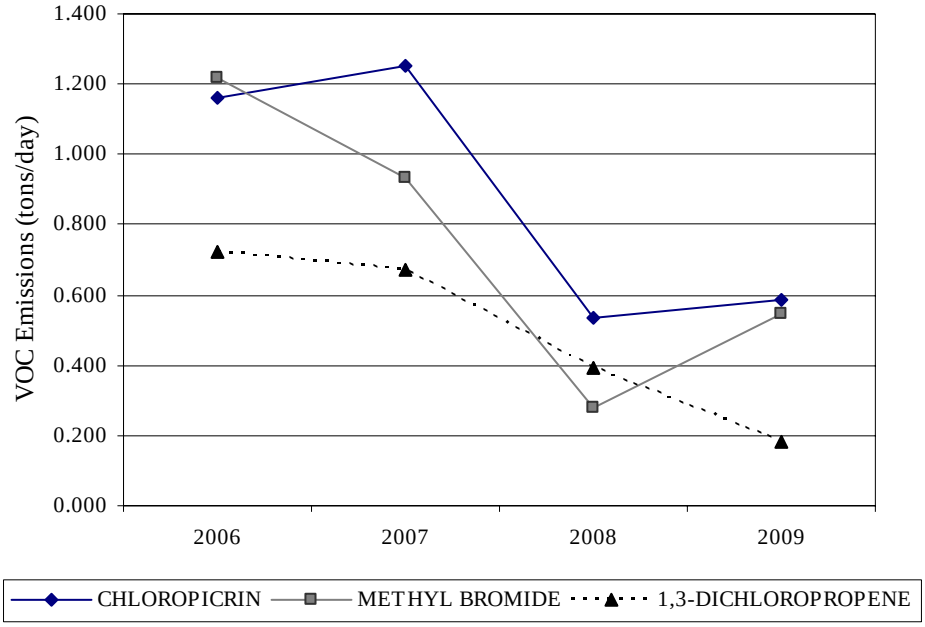


Figure 14. Changes in adjusted emissions of selected AIs in the Ventura NAA from 2006 to 2009.

Table 17. Top ten pesticide application sites contributing to **2009** May-October ozone season *unadjusted* VOC emissions in NAA 4.

Application Site	**Emissions (tons/day)**	**Percent of all NAA 4 May – Oct 2009 emissions**
STRAWBERRY	4.331	65.04
SOIL APPLICATION, PREPLANT-OUTDOOR	1.758	26.40
LEMON	0.172	2.58
TOMATO	0.099	1.48
RASPBERRY	0.089	1.34
AVOCADO	0.029	0.44
ORNAMENTAL TURF	0.028	0.42
N-OUTDR GRWN CUT FLWRS OR GREENS	0.025	0.38
CELERY	0.022	0.33
N-GRNHS GRWN CUT FLWRS OR GREENS	0.015	0.23

