2002
ANNUAL *DATA QUALITY* REPORT

AIR RESOURCES BOARD
MONITORING AND LABORATORY DIVISION

2002

Annual *Data Quality* Report

for the

Monitoring and Laboratory Division's
and
Local Districts' Air Monitoring Networks

The Report was Prepared by
Julie Cooper

Approved By
Michael Miguel

Air Resources Board
Monitoring and Laboratory Division
Quality Assurance Section

July 2004

Table of Contents

Appendices

Appendix A: Air Monitoring Network Survey

Appendix B: Precision Data Analysis by District for Useable Data

Appendix C: Siting Criteria Distances

Appendix D: Quality Assurance Instrument Control Limits

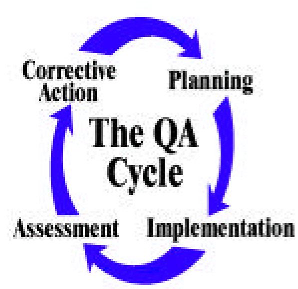
References

I. INTRODUCTION

The purpose of this report is to provide ambient air quality data users with a summary of the quality of the 2002 ambient data in quantifiable terms. This is the fifth edition of the report and presents an overview of various quality assurance and quality control activities. The tables included in this report provide summary data for ambient air monitoring stations in the statewide network.

The California Air Resources Board's (ARB) mission is to promote and protect public health, welfare, and ecological resources through effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the State. The Monitoring and Laboratory Division (MLD) provides a key element of that mission through collecting and reporting on quality information on a large number of pollutants and for a vast air monitoring network. The MLD, directed by State law, conducts ambient air monitoring in support of ARB, local air pollution control and air quality management districts (districts), and the United States Environmental Protection Agency (U.S. EPA). Monitoring programs include gaseous criteria and non-criteria pollutants, particulate matter, toxic air contaminants, non-methane hydrocarbons, pesticides, dioxins, asbestos, consumer products, meteorological parameters, and visibility. Data from these monitoring sources provide the means to determine the nature of the pollution problem and assess the effectiveness of the control measures and programs. The MLD mission includes supporting the regulatory and assessment programs of the Board.

It is the goal of MLD to provide accurate, relevant, and timely measurements of air pollutants and their precursors to support California's Air Quality Management Program for the protection of public health. The Quality Assurance Section (QAS) conducts various quality assurance activities to ensure that data collected comply with procedures and regulations set forth by the U.S. EPA and can be considered good quality data and data-for-record.



What is quality assurance? Quality assurance is an integrated system of management activities that involves planning, implementing, assessing, and assuring data quality through a process, item, or service that meets users needs for quality, completeness, representativeness and usefulness. Known data quality enables users to make judgements about compliance with air quality standards, air quality trends and health effects based on sound data with a known level of confidence. The objective of quality assurance is to provide accurate and precise data, minimize data loss due to malfunctions, and to assess the validity of the air monitoring data to provide representative and comparable data of known precision and accuracy.

Quality assurance is composed of two activities: quality control and quality assessment. *Quality control* is composed of a set of internal tasks performed routinely at the instrument level that ensures accurate and precise measured ambient air quality data. Q*uality control* tasks address sample collection, handling, analysis, and reporting.

Examples include calibrations, routine service checks, chain-of-custody documentation, duplicate analyses, development and maintenance of standard operating procedures, and routine preparation of quality control reports.

Quality assessment is a set of external, quantitative tasks that provide certainty that the quality control system is satisfactory and that the stated quantitative programmatic objectives for air quality data are indeed met. Staff independent of data generators performs these external tasks. Tasks include conducting regular performance audits, on-site system audits, interlaboratory comparisons, and periodic evaluations of internal quality control data. Table 1 illustrates the types of performance audits currently performed by the ARB for each air monitoring program. Field and laboratory performance audits are the most common. System audits are performed on an as-need basis or by request. Whole air sample comparisons are conducted for the toxic air contaminants and non-methane hydrocarbon programs.

Table 1. Audits Performed for Each Air Monitoring Program in 2002

Air Monitoring Program	Field Performance Audit	Laboratory Performance Audit	System Audit	Whole Air Audit
Gaseous Pollutants	X	X	Future	
Particulate Matter	X	X	X	
Toxic Air Contaminants	X	X		X
Non-Methane Hydrocarbons	X	X	X	X
Pesticides	X			
Dioxin/Furans and PCBs	Future	Future	Future	
Asbestos	Future			
Consumer Products		X		
Meteorology	X		Future	

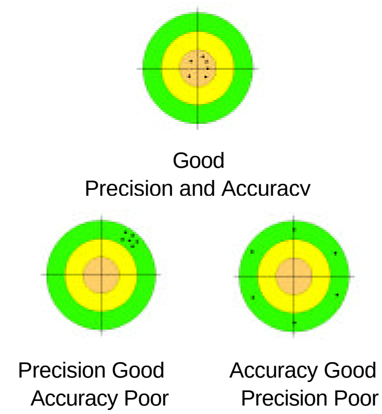
II. QUALITY CONTROL AND QUALITY ASSESSMENT

The QAS supports all ambient monitoring programs undertaken by MLD, which in 2002 includes gaseous pollutants, particulate pollutants, toxic air contaminants, non-methane hydrocarbons, pesticides, dioxin/furans and PCBs, asbestos, consumer products, and meteorologic sensors run by the ARB and local and private air monitoring agencies. There are approximately 230 air monitoring sites in 14 separate air basins operating in California. Over the years, the QAS provided audit support for the Mexico ambient air monitoring program; but due to budget constraints and quality control related issues, audit support concluded in June 2002.

