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Consultants in Quantitative Process and Environmental Measurements

Final Report

Alliance of the Methyl Bromide Industry Methyl Bromide Air Monitoring: Ventura, Santa Cruz, and Monterey Counties July-October, 2002

Prepared for:

Alliance of the Methyl Bromide Industry
c/o William J. Thomas
Livingston & Mattesich Law Corporation
1201 K Street, Suite 1100
Sacramento, CA 95814-3938

Submitted to:

Department of Pesticide Regulation
California Environmental Protection Agency
1001 I Street
Sacramento, CA 95814

Prepared by:

Eric D. Winegar, Ph.D., QEP
Applied Measurement Science
4764 Concord Drive
Fair Oaks, CA 95628
(916) 965-7050, (916) 965-7055 fax
EricWinegar@earthlink.net

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1. INTRODUCTION

The purpose of this report is to present the data from ambient air monitoring for methyl bromide that was conducted in Ventura, Monterey, and Santa Cruz Counties in the summer and fall of 2002. This monitoring was conducted by Applied Measurement Science for the Alliance of the Methyl Bromide Industry (AMBI) at the behest of the California Department of Pesticide Regulation (CDPR). This requirement originated in a re-evaluation notice from June 26, 2001 directed toward the methyl bromide registrants in California.

Previous monitoring had been conducted by AMBI in summer, 2001 in Ventura (Oxnard/Camarillo areas) and Santa Barbara Counties (Santa Maria area). The California Air Resources Board had previously conducted monitoring in Monterey and Santa Cruz Counties in 2001.

The study director was Dr. Eric D Winegar, and laboratory analysis was conducted by Environmental Analytical Service, Inc. of San Luis Obispo under the guidance of Dr. Steven Hoyt. Field technicians were supplied by Diamond Resources of Arroyo Grande, CA and Applied Analytical Consulting of El Dorado Hills, CA.

This work described in this report was conducted in accordance to the work plan submitted to the California Department of Pesticide Regulation, dated August 27, 2002. This work plan was based on the approach developed in 2001 during the first round of monitoring.

2. STUDY DESIGN

The study was intended to collect sets of weekly ambient air concentrations of methyl bromide at sites that would be representative of exposure to the community during fumigation activities. The study design was intended to utilize three main factors for understanding ambient air dispersal of methyl bromide during fumigation activities: source strength (fumigation usage rates and locations), receptor impact (ambient air concentrations as measured during the study period), and the transport mechanism (meteorological conditions).

In order to obtain this information, it required sampling site selection that was balanced among several factors: vicinity to centers of population, a reasonable distance away from other fumigation activities or potential emission sources, meeting the specific sampling site criteria, and permission from the site owners. Final sampling site selections were made after consultation with CDPR.

The work plan to guide the study was prepared in accordance with the proposed protocol suggested by CDPR, reviewed by the AMBI group and then finalized and submitted to CDPR. Any substantive changes to the work plan were incorporated in later revisions that were also submitted to CDPR. Any modifications to the sampling schedule due to changing circumstances were communicated to CDPR immediately.

Based on past years' experiences, in order to ease the data evaluation process and due to the frequent Saturday and Sunday fumigation because of school hours rules, the sampling periods were set for Wednesday to Saturday, with sampling starting as early as possible in the day.

All samples were collected on a 24-hour time-integrated basis in Summa canisters, with subsequent analysis by GC/MS. Meteorological data was collected at each site throughout the study periods. Methyl bromide usage data was collected using the standard county Pesticide Use Report procedures.

2.1. Sampling Locations

2.1.1 Ventura County

Four sites were required to be monitored in the Oxnard/Camarillo area of Ventura County. Table 1 lists the sampling locations used in 2002 monitoring. These locations are the same as were used in 2001.

Sampling locations were selected based on the CDPR site selection criteria along with standard sampling guidelines. A large number of sites were screened and evaluated before selecting the best candidates and obtaining permission. Two of the sites were on public utility property.

The sampling sites listed below represent the final selection of sites following review by CDPR.

Oxnard/Camarillo Sampling Locations

1. Sharps Automotive (SHA)

   Rationale: Adjacent to both agricultural and population centers, good access, single story building, building owners cooperative. This location is adjacent to both residential areas on the west, north, and northeast. To the east are agricultural and sparse industrial areas.

   Evaluation of Siting Criteria: Excellent adherence to all aspects of siting criteria.

2. Abandoned Building (ABD) on Vineyard and Escalande Roads

   Rationale: Adjacent to business and residential area.

   Evaluation of Siting Criteria: Excellent adherence to all aspects of siting criteria.

3. United Water Conservation District (UWC) pump station, NW of airport.

   Rationale: Between Camarillo/Oxnard population centers, near agricultural/fumigation areas.

   Evaluation of siting criteria: Excellent other than being adjacent to fumigated field on two occasions, as noted in discussion.

4. Pleasant Valley Water (PVW) District pump station

   Rationale: Middle of agricultural area, in targeted township, downwind of background sources.

   Evaluation of siting criteria: Excellent adherence to all aspects of siting criteria.

Figure 1 shows an overview of the Ventura County sites, which are marked with stars. From the land usage perspective, these four sites cover urban, rural, and boundary areas (between rural and urban). In addition, two of the sites are distinctly downwind of fumigation areas.

Table 1. Ventura County Sampling Locations

Oxnard/Camarillo Area			Coordinates	
Map Site Code	**Name**	**Location**	**Latitude**	**Longitude**
SHA	Sharps Automotive	Saviers/Hueneme	34.148080°	-119.178200°
ABD	Abandoned Building	Vineyard/Escalade	34.230400°	-119.174717°
UWC	United Water Cons. District #2	Near Airport - NW	34.216690°	-119.111400°
PVW	Pleasant Valley Water	Los Posas/Rt. 34	34.196967°	-119.069367°

Figure 1. Oxnard/Camarillo Area Sites

2.1.1.1 Sampling Schedule

Sampling was conducted over 24-hour periods from Wednesday to Saturday each week for eight weeks, starting on July 10, 2002 and ending on August 31, 2002. The start and end times for the samples were approximately mid-day.

The monitoring was scheduled to coincide with the maximum usage periods for methyl bromide soil fumigation in the Ventura County area. Past data has shown that the peak of the season is in the late July to early August time frame.

2.1.2 Monterey/Santa Cruz Counties

A total of five sites were required in the Monterey/Santa Cruz Counties areas. In addition, a background site was selected in the city of Santa Cruz. In order to achieve some comparability with previous monitoring, attempts were made to find sites close to the original CDPR/CARB sites while still adhering to siting criteria. Table 3 contains siting location information. Figures 2 and 3 show the AMBI locations in blue diamonds relative to CDPR/CARB sites, which are marked in red dots.

The selected sites and the rationale for each is as follows.

1. Watsonville City Park Services yard (WAT). East Front St. and Union.

   Rationale: This location is within 0.5 miles of the Pajaro school site (PMS), is in an area of high population density, and is not directly adjacent to any potential fumigation sites.

   Evaluation of siting criteria: Sampler was within 15 meters of trees. However, the trees are separated by a large gap which allows air movement.

2. Farm Bureau Office (FRM). 141 Monte Vista Street.

   Rationale: In residential area, near the center of town. Located approximately 0.46 miles from MES site. No close agricultural areas.

   Evaluation of siting criteria: Excellent adherence to all aspects of site criteria.

3. County Public Works yard (CPW). Grimmer Road.

   Rationale: On eastern, downwind of town. Adjacent to agricultural areas, but ones that were not forecasted to be fumigated.

   Evaluation of siting criteria: Excellent adherence to all aspects of site criteria.

4. BB Construction (BBC). Corner of San Juan Grade Road and Cornwall Roads in Salinas.

Rationale: Close to previous monitoring site. Away from agricultural activities.

Evaluation of siting criteria: Excellent adherence to all aspects of site criteria.

5. Monterey County Unified Air Pollution Control District ambient air monitoring site (MAQ).

Rationale: previous CDRP/CARB site, not close to current agricultural activities.

Evaluation of siting criteria: Proximity to building was of some concern.

Table 3. Watsonville and Salinas Sampling Locations

Watsonville/Salinas Area			Coordinates	
Map Site Code	**Name**	**Location**	**Latitude**	**Longitude**
WAT	Watsonville Park Offices	East Front and Union	36.697615°	-121.628867°
FRM	Farm Bureau	Prospect Dr.	36.698156°	-121.606950°
CPW	County Public Works yard	Grimmer Road	36.945583°	-121.754533°
MAQ	MBUAQMD monitoring site	E. Laurel Dr.	36.690444°	-121.625571°
BBC	BB Construction	San Juan Grade Road	36.733859°	-121.637865°

Figure 2. Watsonville Area Sites

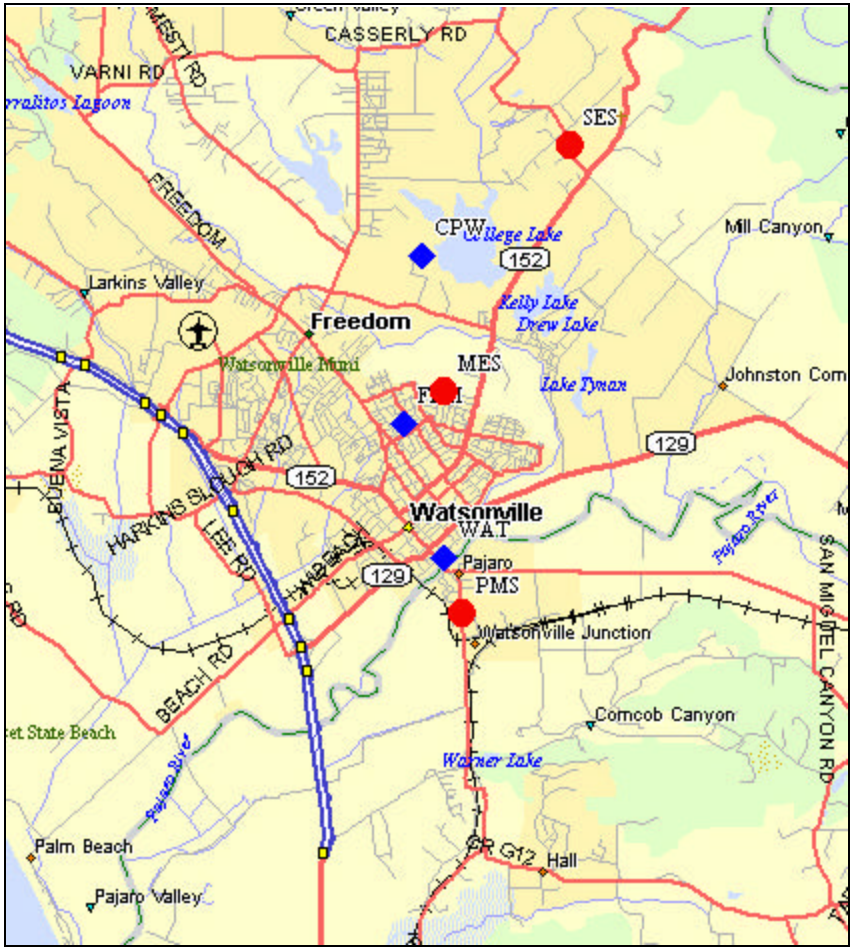

Figure 3. Salinas Sites

2.1.2.1 Sampling Schedule

Sampling was conducted over 24-hour periods from Wednesday to Saturday each week for eight weeks, starting on September 4. 2002 and ending on October 27, 2002. The start and end times for the samples were approximately early morning.