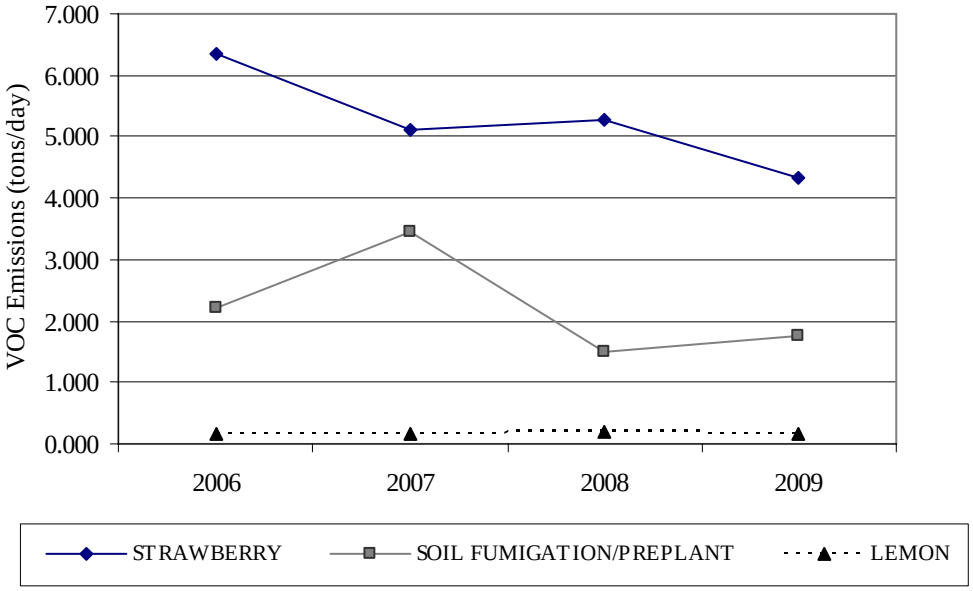


Figure 15. Changes in unadjusted emissions from selected commodities/sites in the Ventura NAA from 2006 to 2009.

Table 18. *Unadjusted* **2009** May–October VOC emissions in NAA 4 by ARB emission inventory classification (tons per day, tpd).

NAA 4 - 2009	**Agricultural Applications**	**Structural Applications**
METHYL BROMIDE EMISSIONS	1.129	0.000
NON-METHYL BROMIDE EMISSIONS	5.030	0.000

South Coast - NAA 5

In the South Coast NAA, adjusted emissions continued their steady decline from 1.969 tpd in 2005 to 1.163 tpd in 2009, well below the SIP goal of 8.7 tpd. In 2009, emissions from nonfumigants accounted for more than 75 percent of the total for the South Coast NAA (Tables 6a, 6b, Figure 3, 16).

The fumigants methyl bromide, chloropicrin, and dazomet, contributed to 21.15 percent of 2009 adjusted emissions. Emissions from methyl bromide and chloropicrin decreased from 2008, but dazomet emissions increased from 0.003 tpd in 2008 to 0.037 tpd in 2009. Permethrin, an insecticide used in structural pest control, landscape maintenance and on a wide range of nursery commodities, was the largest nonfumigant contributor to the adjusted inventory accounting for 16.98 percent (0.197 tpd) of emissions, up from 0.181 tpd in 2008 (Tables 19, A3-5a to A3-5d, Figure 17). Limonene, an oil extracted from citrus that is used almost exclusively in structural pest control, increased in emissions in 2009 (0.070 tpd), nearly a double those from 0.0.037 tpd in 2008. Over seventy-five percent of emissions in NAA 5 came from fumigant and nonfumigant use in structural pest control and strawberries, with landscape maintenance accounting for another 9 percent (0.143 tpd). Emissions from dazomet have increased steadily from 0.002 tpd in 2006 to 0.037 tpd in 2009, primarily from use of this fumigant on rights-of-way (Tables 20, A2-5e to A2-5h, Figure 18).

Since this NAA has complied with the SIP goal for several years, most provisions of the 2008 fumigant regulations do not apply. Therefore, the fumigant regulations had little or no impact on emissions in this NAA.

Using the ARB emission inventory classification, emissions from structural applications of methyl bromide remained at 0.002 tpd in 2009. Agricultural applications decreased from 0.522 tpd in 2008 to 0.225 tpd in 2009, and non-methyl bromide emissions from agricultural applications also decreased from 0.705 tpd in 2008 to 0.640 tpd in 2009. Structural non-methyl bromide emissions increased from 0.637 tpd in 2008 to 0.640 tpd in 2009 (Tables 21, A2-5i to A2-5l).