Appendix A provides information about the air monitoring network (i.e., sampling schedules, number of instruments, collection/analysis method, etc.). The information in Appendix A is also available at the following Internet site under Air Monitoring Activities at http://www.arb.ca.gov/aaqm/qmosqual/qmosqual.htm.

Information about each air monitoring station audited by the ARB is available at http://www.arb.ca.gov/qaweb/. The web site includes maps of each site, latitude and longitude coordinates as determined by GPS, site photos, precision and accuracy data, and a detailed survey of the physical parameters and conditions at each site. The site surveys list in-depth monitoring information such as traffic descriptions, calibration dates, distances to trees and obstacles, and residence times. This site also includes an area for District precision and accuracy reports. These reports are available on a limited basis to District staff.

The air quality monitors collect data in both real-time and on a time integrated basis. The data are used to define the nature, extent, and trends of air quality in the State; to support programs required by State and federal laws; and to track progress in attaining air quality standards. The precision and accuracy necessary depends on how the data will be used. The illustration to the right shows the relationship between precision and accuracy. From the figure, it is evident how important having good precision and accuracy is to ensuring good data quality. Data that must meet specific requirements (i.e., criteria pollutants) are referred to as *controlled data sets*. Criteria for the accuracy, precision, completeness, and sensitivity of the measurement in controlled data sets must be met and documented.



Air Quality Data Actions (AQDAs) are a key tool used by the QAS to confirm the data set meets the established control limits. They are initiated generally by auditors upon a failed audit and resolved after a review of calibrations, precision checks, and audit results. The AQDA must confirm that an analyzer/sampler has operated within ARB's control limits of +/-15% (+/-10% for PM10 and +/-4% for PM2.5), or for siting or temperature conditions otherwise, further action is taken.

Data without formal data quality objectives (i.e., toxics) are called *descriptive data sets*. The data quality measurements are made as accurately as possible in consideration of how the data are being used. Quantified quality assessment results describe the measurement variability in standard terminology, but no effort is made to confine the data set to values within a predetermined quality limit.

The ARB's Quality Assurance Program is outlined in a six-volume *Quality Assurance Manual*. The volumes, listed below, guide the operation of the quality assurance programs used by the ARB, local districts, and private industry in California.

Volume I	Quality Assurance Plan
Volume II	Standard Operating Procedures for Air Quality Monitoring
Volume III	Laboratory Standard Operating Procedures
Volume IV	Monitoring Methods for the State Ambient Air Quality Standards
Volume V	Audit Procedures for Air Quality Monitoring
Volume VI	Standard Operating Procedures for Stationary Source Emission Monitoring and Testing

The six-volume Quality Assurance Manual is available on the Internet at http://www.arb.ca.gov/aaqm/qmosqual/qamanual/qamanual.htm. Volume I lists the data quality objectives and describes quality control and quality assessment activities used to ensure that the data quality objectives are met.

A. Gaseous Pollutants

Ambient concentrations of carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2), and hydrogen sulfide (H2S) are continuously monitored by an automated network of stations run by MLD and the districts. Non-criteria pollutants such as methane (CH4) and total hydrocarbons (THC) are also monitored continuously as precursors for criteria pollutants to help ensure the ambient air quality standards are met. Exposure to these pollutants cause adverse health effects which include respiratory impairment, fatigue, permanent lung damage, and increased susceptibility to infection in the general population. Gaseous criteria and non-criteria pollutant data are a controlled data set and are subject to meeting mandatory regulations.

Sampling Cane

Accuracy (field): Annually, the QAS conducts field through-the-probe (TTP) performance audits for gaseous pollutants (criteria and non-criteria) to verify the system accuracy of the automated methods and to ensure the integrity of the sampling system.

Accuracy is represented as an average percent difference. The average percent difference is the combined differences from the certified value of all the individual audit points. The upper and lower probability limits represent the expected accuracy of 95 percent of all the single analyzer's individual percent differences for all audit test levels at a single site. Audit results were not used in statistical analysis if the audit was invalidated due to an AQDA that resulted in data invalidation.

Overall, the responses of the individual analyzers indicate that as a whole, the network is providing accurate data. Ninety-five percent of the instruments audited in 2002 were found to be operating within the ARB's control limits (+/-15%). The most common causes for audit failure are malfunctions within the instrument and leaks in the sampling system. Instruments operating outside of ARB's control limits resulted in 964 days of invalidated data and 7 days of corrected data. Table A1 summarizes the 2002 performance audit results for the criteria pollutants. Further information about the air monitoring systems and the audit procedures are available at http://www.arb.ca.gov/aaqm/qmosqual/sysaudit/criteria/qa_gas.htm.