The monitoring period was scheduled to coincide with the main usage season for methyl bromide fumigation activities, which peaks in the September and October for the northern counties.

2.2 Background Locations and Sampling Schedules

Several background locations were used during the 2002 monitoring:

- San Luis Obispo background site. This site was adjacent to the laboratory in SLO, at the same point used in 2001. Site coordinates are: 35° 14.755, -120° 40.237. A total of 8 samples were collected at this location during October 16-19, 2002 and November 6-9, 2002. Samples were collected in the regular 24-hour integrated fashion.

- Santa Cruz Fire Station. This site was the same as used by CDPR/CARB in 2001, although the AMBI site was located on top of a higher building than the CDPR/CARB sampler was sited. Site coordinates are: -36° 57.704°, -122° 02.595°. Samples were collected during two weeks of the regular program: September 11-14, 2002, and October 16-19, 2002. Samples were collected in the regular 24-hour integrated fashion.

- Grab samples at several remote and urban locations at the noted dates:

Sylmar, CA	6/25/2002
Mountain Pass, CA	6/27/2002
SJ Valley, along I-5 north of Fresno	6/24/2002
Berkeley Marina	7/2/2002

All background samples were processed in the same fashion as regular field samples.

2.3 Sampling and Analysis Methods

2.3.1 Sampling Methods

Sampling was conducted with Summa canisters, stainless steel flow controllers, and stainless steel inlets. Sampling was conducted for 24 hour periods, with start times varying for each four-day sampling period and for each sampler. Due to the distance between each of the sampling locations and the transit and set up times, the start and stop times of the four locations were not the same, but were as close as possible. The circuit to start all sampling

locations required between one and two hours, so the majority of sampling start and end times were within a two hour period.

Sampling canisters were located on rooftops at the selected sampling locations. The canister was placed on a tripod holding the micrometeorological monitoring station at each site. The inlet for the sampling line was at a height of approximately 6 feet above the surface of the roof-top or other surface where the tripod was placed. Figure 4 shows an example placement on the roof of the Sharps Automotive location in Oxnard (SHA).

The beginning vacuum in the canister was –29.95 to –27 in Hg, which are considered commonly acceptable limits in the sampling community. The flow rate was set to fill the canister from the nominal –29.95 inches of Hg to approximately –5-8 inches of Hg, corresponding to a flow rate of approximately 3 mL/min. The target volume was 4 liters of sample. The inlet was fashioned from ¼ inch OD 304 stainless steel with the tip curved downward to prevent entry of rain. A 1 micron stainless steel frit filter was inserted in the sampling line before the flow controller.

A Veriflo flow controller or the equivalent was used to control the flow into the canisters. New flow controllers were used for this program given that past experiences were problematic.

Flow controllers were calibrated on a daily basis. The sampler was flow and leak checked prior to the start of each sample. The leak check procedure consisted of placing the flow controller on the canister, closing off the inlet with a cap, and opening and subsequently closing the valve. The pressure gauge was watched for any movement. Given the small volume of the inlet line and pressure gauge, a small leak could be detected. If any movement was detected over a 2 minute period, all fittings were checked and tightened.

Flow was measured at the start and end of the sampling period with a J&W ADM-3000 digital flow meter, NIST certified and accurate to ±3%. Deviations to the expected flow of ±25% were allowed before disqualifying the sample. Vacuum gauges were integrated with the inlet system so that the pressure in addition to flow was monitored without removing the inlet.

A small number of samples were invalidated due to flow controller deviations. It was concluded that the leak check procedure was critical in maintaining correct flow rates.

Following collection, individual samples were labeled with notation encoding the sampling location and date. The sample tag included type of sample information, project information (client, etc), and field technician name. Chain of custody forms were prepared for each batch of canisters sent to the laboratory.

Figure 4. Sampler and micromet set up at SHA rooftop site.

Samples were stored at ambient temperature until analysis, which typically was less than one week after sample collection. Stability of the collected sampled was not considered a problem due to the large amount of documentation in the literature regarding the stability of methyl bromide and other similar toxic compounds for periods of at least two weeks or more.[i,ii,iii]

Detailed notes on the start and end times, start and ending pressures, and flow rate measurements are included in the appendix.

2.3.2 Laboratory analysis

Laboratory analysis was conducted at Environmental Analytical Service (EAS) in San Luis Obispo, California, using Modified EPA Compendium Method TO-14A. This method uses a cryogenic preconcentration of an aliquot of the field sample, with subsequent desorption into the gas chromatograph column and detection by mass spectrometry with selected ion monitoring (SIM). Specific method details relating to the performance of the laboratory analysis were detailed in the work plan. It should be noted that this analysis utilized the stable isotope dilution technique to provide accurate results. This modified method is more sophisticated than the usual method of quantitation and provides for a determination of matrix effects to the target compound. EAS is an experienced practitioner of this technique which is unusual for standard air analysis.

A method detection limited study was performed based on the standard EPA method for determining method detection limits as noted in 40 CFR part 36, Appendix B. A standard at concentration of 0.0082 ppbv was analyzed seven times to yield a standard deviation of

0.00084, which was multiplied times 3.14 to provide the method detection limit of 0.003ppbv. Table 4 contains the data from this study.

Std	0.0082
Run	Result
1	0.0082
2	0.0076
3	0.0067
4	0.0063
5	0.0076
6	0.0058
7	0.0072
Ave.	0.0071
Std. Dev.	0.00084
MDL	0.0026

All conc. in ppbv.

Table 4. MDL Study

All data above the MDL was reported and used in statistical calculations. All data above the MDL were reported by the laboratory and were used in data calculations (except for data rejected due to specific QA issues). No field samples were below the MDL.

2.3.3 Meteorological Data Collection

Two types of meteorological monitoring were conducted during the program. First, each sampling site had a site-specific micrometeorological station to collect wind speed, wind direction, and temperature. These stations were called "micrometeorological stations." These stations were a Spectrum Technologies, Inc. Model 525 weather station, which measured wind speed, wind direction, and temperature. The station was at the same height and location as each canister sampler so that specific site micro-conditions could be recorded. Wind data was recorded at 60 minute intervals and downloaded weekly with each sample set.

The second meteorological monitoring station was located at a central location and was used for general regional conditions. This system is identified as the "main meteorological station." This system was a Novalynx WS-16 system which measured wind speed, wind direction, temperature, relative humidity, and barometric pressure. The main sensor set (wind speed and direction) were NIST certified and met PSD performance specifications. Data was recorded as 60 minute averages for the duration of the program. In Oxnard/Camarillo, the main met station was located at the UVW site, on top of a pump building, at a height of approximately 8 meters. In Watsonville, the main met station was situated at the FRM site, at a height of approximately 5 meters. Meteorological data for the MAQ site was obtained from the Monterey County Unified Air Pollution Control District, which maintains a 10 meter tower at the site.

2.4 External Comparison Samples

Comparison samples were collected alongside CDPR samplers over a 2-day period in both the Ventura and Monterey/Santa Cruz areas. AMBI data from these dates has been submitted to CDPR, but comparison data has been provided, so no evaluation of this intercomparison can be performed at this point.

2.5 Excluded Periods

As cited in the work plan, any nearby fumigation would be considered grounds for exclusion of any samples collected at that time. This circumstance occurred on two occasions at the UWC site in Camarillo. On August 23 and 24, 2002, the field immediately to the north of the UWC site was fumigated by Trical, starting at 6:30 AM on each day. Figure 5 demonstrates the proximity of the field to the sampler.

Figure 5. UWC Site adjacent to fumigated field

Therefore, no samples were analyzed for these two dates.

3. DATA VALIDATION

Data validation was performed on that data sets from Ventura and Monterey/Santa Cruz area by examining the following quality assurance indicators:

- Completeness—the ratio of valid samples to total possible samples. The usual criterion is a completeness ratio of 75%. Valid samples were determined according to meeting flow deviation criteria.
- Comparability—use of standard procedures to ensure comparability with other monitoring data.
- Representativeness—evaluation of how closely the sampling design represents the true concentrations of ambient air in the area.
- Accuracy—adequate recovery of daily laboratory spikes. Evaluation of field and trip spike recoveries.
- Precision—adequate precision between field and laboratory duplicate samples.

3.1 Completeness

In the Monterey/Santa Cruz area, a total of 165 valid samples were collected, out of a possible total of 168. Three samples were lost due to flow controller exceedances outside of the ±25% criterion, one of which was at the background site. This yields a completeness of 98.2%.

In Ventura County, there was a total of 121 valid samples out of a possible total of 128, which yields a completion rate of 94.5%. A total of seven samples were invalidated due to not meeting the flow controller criterion, however one of these was in a duplicate sample pair so the primary sample was still valid. In addition, two samples were not analyzed due to a nearby fumigation on August 23 and 24, 2002 adjacent to the UWC site, as noted above. As the elimination of these two samples due to proximity to a fumigation was part of the work plan, these samples were not considered to be part of the invalidated sample list.

3.2 Comparability

The use of standard approved sampling and analytical techniques provides for comparable data. All procedures were based on USEPA sampling and analytical methods. Therefore, the data collected in this program are comparable to that collected in other programs.

3.3 Representativeness

The representativeness of a program is based on adherence to the stated objectives of the program as well as following standard sampler and probe sampling criteria. The objective of this program has been understood to be an assessment of the impact to ambient air of fumigation activities in heavy use areas. Therefore, a key aspect was the selection of appropriate sampling sites that represent a balance between being close to populations at risk but not so far from agricultural operations to render the sampling data unusable. This balance

is subjective, and it is believed that the site selection was appropriate for the objectives of the program.