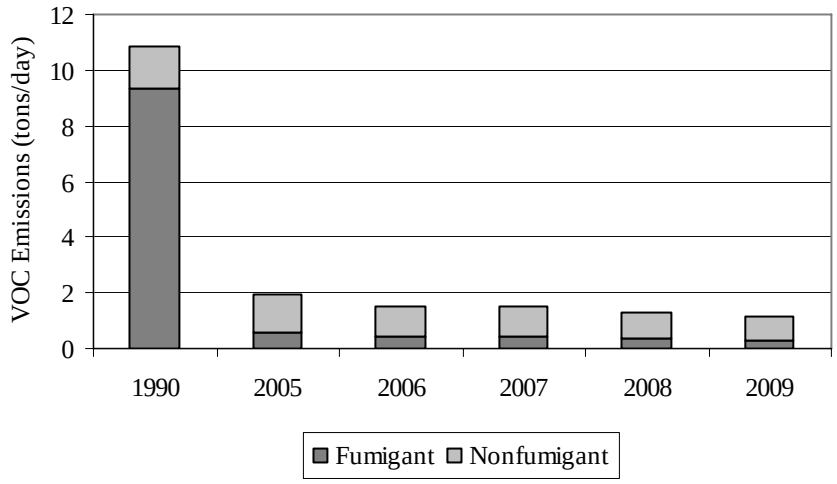


Figure 16. Pesticide VOC emissions for the South Coast NAA, May–October. Emissions for each year are divided into fumigants and nonfumigants. Fumigant emissions are *adjusted* to account for fumigation method.

Table 19. Top ten primary active ingredients contributing to **2009** May-October ozone season *adjusted* VOC emissions in NAA 5, South Coast.

Primary AI	**Total Product Adjusted Emissions (tons/day)**	**Percent of All NAA 5 May – Oct 2009 Adjusted Emissions**
PERMETHRIN	0.197	16.98
METHYL BROMIDE	0.151	13.02
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE	0.079	6.82
LIMONENE	0.070	6.03
CYFLUTHRIN	0.065	5.60
CHLOROPICRIN	0.058	4.99
DAZOMET	0.037	3.20
PIPERONYL BUTOXIDE	0.036	3.07
DISODIUM OCTABORATE TETRAHYDRATE	0.034	2.96
BIFENTHRIN	0.034	2.93

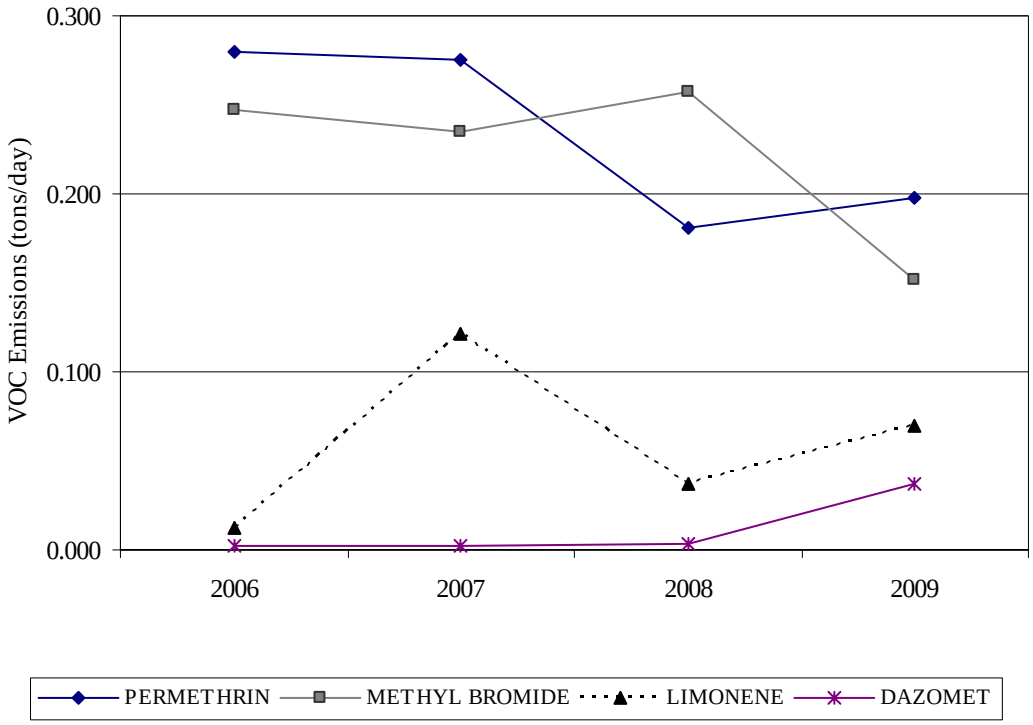


Figure 17. Changes in adjusted emissions of selected AIs in the South Coast NAA from 2006 to 2009.