Adherence to the siting and probe placement guidelines has been met in all sites except for the WAT site in Watsonville in which the sampler was slightly closer to some trees than the criteria state. It is believed that this slight difference does not impact the data.

3.4 Accuracy

The accuracy of the analytical data relies on several types of indicator samples: laboratory check standard analyses, trip spikes, and field spikes. In addition, while blanks are not a direct an indicator of accuracy, they can affect the accuracy of the sample data, so they will be considered here along with the more traditional means of assessing accuracy.

- Laboratory check standards

  The laboratory checks standards (LCS) are the primary means to assess laboratory accuracy, which is the major portion of the accuracy breakdown. A total of 13 laboratory check samples were analyzed for the Ventura sample set, and a total of 17 were analyzed for the Monterey/Santa Cruz sample set.

  Table 5 contains the results of the Ventura LCS samples. Figure 6 shows a quality control chart with these data point. These data show that the system was in statistical control throughout the sampling program, with an average recovery of 96.3% on the LCS samples.

Date	Recovery	Ave.
7/17/02	97	96.3
7/26/02	92	96.3
8/1/02	93	96.3
8/2/02	73	96.3
8/8/02	92	96.3
8/9/02	105	96.3
8/15/02	97	96.3
8/22/02	100	96.3
8/29/02	98	96.3
8/30/02	96	96.3
8/31/02	99	96.3
9/5/02	111	96.3
9/6/02	99	96.3

Table 5. Ventura LCS Recoveries

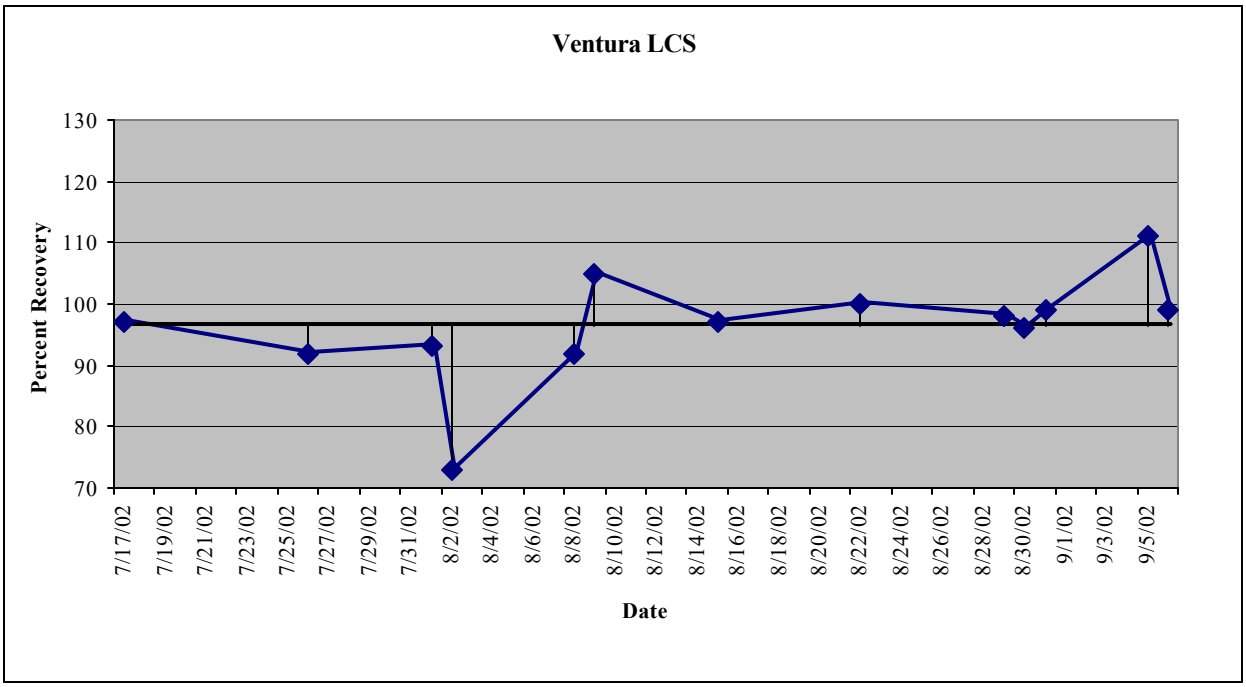

Figure 6. Ventura LCS Quality Control Chart

Table 6 contains the results from the Monterey/Santa Cruz LCS samples. The average recovery was 107.9%. Figure 7 shows the Monterey/Santa Cruz QC chart.

Date	Recovery
9/10/02	110
9/11/02	118
9/17/02	118
9/18/02	103
9/23/02	96
9/24/02	109
9/25/02	96
10/1/02	106
10/2/02	106
10/7/02	95
10/9/02	103
10/14/02	100
10/15/02	96
10/21/02	108
10/23/02	122
10/25/02	129
10/29/02	120

Table 6. Monterey/Santa Cruz LCS Recoveries

These sets of data show that the system was in statistical control and that the average recoveries are satisfactory and indicative of a well-functioning system.

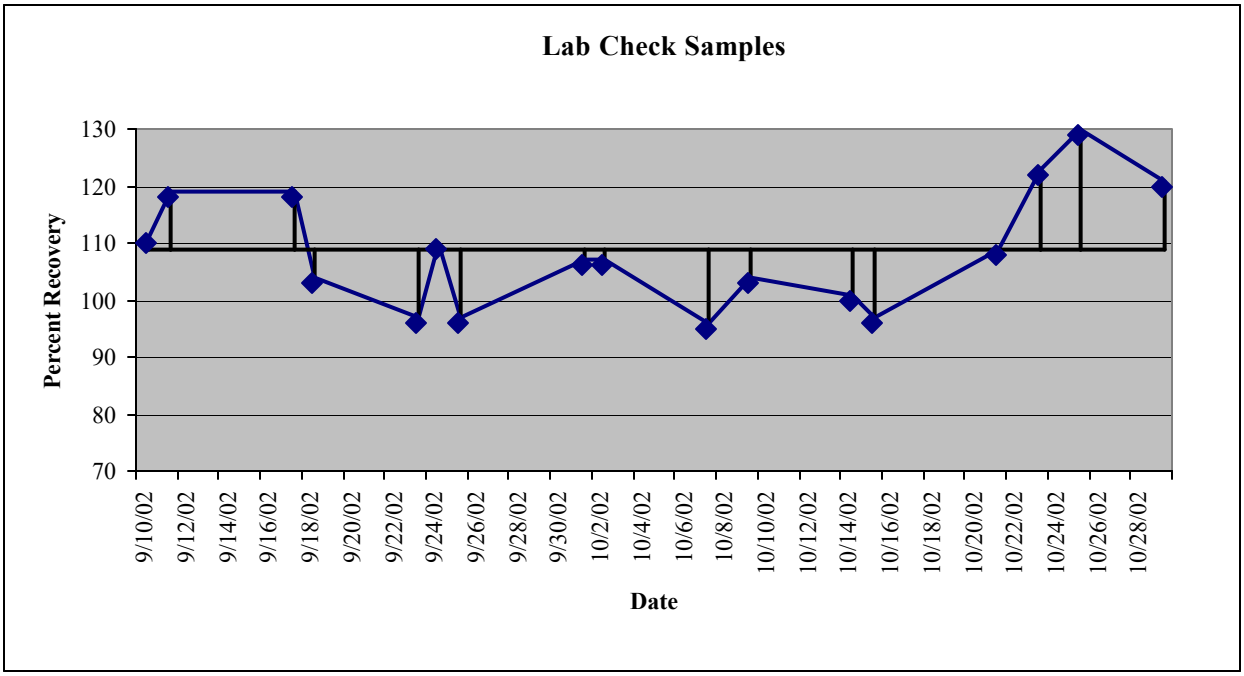

Figure 7. Monterey/Santa Cruz QC Chart

- Trip Spikes

  A total of 10 trip spikes were prepared and analyzed for the Ventura and Monterey/Santa Cruz programs. Table 7 contains the results from these spikes.

Ventura					
Type of Sample	**Date**	**Sample (ppbv)**	**FS (ppbv)**	**Spiked Amt (ppbv)**	**Recovery**
Trip Spikes	07/19/02		1.183	1.2	**98.6%**
In house Trip Spike	08/03/02		1.119	1.2	**93.3%**
Trip Spikes	08/03/02		1.183	1.2	**98.6%**
Trip Spikes	08/09/02		0.954	1.2	**79.5%**
Trip Spikes	08/17/02		0.718	1.2	**59.8%**
Trip Spikes	08/30/02		0.670	1.2	**55.8%**
Monterey/Santa Cruz					
Trip Spikes	09/12/02		0.804	1.2	**67.0%**
Trip Spikes	09/26/02		1.759	1.2	**146.6%**
Trip Spikes	10/10/02		1.254	1.2	**104.5%**
Trip Spikes	10/24/02		1.727	1.2	**143.9%**
				Average	**94.8%**

Table 7. Trip Spike Results

Figure 8 shows the recoveries over time.

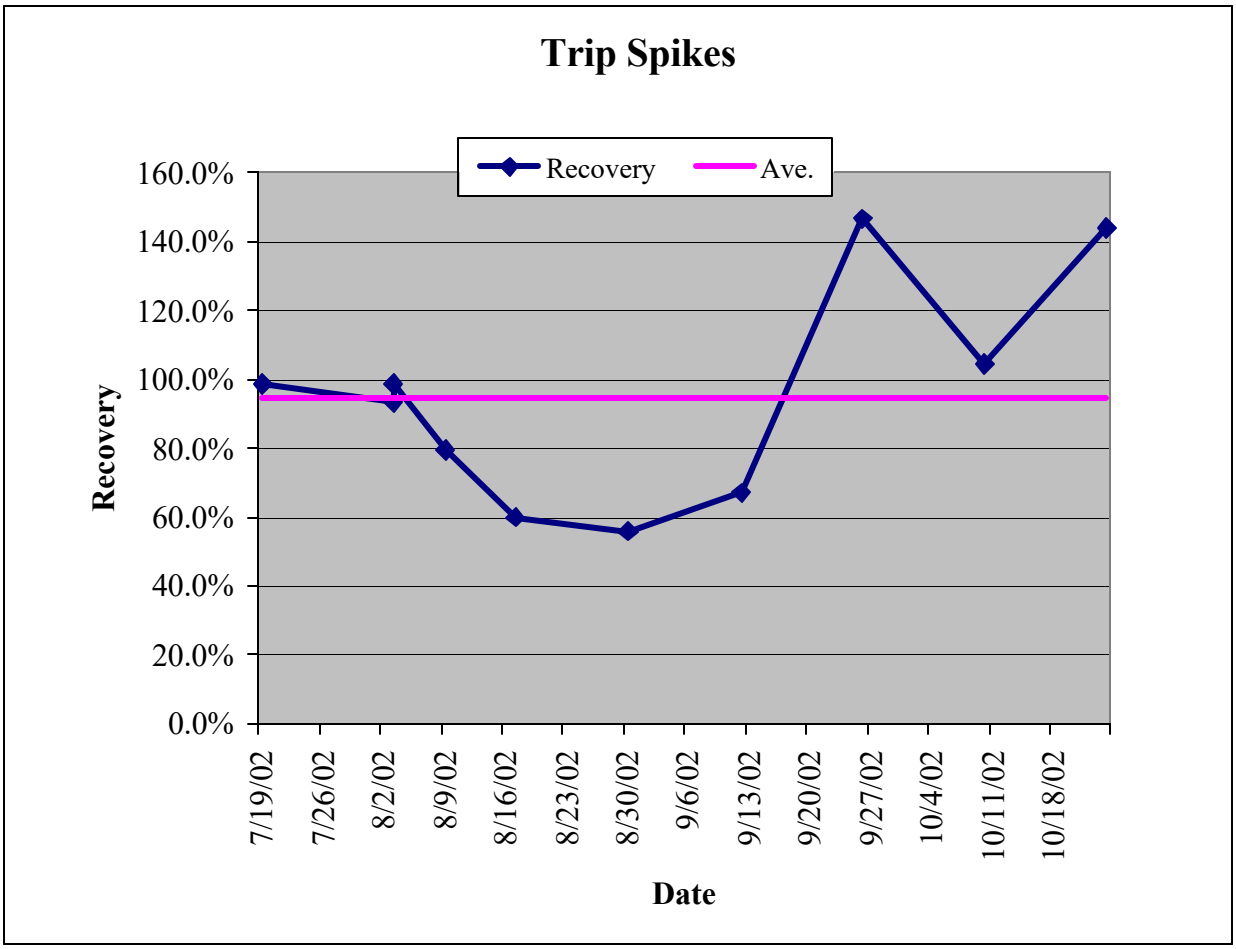

Figure 8. Trip Spike Recovery QC Chart

While the overall average of 94.8% is satisfactory, several individual results are outside of the usual bounds for satisfactory recovery. There appears to be a trend towards low recoveries during the July time frame, but that is broken by some high and normal values that follow.

The reason for this kind of variability is hard to diagnose. Two main possibilities are 1) instability of methyl bromide in the canisters, and 2) a spiking process that is poorly controlled.

Attempts were made to duplicate the CARB as understood. Both dry and humid canisters were tested. Unfortunately, the on-going nature of the study did not allow an opportunity to develop and test the procedure adequately. The laboratory had to resort to testing along with conducting routine analyses.

The first possibility for reasons behind this variability is shown to be moot—there are several well-regarded studies that show the long-term stability of methyl bromide in Summa canisters. No statements regarding unstable behavior for methyl

bromide in canisters is ever seen in the literature, nor among discussions with several commercial laboratories or experienced analysts. Indeed, the CARB laboratory does not make any assertions regarding possible poor stability.

Therefore, it is concluded that the reason for the poor performance of the trip spike results is due to an out of control spike production process. The performance during the month of August may be explained by the absence of the laboratory director and the subsequent reliance upon less experienced personnel, but the later high values cannot be explained in this fashion.

While it is a reasonable explanation regarding the laboratory processes, the question that remains is whether these results indicate anything about the quality and accuracy of the data that has been reported.

Based on the above statements regarding the wide-spread positive experience with methyl bromide in summa canisters, the use of the trip spike canisters to evaluate stability is of little use, with subsequent poor results doing nothing to disqualify marginal data. The conclusion, therefore, is that the variable trip spike results alone do not affect the overall quality of the data. A discussion of the ensemble of the QA/QC data follows the individual data indicator reviews that takes into account the results from the various quality assurance procedures.

- Field spikes

  Ostensibly, the use of field spikes was designed to assess the process of sampling and the stability of the sample in the canister. In reality, it appears to primarily assess the skill of the operator in spiking the canister. The field spike results from 2002 were extremely variable, which mirrors the experience from 2001. Table 8 contains the results of these spikes.

Type of Sample	Date	Sample (ppbv)	FS (ppbv)	Spiked Amt (ppbv)	Recovery	Comments
Ventura						
Field Spike (1)	07/19/02	0.304	0.278	1.2	**-2.2%**	This was the first spike, dry
In House Field Spike	08/03/02	1.183	0	1.2	**-98.6%**	
Field Spike	08/09/02	2.22	5.139	1.2	**243.3%**	Highly variable site (3)
Field Spike	08/17/02	1.449	1.649	0.24 (2)	**83.3%**	Used higher duplicate result
Field Spike	08/30/02	0.224	1.175	1.2	**79.3%**	
Monterey/Santa Cruz						
Field Spike	09/13/02	0.846	1.742	1.2	**74.7%**	
Field Spike	09/26/02	1.045	3.224	1.2	**181.6%**	
Field Spike	10/10/02	0.247	2.358	1.2	**175.9%**	
Field Spike	10/24/02	0.745	2.317	1.2	**131.0%**	

Comments:

The field spike recovery was calculated as the difference between two measurements each of which has an uncertainty of about 30%. In addition the sample result is an estimate based on a duplicate canister collected at the same time and location as the spiked canister.

(1) The first field spike was spiked into a dry canister and had poor recovery as expected. Subsequent field spikes were made into a humidified canister.
(2) This can was prepared as a trip spike then evacuated and sent as a field spike. No additional methyl bromide was spiked into the canister. Two analysis were made on this sample for comparison the higher was used.
(3) This site had high and sometimes variable values even in replicate canisters. Two analysis were made on this sample, for comparison the higher was used.

Table 8. Field Spike Results

These results show a great amount of variability and can be interpreted in several ways. As with the trip spikes, the question boils down to whether the behavior of methyl bromide in Summa canisters is under question, or whether the spike preparation process is inadequate. Again, ultimately, the question to be answered in assessing this data is whether the data accurately represents the performance of the sampling and analytical system.

Between the 2001 and 2002 data, the majority of the satisfactory results can be seen in the few spike samples prepared by the laboratory director and the AMBI study director, both experienced PhD chemists. The primary information that the spiking process has shown over two years of monitoring is the skill of the persons doing the spiking. In addition, in a query to USEPA OAQPS staff, it was determined that no Federal programs ever use this kind of spike technique because of these kinds of difficulties. In addition, no commercial laboratory queried has seen this kind of spiking regimen.

The trip spike results assessed solely the performance of methyl bromide in a clean canister. The field spike assesses the additional factor of the sample matrix. Hence the question becomes whether the sample matrix could likely affect the recovery to the extent that is seen in these spike results?

The answer to this question is believed to be no—the ambient air matrix for this study is not so unusual to contradict the wide-spread experience of many laboratories and studies. The atmospheric environment that was sampled would not be expected to cause difficulties. The areas are not heavily industrialized so no high burden of reactive species would be expected to be present, the humidity is not high nor low causing surface issues, and the particulate levels would be expected to be low due to the high marine air content. There does not appear to be any reason to expect the air matrix to contribute negatively to recoveries in the Summa canisters. Indeed, the preponderance of evidence is that these atmospheres are benign and that they would be a good matrix for methyl bromide recoveries.

Therefore, as with the trip spike results, the evaluation of the field spike results leads to the conclusion that the spike production procedure was flawed at the laboratory and that the system was out of statistical control. Indeed, it is likely that the same technician that prepared the trip spike would have prepared the field spikes, thus perpetuating similar errors. The final evaluation of the field spikes will be made in Section 3.6 Data Quality Assessment.

- Trip and Laboratory Blanks

A total of 8 trip blank samples in both Ventura and Monterey/Santa Cruz were prepared and assessed. Table 9 shows the results of the trip blank samples. All were non-detect, thus no contamination from field sources or from contaminated canisters is indicated.

Date	Result	MDL
Ventura		
7/13/2002	<MDL	0.003 ppbv
7/18/2002	<MDL	0.003 ppbv
7/26/2002	<MDL	0.003 ppbv
8/2/2002	<MDL	0.003 ppbv
8/7/2002	<MDL	0.003 ppbv
8/15/2002	<MDL	0.003 ppbv
8/28/2002	<MDL	0.003 ppbv
8/29/2002	<MDL	0.003 ppbv
Monterey/Santa Cruz		
7-Sep	<MDL	0.003 ppbv
12-Sep	<MDL	0.003 ppbv
19-Sep	<MDL	0.003 ppbv
26-Sep	<MDL	0.003 ppbv
3-Oct	<MDL	0.003 ppbv
10-Oct	<MDL	0.003 ppbv
17-Oct	<MDL	0.003 ppbv
24-Oct	<MDL	0.005 ppbv

Table 9. Trip Blank Results

All the laboratory blanks were non-detect at the 0.003 ppbv MDL, thus no laboratory-based contamination need be considered to affect the data.

3.5 Precision

Table 10 contains the results of the field duplicates from Ventura. Table 11 contains the results of the laboratory duplicate analysis.

Date	Primary	Duplicate	RPD
7/12/02	0.263	0.242	8.3%
7/17/02	0.095	0.116	19.9%
7/25/02	3.105	3.357	7.8%
7/26/02	0.702	0.296	81.4%
7/27/02	0.173	0.178	2.8%
7/27/02	1.07	0.746	35.7%
7/27/02	0.712	0.561	23.7%
7/27/02	0.731	0.35	70.5%
7/31/02	0.764	0.697	9.2%
8/2/02	0.986	1.039	5.2%
8/7/02	6.415	5.125	22.4%
8/16/02	0.964	1.111	14.2%
8/28/02	0.039	0.050	24.7%
8/29/02	0.073	0.070	4.2%
Average			23.6%

Units: ppbv
RPD=Relative Percent Difference

Table 10. Field Duplicate Sample Results

Date	Primary	Duplicate	RPD
7/11/02	0.595	0.524	12.7%
7/17/02	0.398	0.414	3.9%
7/25/02	0.229	0.224	2.2%
7/27/02	0.086	0.066	26.3%
8/3/02	7.594	7.386	2.8%
8/8/02	14.216	12.128	15.9%
8/14/02	0.612	0.728	17.3%
8/16/02	0.163	0.153	6.3%
8/23/02	0.893	0.831	7.2%
8/29/02	0.358	0.364	1.7%
8/31/02	0.023	0.025	8.3%
Average			9.5%

Units: ppbv
RPD=Relative Percent Difference

Table 11. Laboratory Duplicate Analysis Results

While the average of 23.6% is satisfactory for the field duplicates, it is largely driven by the two large values—81.45 and 70.5%. This average RPD suggests an adequately precise sampling and analysis system.