Table 20. Top ten pesticide application sites contributing to **2009** May-October ozone season *unadjusted* VOC emissions in NAA 5.

Application Site	**Emissions (tons/day)**	**Percent of all NAA 5 May – Oct 2009 emissions**
STRUCTURAL PEST CONTROL	0.637	40.35
STRAWBERRY	0.561	35.53
LANDSCAPE MAINTENANCE	0.143	9.08
RIGHTS OF WAY	0.049	3.12
FUMIGATION, OTHER	0.047	2.99
N-OUTDR CONTAINER/FLD GRWN PLANTS	0.029	1.85
COMMODITY FUMIGATION	0.022	1.40
ORANGE	0.013	0.85
PEPPERS,FRUITING	0.011	0.72
CABBAGE	0.010	0.66

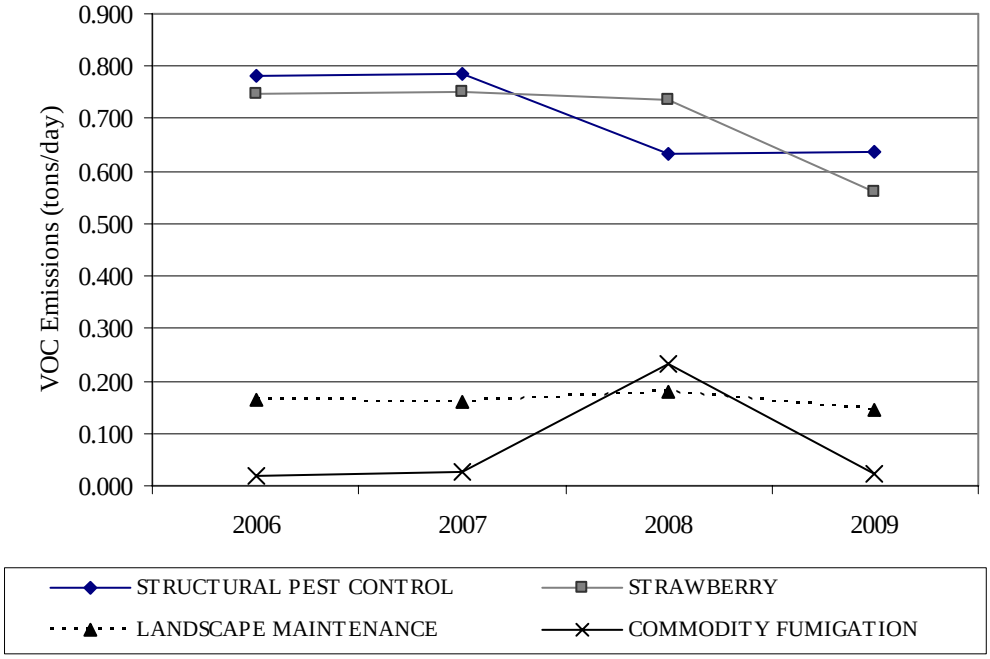


Figure 18. Changes in unadjusted emissions from selected commodities/sites in the South Coast NAA from 2006 to 2009.

Table 21. *Unadjusted* **2009** May–October VOC emissions in NAA 5 by ARB emission inventory classification (tons per day, tpd).