Tables 12 and 13 contain the field and laboratory duplicate results from Monterey/Santa Cruz.

Date	Result	Dup	RPD
9/11/02	0.302	0.435	36.1%
9/13/02	2.176	2.295	5.3%
9/20/02	2.757	2.526	8.7%
9/25/02	1.28	1.24	3.2%
10/3/02	1.391	1.275	8.7%
10/9/02	0.813	0.729	10.9%
10/16/02	1.868	1.891	1.2%
10/23/02	1.094	0.613	56.4%
Average			16.3%

Units: ppbv
RPD=Relative Percent Difference

Table 12. Field Duplicate Results for Monterey/Santa Cruz

Date	Result	Dup	RPD
9/12/02	0.205	0.215	4.8%
9/14/02	0.836	0.816	2.4%
9/20/02	3.039	3.734	20.5%
9/21/02	1.801	2.278	23.4%
9/27/02	1.498	1.474	1.6%
10/4/02	0.743	0.835	11.7%
10/11/02	3.251	3.133	3.7%
10/9/02	0.673	0.785	15.4%
10/16/02	0.262	0.295	11.8%
10/16/02	0.016	0.019	17.1%
10/19/02	0.643	0.635	1.3%
10/24/02	1.677	1.651	1.6%
10/25/02	0.473	0.336	33.9%
10/26/02	0.401	0.301	28.5%
Average			12.7%

Units: ppbv
RPD=Relative Percent Difference

Table 13. Laboratory Duplicate Results for Monterey/Santa Cruz

The field precision results from Monterey/Santa Cruz of 16.3% is satisfactory, as is the laboratory result of 12.7%. Both these results suggests a system that is in control and that produces valid data.

3.6 Data Quality Assessment

For the final validation of these data sets, the question remains about to reconcile conflicting results. The variable field and trip spike results suggest either problems with the fundamental basis for sampling methyl bromide in canisters or a poorly controlled spiking system. These results are contradicted by the appearance of a highly controlled quantitative analysis system, as evidenced by the LCS recoveries plus the favorable precision results from the duplicate analyses. Furthermore, the other field and laboratory data quality indicators suggest an adequately controlled system that can provide satisfactory data for program uses. How are these results reconciled?

In regards to the spike question, it is believed that there is no question regarding the stability of methyl bromide in Summa canisters. Therefore, assuming that stability is not a variable, the high variability in the field and trip spikes suggests a spiking system that is out of statistical control. On the other hand, the satisfactory LCS recoveries, the clean laboratory and trip blanks, and satisfactory field and laboratory precision data results suggest a system that is indeed under control and producing satisfactory and usable results.

When one considers the spiking process, it is apart from the normal part of the laboratory analysis process. It was performed on canisters leaving the laboratory, not entering it for analysis. Therefore, the errors that originated in that process would not be expected to affect the analysis portion of the entire system. Indeed, the other quality assurance indicators suggest that this is what happened. With the exception of the spiking process, both the field and laboratory processes appear to have been performed adequately.

Therefore, the combination of results leads to the conclusion that although a substantial portion of the intended quality process has been compromised due to unknown errors, the overall quality of the data has not been compromised. Consequently, it is concluded that that the data can be used for the intended purpose. Based on this analysis, the conclusion is that there is no justification for any wide-scale disqualification of the data on the basis of the spike results, and the data can be used as desired.

4. RESULTS AND DISCUSSION

4.1 Ventura County

4.1.1. Methyl Bromide Concentrations

The data from the valid data set as described above were combined into one data set for review and interpretation. The field duplicate pairs were averaged, as were the laboratory duplicate pairs. Sets of laboratory and duplicate pairs were averaged with the same type first and then together.

Table 14 contains the results from Ventura County-2002. The dashes (--) indicate lost samples.

Table 14. Results from Ventura County

Ventura County-2002					
Date	Day	ABD	SHA	PVW	UWC
7/7/02	Sun				
7/8/02	Mon				
7/9/02	Tue				
7/10/02	Wed	0.042	0.028	0.21	--
7/11/02	Thu	0.092	0.031	0.56	--
7/12/02	Fri	0.25	0.013	0.49	0.17
7/13/02	Sat	0.18	0.087	0.35	0.36
7/14/02	Sun				
7/15/02	Mon				
7/16/02	Tue				
7/17/02	Wed	--	0.11	0.10	0.41
7/18/02	Thu	0.39	0.15	0.63	1.0
7/19/02	Fri	0.14	0.028	0.30	0.42
7/20/02	Sat	0.16	--	0.15	--
7/21/02	Sun				
7/22/02	Mon				
7/23/02	Tue				
7/24/02	Wed	0.88	0.37	0.86	2.1
7/25/02	Thu	1.9	0.45	0.23	3.2
7/26/02	Fri	0.50	0.63	0.91	0.54
7/27/02	Sat	0.18	0.08	0.38	0.64
7/28/02	Sun				
7/29/02	Mon				
7/30/02	Tue				
7/31/02	Wed	--	0.041	0.73	--
8/1/02	Thu	0.41	0.060	0.62	0.77
8/2/02	Fri	1.0	0.059	0.85	1.5
8/3/02	Sat	0.99	0.43	1.6	7.5

Ventura County-2002					
Date	Day	ABD	SHA	PVW	UWC
8/4/02	Sun				
8/5/02	Mon				
8/6/02	Tue				
8/7/02	Wed	2.0	5.8	5.2	5.2
8/8/02	Thu	3.4	1.9	6.0	13
8/9/02	Fri	3.4	1.3	9.5	8.8
8/10/02	Sat	2.0	0.11	3.6	4.7
8/11/02	Sun				
8/12/02	Mon				
8/13/02	Tue				
8/14/02	Wed	0.67	0.18	1.3	2.4
8/15/02	Thu	0.36	0.12	1.2	1.5
8/16/02	Fri	0.16	0.089	1.0	1.2
8/17/02	Sat	0.57	0.64	1.2	1.4
8/18/02	Sun				
8/19/02	Mon				
8/20/02	Tue				
8/21/02	Wed	0.59	1.4	3.2	1.9
8/22/02	Thu	0.62	2.2	3.1	1.7
8/23/02	Fri	0.65	0.86	2.4	DNA
8/24/02	Sat	0.34	1.2	1.8	DNA
8/25/02	Sun				
8/26/02	Mon				
8/27/02	Tue				
8/28/02	Wed	0.19	0.04	0.28	0.37
8/29/02	Thu	0.072	0.004	0.36	0.34
8/30/02	Fri	0.22	0.14	1.2	0.44
8/31/02	Sat	0.98	0.024	1.5	1.2

Units: ppbv
(--)=invalidated or lost samples
DNA= Do not analyze, due to nearby fumigation

4.1.2 Statistical Description of Ventura County Concentration Data

Table 15-A contains a statistical summary of the methyl bromide concentrations in the Ventura data set as an ensemble. Table 15-B contains the breakdown of the data set into the individual data sets, and Table 15-C shows the weekly average concentrations. Figure 9 shows the plot of weekly concentrations over the study period.

Number	158
Max	16
Min	0.004
Overall Normal Ave.	2.3
95% Conf. Lim.	0.40
Overall Std Dev.	2.6
95th Percentile	2.7
Geometric mean	1.4
Median	1.5
Lognormal Ave.	2.6

Units: ppbv

Table 15-A. Ventura County Data Description

Sampling Site	**ABD**	**SHA**	**PVW**	**UWC**
Number	30	31	32	26
Max	3.4	5.8	9.5	13
Min	0.042	0.004	0.10	0.17
Normal Ave.	0.78	0.60	1.6	2.4
95% Conf. Lim.	0.32	0.40	0.70	1.20
Std Dev	0.90	1.1	2.0	3.1
95th Percentile	1.1	1.0	2.3	3.6
Geometric Mean	0.44	0.17	0.90	1.3
Median	0.46	0.12	0.89	1.3
Lognormal	0.82	0.72	1.7	2.4

Units: ppbv

Table 15-B. Ventura County Sampling Site Data Description

Week	**ABD**	**SHA**	**PVW**	**UWC**
7/10/02	0.141	0.040	0.400	0.266
7/14/02	0.227	0.096	0.297	0.624
7/24/02	0.852	0.379	0.594	1.633
7/31/02	0.805	0.149	0.942	3.259
8/7/02	2.701	2.278	6.053	7.961
8/14/02	0.438	0.259	1.208	1.623
8/21/02	0.550	1.424	2.610	1.783
8/28/02	0.364	0.052	0.847	0.585

Units: ppbv

Table 15-C. Weekly Ventura Sampling Site Concentrations

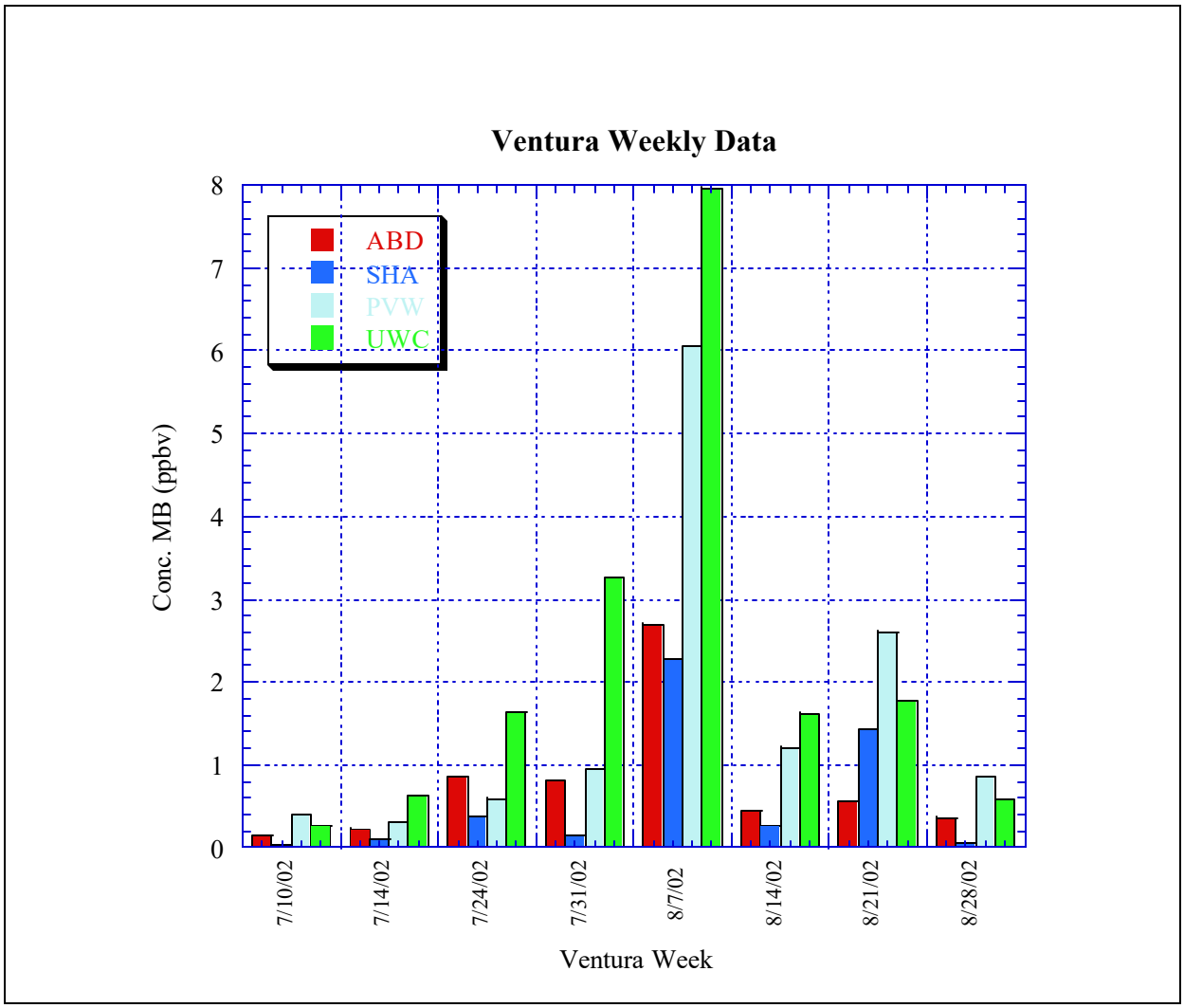

Figure 9. Plot of Weekly Ventura County Concentrations by Sampling Sites

4.1.3 Ventura County Meteorological Data

The meteorological data from 2002 was similar to 2001. The wind comes predominately from the south. Figure 9 contains the wind rose for the study period from the main met tower at the UVW site. This data shows that the majority of winds come from the SW to NW sectors. This is consistent with an off-shore/on-shore pattern for coastal areas. This also shows how emissions from fumigated fields to the south and southwest of the northern-most UVW site would impact the urban areas to the north side of the 101 freeway.

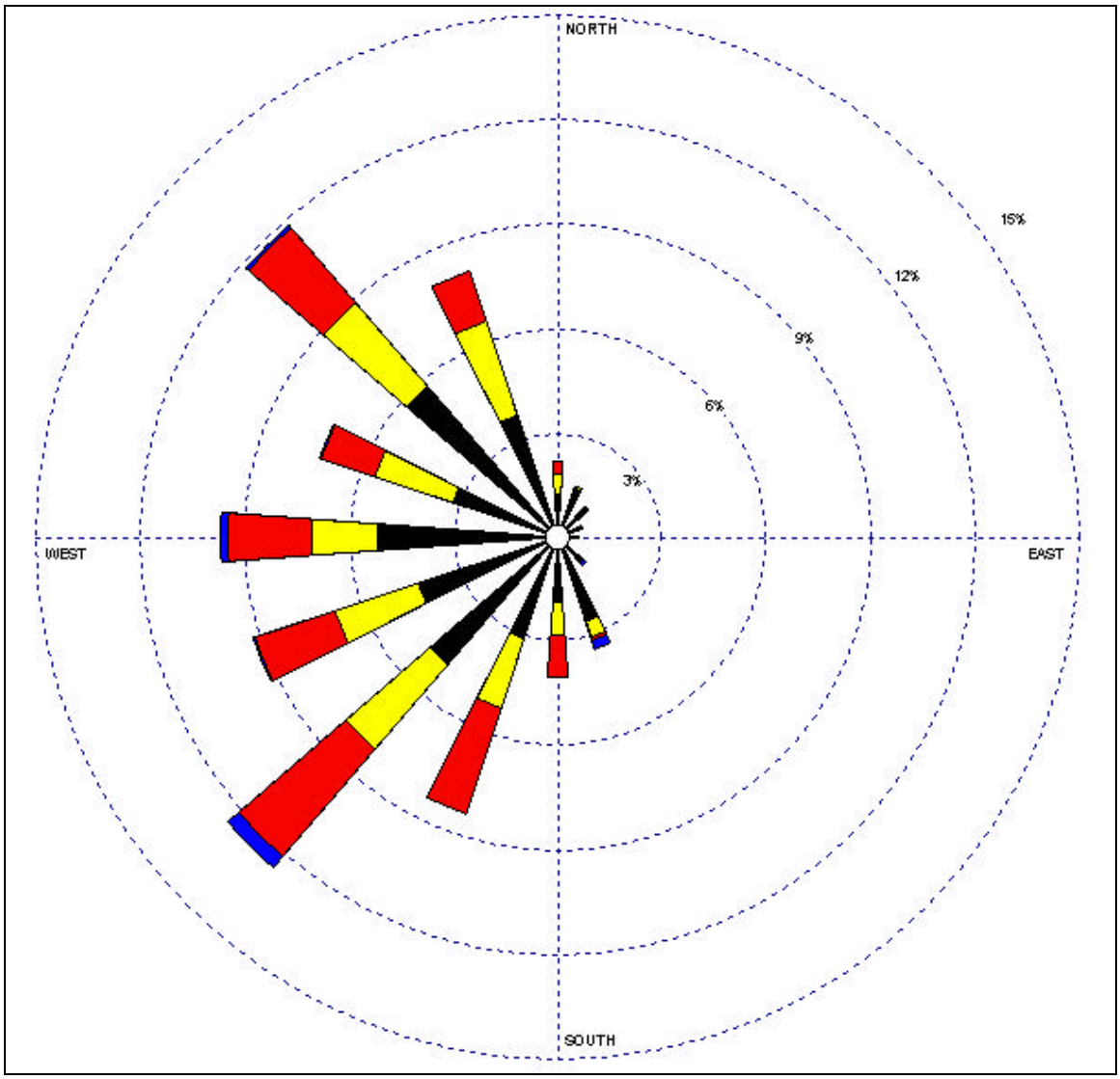

Figure 9. Wind Rose for Ventura County Area

The wind pattern represented in this wind rose is different from the later fall period when monitoring was conducted in 2001. That data showed a more westerly pattern, which is probably related to the time of year, as the previous monitoring was conducted in the August to October time frame.

4.2 Monterey/Santa Cruz Counties

4.2.1. Methyl Bromide concentrations

Table 15 contains the results from Monterey/Santa Cruz Counties.

Table 15. Results from Monterey/Santa Cruz County

Monterey/Santa Cruz Data							
Date	**Day**	**MAQ**	**BBC**	**WAT**	**FRM**	**CPW**	**SCF**
4-Sep	Wed	0.36	4.1	9.9	2.8	--	
5-Sep	Thu	0.86	2.9	7.5	4.2	0.003	
6-Sep	Fri	1.1	2.0	4.0	5.7	3.5	
7-Sep	Sat	1.2	1.0	--	14.0	2.8	
8-Sep	Sun						
9-Sep	Mon						
10-Sep	Tue						
11-Sep	Wed	0.092	0.37	1.2	0.72	2.3	0.12
12-Sep	Thu	0.21	0.80	0.65	0.47	0.90	0.24
13-Sep	Fri	0.64	0.85	2.2	1.9	1.2	--
14-Sep	Sat	0.83	1.6	2.1	2.1	1.5	0.69
15-Sep	Sun						
16-Sep	Mon						
17-Sep	Tue						
18-Sep	Wed	2.5	6.3	16.4	6.8	3.0	
19-Sep	Thu	4.5	5.5	12	9.8	11	
20-Sep	Fri	2.7	3.4	4.1	2.6	2.2	
21-Sep	Sat	0.80	6.3	0.94	2.0	2.8	
22-Sep	Sun						
23-Sep	Mon						
24-Sep	Tue						
25-Sep	Wed	0.18	0.81	0.83	0.83	1.3	
26-Sep	Thu	0.077	0.50	0.95	0.60	1.0	
27-Sep	Fri	0.43	1.2	3.1	0.45	1.5	
28-Sep	Sat	0.48	0.004	5.7	4.1	4.1	
29-Sep	Sun						
30-Sep	Mon						
1-Oct	Tue						
2-Oct	Wed	1.2	0.54	4.0	1.5	3.2	
3-Oct	Thu	1.3	1.8	3.4	3.6	3.5	

Monterey/Santa Cruz Data							
Date	**Day**	**MAQ**	**BBC**	**WAT**	**FRM**	**CPW**	**SCF**
4-Oct	Fri	2.1	2.5	3.9	0.79	2.7	
5-Oct	Sat	2.5	2.2	5.8	5.3	4.6	
6-Oct	Sun						
7-Oct	Mon						
8-Oct	Tue						
9-Oct	Wed	0.77	2.0	0.89	0.25	0.38	
10-Oct	Thu	0.25	4.6	3.0	0.51	0.82	
11-Oct	Fri	1.8	3.2	6.5	1.8	1.4	
12-Oct	Sat	1.5	3.1	0.24	1.5	1.5	
13-Oct	Sun						
14-Oct	Mon						
15-Oct	Tue						
16-Oct	Wed	0.63	2.2	3.5	1.9	0.28	0.018
17-Oct	Thu	0.22	0.24	1.7	1.3	0.53	0.14
18-Oct	Fri	0.32	0.25	1.0	1.0	0.64	0.094
19-Oct	Sat	0.51	0.93	1.3	1.0	0.64	0.43
20-Oct	Sun						
21-Oct	Mon						
22-Oct	Tue						
23-Oct	Wed	0.11	0.30	0.85	0.50	0.49	
24-Oct	Thu	2.4	1.7	3.0	2.0	2.2	
25-Oct	Fri	3.1	3.3	4.4	1.0	0.41	
26-Oct	Sat	0.39	0.32	0.75	0.60	0.35	

Units: ppbv
(--)=invalidated or lost samples

4.2.2. Statistical Description of Data

Table 16-A contains a statistical summary of the results from the Monterey/Santa Cruz Counties data set. Table 16-B contains statistics from this data set for the individual sampling sites. Table 16-C contains the weekly concentrations by sampling site. Figure 10 shows a plot of the weekly site concentrations.