NAA 5 - 2009	**Agricultural Applications**	**Structural Applications**
METHYL BROMIDE EMISSIONS	0.225	0.002
NON-METHYL BROMIDE EMISSIONS	0.640	0.640

PROJECTION OF 2011 VOC EMISSIONS AND FUMIGANT LIMITS

DPR is required to limit VOC emissions of volatile organic compounds from pesticides in Ventura County during each annual May–October ozone season, and for the other NAAs if pesticide VOC emissions exceed 80% of the benchmarks specified in 3 CCR section 6452.2. As shown in Table 22, pesticide VOC emissions are less than 80% of the benchmarks that trigger fumigant limits in the other NAAs.

Table 22. Fumigant limit triggers and 2009 pesticide VOC emissions.

NAA	Benchmark and SIP Goal (tons/day)	Fumigant Limit Trigger (80% of Benchmark) (tons/day)	2009 Emissions (tons/day)
1 – Sacramento Metro	2.2	1.8	0.960
2 – San Joaquin Valley	18.1	14.5	13.773
3 – Southeast Desert	0.92	0.74	0.152
5 – South Coast	8.7	7.0	1.163

The maximum allowable annual ozone season pesticide VOC emissions (VOC_{MAX}) are defined in regulation 3 CCR, section 6452.2. DPR limits emissions by restricting use of the highest VOC contributing pesticides. These are the fumigants methyl bromide, 1,3-dichloropropene, chloropicrin, metam-sodium, metam-potassium, dazomet and sodium tetrathiocarbonate. DPR calculates the maximum allowable fumigant emissions (VOC_{FUM}) as the difference between VOC_{MAX} and projected nonfumigant pesticide emissions (VOC_{NF}) during the ozone season.

[1] $$VOC_{FUM} = VOC_{MAX} - VOC_{NF}$$

The allowable fumigant use is then calculated from VOC_{FUM} using the most recent method use fractions and application method adjustment factors as originally described in Barry et al. (2007). This procedure is defined in regulation (3 CCR section 6452.2) and requires DPR to develop an estimate of nonfumigant emissions in advance of an upcoming ozone season. For 2011, the 2009 method use fraction data and the application method adjustment factors used to determine allowable fumigant use from VOC_{FUM} are given in Appendix 1.

DPR developed a forecasting method to estimate Ventura NAA NOC_{NF} based on a statistical time series analysis (Spurlock, 2009). The time series model is updated each year to include the most recent available pesticide use report data. After updating, the revised time series model is used to forecast nonfumigant emissions which, in turn, are used to calculate allowable fumigant emissions and fumigant use as described above. Table 22 compares 2004–2009 NAA 4 nonfumigant ozone seasons emissions, while Table 23 provides the forecast 2010 nonfumigant emissions and resultant allowable fumigant emissions based on the regulatory benchmark and the SIP goal.

Table 23. May–October (ozone season) nonfumigant pesticide VOC emissions and percent of total adjusted emissions.

NAA	2004 Emissions (tons/day)	2005 Emissions (tons/day)	2006 Emissions (tons/day)	2007 Emissions (tons/day)	2008 Emissions (tons/day)	2009 Emissions (tons/day)	Mean Percent of Total Emissions
4 – Ventura							
Nonfumigants	0.622 (16%)	0.497 (14%)	0.508 (14%)	0.428 (13%)	0.488 (28%)	0.452 (25%)	18%

Table 24. Projection for 2011 NAA 4 VOC emissions. The 2011 fumigant emission limit was determined by subtracting the forecast 2011 nonfumigant emissions from the SIP goal and VOC regulation benchmark (Tao, 2010).

Non-Attainment Area	SIP Goal and VOC Regulation Benchmark (tons/day)	Forecast 2011 Nonfumigant Emissions (tons/day)	2011 Fumigant Limit (tons/day)	2011 Fumigant Limit (pounds)	2009 Adjusted Fumigant Emissions (tons/day)
4 - Ventura	3.3 a	0.439	2.86	1,047,000	1.355

a The Ventura SIP Goal and VOC Regulation Benchmark for 2011 is shown.

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