Number	158
Max	16
Min	0.004
Overall Normal Ave.	2.3
95% Conf. Lim.	0.40
Overall Std Dev.	2.6
95th Percentile	2.7
Geometric mean	1.4
Median	1.5
Lognormal Ave.	2.6

Units: ppbv

Table 16-A. Monterey/Santa Cruz Counties Data Description

Site Specific	**MAQ**	**BBC**	**WAT**	**FRM**	**CPW**
Number	32	32	31	32	31
Max	4.5	6.3	16	14	11
Min	0.077	0.004	0.24	0.25	0.28
Normal Average	1.1	2.1	3.7	2.6	2.1
95% Conf.	0.37	0.61	1.3	1.0	0.73
Std Dev	1.1	1.8	3.7	3.0	2.1
95th Percentile	1.5	2.7	5.0	3.6	2.8
Geometric Mean	0.69	1.2	2.4	1.6	1.4
Median	0.78	1.7	3.0	1.7	1.5
Lognormal	1.2	3.3	4.0	2.6	3.2

Units: ppbv

Table 16-B. Monterey/Santa Cruz Counties Sampling Site Data Description

Week	**MAQ**	**BBC**	**WAT**	**FRM**	**CPW**
9/4/02	0.88	2.49	7.13	6.64	2.08
9/11/02	0.44	0.91	1.54	1.32	1.47
9/18/02	2.62	5.35	8.44	5.31	4.77
9/25/02	0.29	0.62	2.65	1.49	1.98
10/2/02	1.79	1.74	4.26	2.81	3.48
10/9/02	1.06	3.22	2.64	1.03	1.02
10/16/02	0.42	0.92	1.86	1.30	0.52
10/23/02	1.49	1.41	2.25	1.01	0.86

Table 16-C. Weekly Monterey/Santa Cruz Counties Sampling Site Concentrations

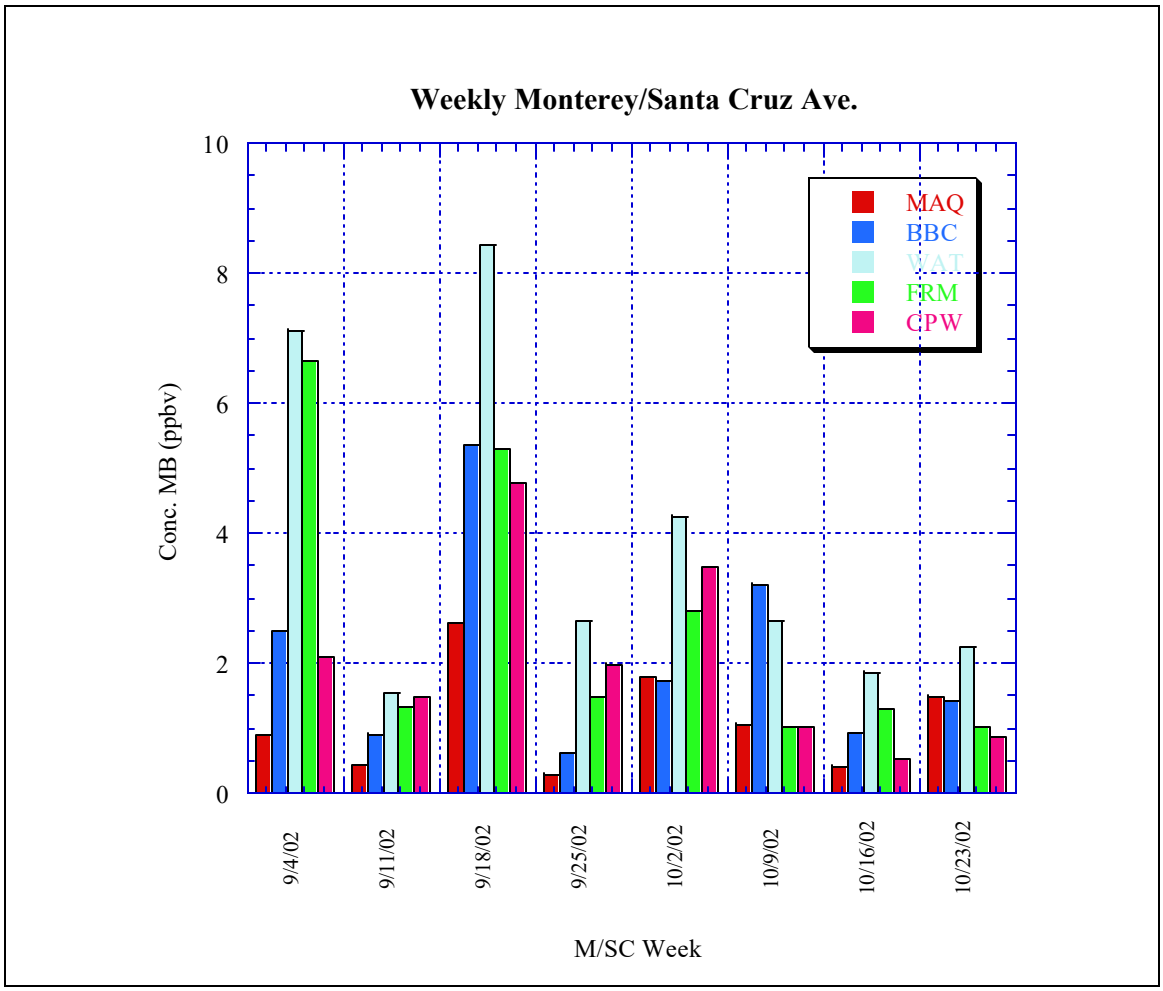

Figure 10. Plot of Weekly Monterey/Santa Cruz Counties Concentrations by Sampling Sites

4.2.3. Meteorological Data

Figures 11 and 12 show the wind roses for Watsonville and Salinas, respectively. The wind field is substantially different for the two locales due to the differences in terrain. In Watsonville, the wind comes primarily from the west in an on-shore pattern, plus a component of an off-shore pattern consistent with coastal areas. This wind pattern suggests that much of the fumigations that occur to the west of the city would produce impacts to the east. In addition, the on/off-shore pattern would reverse that tendency and disperse emissions from the east and northeast toward the city again.

The wind pattern for Salinas reflects the valley in which it sits at the entrance. The wind comes from the northwest, with a partial pattern from the southeast, in a remnant of the on-

shore/off-shore pattern. This pattern would affect the transport of emissions from the higher use area around Watsonville.

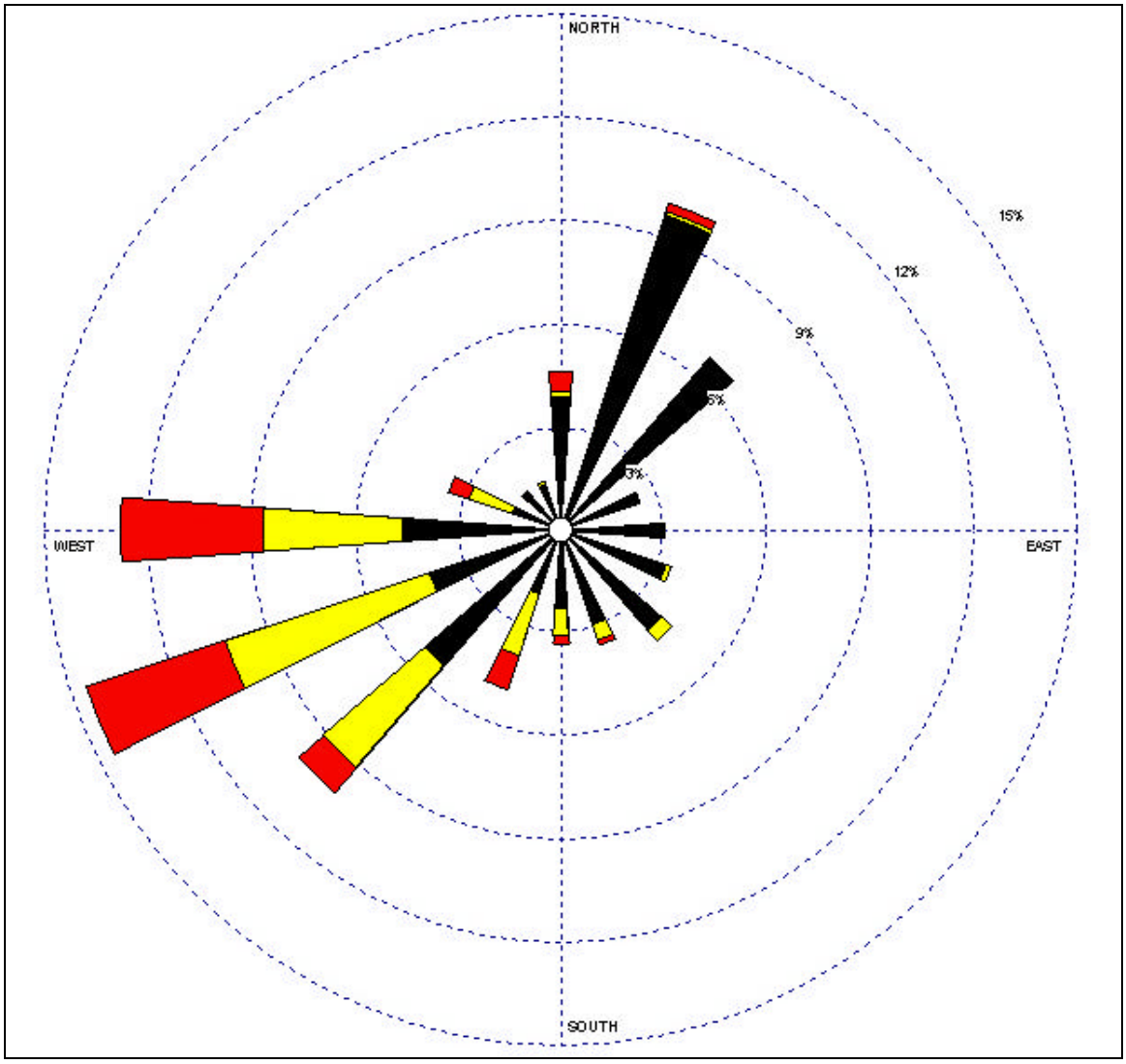

Figure 11. Watsonville Wind Rose

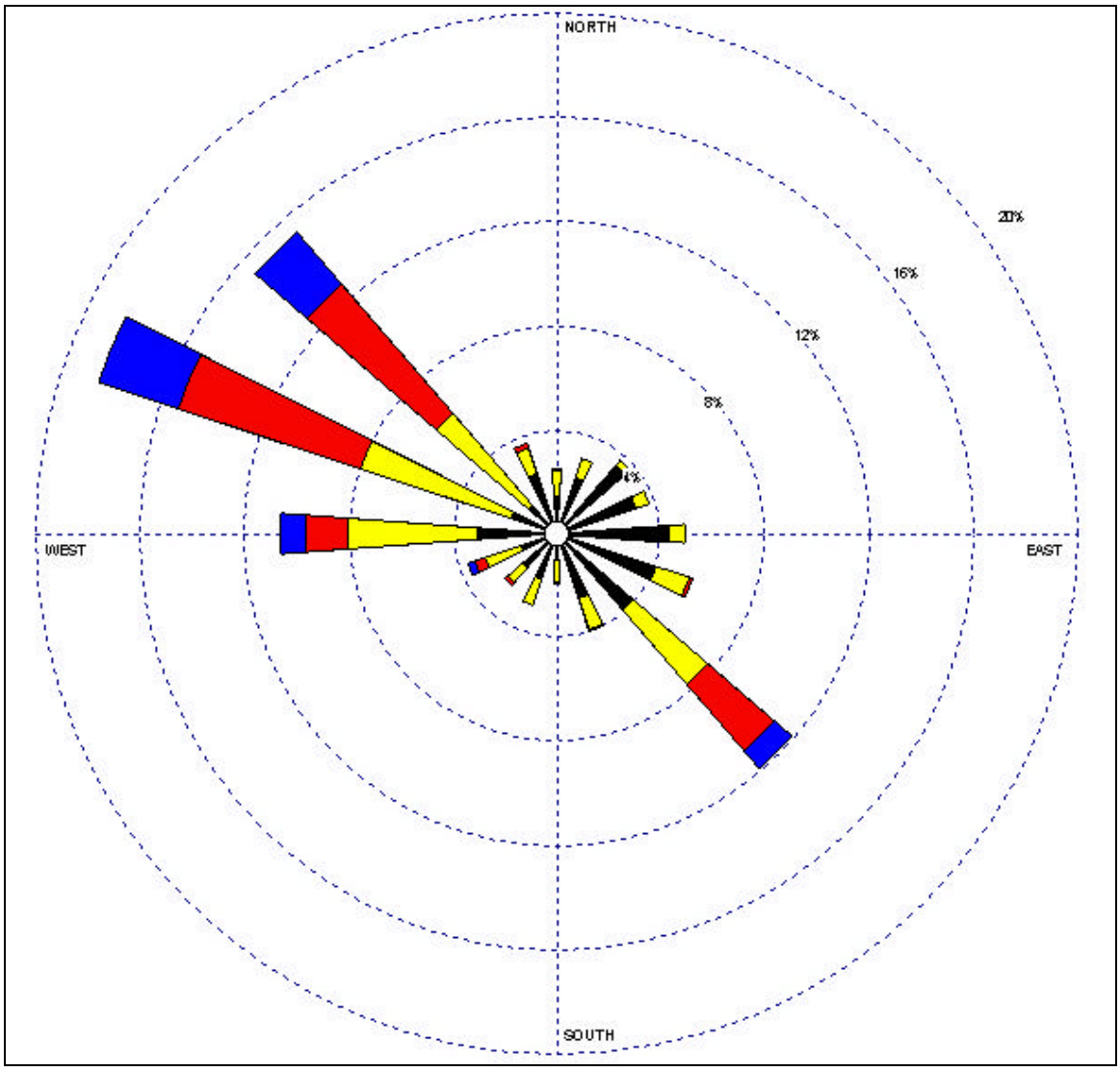

Figure 12. Wind Rose for Salinas Area

4.3 Background Data

The background data was collected in several different locations, as noted in Table 17.

The data collected in San Luis Obispo, with an average of 0.029 ppbv, is lower than what was found in 2001, an average of 0.084 ppbv. With an average of 0.249 ppbv, the background data from Santa Cruz were considerably higher than other background locations. Several of the measured concentrations are similar to regular ambient levels detected at the regular sampling locations.

The background data collected at other locations in California averaged 0.014 ppbv. The lowest level at 0.009 ppbv is from the marina Berkeley which is affected by winds coming directly through the Golden Gate bridge that originate in the Pacific Ocean. The concentration collected at Sylmar (Northern LA area) is close to that collected far inland from any fumigation sources—Mountain Pass, California, a point approximately 50 miles south of Las Vegas on the Nevada/California border. As this is a distinct desert area, no fumigations would be expected in the area

Background			
Location	**Date**	**Sample**	**Average**
Santa Cruz, CA	9/11/2002	0.124	0.247
	9/12/2002	0.235	
	9/13/2002	--	
	9/14/2002	0.685	
	10/16/2002	0.018	
	10/17/2002	0.140	
	10/18/2002	0.094	
	10/19/2002	0.432	
San Luis Obispo, CA	10/16/2002	0.035	0.029
	10/17/2002	0.032	
	10/18/2002	0.044	
	10/19/2002	0.063	
	11/6/2002	0.031	
	11/7/2002	0.012	
	11/8/2002	0.010	
	11/9/2002	0.005	
Sylmar, CA	6/25/2002	0.011	0.014
Mountain Pass, CA	6/27/2002	0.013	
SJ, CA Valley	6/24/2002	0.024	
Berkeley, CA Marina	7/2/2002	0.009	

Units: ppbv

Table 17. Background Data

4. Comparison with Past Data

Comparisons with past data are useful for elucidating trends. For the data in this report, the most direct comparison can be made for the Monterey/Santa Cruz data set, as the two data sets were collected during the exact time period from year to year. The sampling sites did differ, which may explain part of the differences.

A comparison with past data is contained in Table 18 which contains the 2001 DPR data alongside the 2002 AMBI data. Table 19 contains site specific data from the two years. The data in Table 18 show that the overall 95th percentile concentration is lower in 2002 compared to 2001, 2.7 ppbv vs. 3.8 ppbv.

Year	2001 (DPR)	2002 (AMBI)
Number	144	158
Max	37	16
Min	0.069	0.004
Overall Normal Ave.	2.9	2.3
95% Conf. Lim.	0.83	0.40
Overall Std Dev.	5.1	2.6
95th Percentile	3.8	2.7
Geometric mean	1.1	1.4
Median	1.0	1.5
Lognormal Ave.	2.9	2.6

Units: ppbv

Table 18. Comparison of 2001 and 2002 Data

Part of the reason for this lower concentration can be seen from examining individual site concentrations. Table 19 contains the site-specific concentration data. While the DPR and AMBI sites differed, the spatial siting appears to be of less effect than the proximity to active fields. The LJE and MES sites from 2001 had substantially higher concentrations than the BBC and FRM sites in 2002. Both the LJE and MES sites were considerably closer to active agricultural areas where fumigations were possibilities. For example it was noted that the MES site was just a few hundred feet from an active strawberry field. Although no notes pertaining to a fumigation that impacted the data set are recorded, the proximity to active agricultural areas may be an explanation for the observed difference. The observed differences are consistent with the locations of the sampling sites, confirming the need for sampling sites away from agricultural areas.

	2001 DPR Monitoring						2002 AMBI Monitoring				
Site	**SAL/MAQ**	**LJE/BBC**	**PMS/WAT**	**MES/FRM**	**SES/CPW**		**MAQ/SAL**	**BBC/LJE**	**WAT/PMS**	**FRM/MES**	**CPW/SES**
Number	31	32	30	26	25		32	32	31	32	31
Max	9.3	15	21	37	5.3		4.5	6.3	16	14	11
Min	0.10	0.142	0.15	0.069	0.071		0.077	0.004	0.24	0.25	0.28
Normal Average	1.4	2.9	3.4	6.1	1.2		1.1	2.1	3.7	2.6	2.1
95% C.I..	0.8	1.3	1.7	3.4	0.44		0.37	0.61	1.3	1.0	0.73
Std Dev.	2.3	3.9	4.9	8.9	1.1		1.1	1.8	3.7	3.0	2.1
95th Percentile	2.2	4.2	5.1	9.5	1.6		1.5	2.7	5.0	3.6	2.8
Geometric Mean	0.59	1.1	1.6	2.4	0.8		0.69	1.2	2.4	1.6	1.4
Median	0.48	0.73	1.6	2.5	1.0		0.78	1.7	3.0	1.7	1.5
Lognormal	1.3	3.1	3.4	7.5	1.3		1.2	3.3	4.0	2.6	3.2

4.5 Methyl Bromide Usage Comparison

Comparing the data for methyl bromide use with ambient air concentration was determined to be overwhelming for the timing of this report. The most appropriate approach to presentation of this kind of data would be as a GIS project. Misinformation about the status of the counties GIS capabilities along with a mis-estimation of the level of effort to perform such an analysis lead to a shortage of time to complete this aspect. Santa Cruz County has advanced capabilities in this regard, but Monterey and Ventura Counties do not have adequate information available for even a simple exploration.

Therefore, this interpretation is left open for future efforts.

5. CONCLUSIONS

Ambient air monitoring for Ventura, Monterey, and Santa Cruz Counties has been conducted during the periods of high use of July and August for Ventura, and September and October for Monterey/Santa Cruz. Four sampling locations were monitored for four days each over an eight week period in Ventura, and 5 locations in Monterey/Santa Cruz. Samples were collected at sites selected to provide insight into the exposure patterns for the populated areas surrounding the regular fumigation areas. Samples were collected over 24-hours and analyzed for concentrations down to 0.003 ppbv.

The measured concentrations varied from close to the detection limit up to tens of ppbv. Usage data for correlation of these measured concentrations is available but was too complex for a rapid processing and interpretation.

References

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