Table A1. **2002 Results for Criteria Pollutants Performance Audits Conducted by ARB**

Pollutant	Number of Analyzers Audited	Number of AQDAs	Average % Difference	Probability Limits 95%UL	95%LL
CO	74	9	0.4	7.6	-6.8
NO2	95	6	1.1	11.0	-8.8
O3	160	5	-1.6	5.6	-8.8
SO2	34	2	-0.1	10.9	-11.1
H2S	7	1	-2.4	9.3	-14.1

Source: Quality Assurance Section, Accuracy Estimates

In addition, full system audits were initiated for the San Luis Obispo Co. Air Pollution Control District (SLOAPCD) and Santa Barbara Co. Air Pollution Control District (SBAPCD). Audit results will be presented in the 2003 report.

Precision (field): Precision checks (zero and span) are performed by site operators on a nightly basis to confirm the linear response of the instrument. The zero precision check confirms the instrument's ability to maintain a stable reading. The span precision check confirms the instrument's ability to respond to a known concentration of gas. The degree of variability in each of these nightly measurements is computed as the precision of that instrument's measurements.

Annually, the QAS conducts a precision data analysis as an overall indicator of data quality. The analysis addresses three parameters: precision data submission, precision data validity, and a combination of the two referred to as data usability rates. The precision performance goal for all three parameters is 85%. The submission rate is the number of precision points submitted for a pollutant divided by the expected number of bi-weekly submissions. Data validity is the percent difference of the actual and indicated values of each precision check. These differences should not exceed +/-15% for gaseous analyzers. Usable data rates are determined by multiplying the data submission and data validity rates; and indicate the completeness of verifiable air quality data on the official database. Overall, the precision data showed that there was an overall increase in the amount of precision data submitted as well as corresponding improvements in validity and useable data rates. However, there was a decrease for all three NO_2 precision parameters. Table A2 shows the statewide submission, validity, and usable data rates for each pollutant. For a more detailed description of the usability data rates for each district, please refer to Appendix B.

Table A2. **2002 Criteria Pollutants Precision Analysis Results for California**

Pollutant	Submission Rate	Validity Rate	Usable Rate
CO	84%	100%	84%
NO_2	81%	100%	81%
O_3	83%	98%	82%
SO_2	90%	99%	89%
H_2S	99%	100%	100%

Source: Quality Assurance Section, Precision Data Analysis

B. Particulate Matter

Particulate Samplers

Particulate matter is a mixture of substances that include elements such as carbon and metals; compounds such as nitrates, organic compounds, and sulfates; and complex mixtures such as diesel exhaust and soil. Particles with an aerodynamic diameter of 10 microns or smaller pose an increased health risk because they can deposit deep in the lung and contain substances that are particularly harmful to human health. Respirable particulate matter (PM10) and fine particulate matter (PM2.5) increase the chance of respiratory disease, lung damage, cancer, and premature death. Particulate matter monitoring is conducted using both manual and continuous type samplers. Manual samplers are operated on a six-day sampling schedule for PM10, and a similar, or more frequent schedule, for PM2.5. ARB's particulate program also includes total suspended particulates (TSP) sulfate, mass and lead monitoring. Particulate matter is a controlled data set and as such is subject to formal data quality objectives and federal and State regulations. For additional information about the Particulate Matter Monitoring program, visit the Particulate Matter home page at http://www.arb.ca.gov/aaqm/partic.htm.

Accuracy (field): The accuracy of particulate samplers is determined using a certified variable orifice (PM10 and TSP), or a calibrated mass flow meter (TEOM, BAM, and PM2.5 samplers) that is certified against a National Institute of Standards and Technology (NIST) traceable flow device or calibrator. Since an accurate measurement of particulate matter is dependent upon flow rate, the ARB conducts annual flow rate audits at each site. The average percent difference between the sampler flow rates and the audit flow rates represents the combined differences from the certified value of all the individual audit points for each sampler. The upper and lower probability limits represent the expected flow rate accuracy for 95 percent of all the single analyzer's individual percent differences for all audit test levels at a single site. Audit results were not used in the statistical analysis shown here if the audit was invalidated due to an AQDA that resulted in data invalidation.

Overall, the 2002 flow audit results indicate that the flow rates of samplers in the network are generally within bounds. Ninety-two percent of the instruments audited in 2002 operated within the ARB's control limits. Instruments operating outside the control limits again typically had an improper set-point of the mass flow controller or drift that was not discovered. Under normal operation, the set-point of the mass flow controller should compensate for a change in temperature and pressure. Instruments operating outside of ARB's control limits resulted in 3,591 days of invalidated data. The 2002 performance audit results are listed below in Table B1. The TSP data accuracy estimates include samplers that analyze for mass and/or sulfates and/or lead. Because of the developing PM2.5 network, sampling and analyses of the dichotomous particulates was discontinued at the end of 2001, thus audits were not conducted in 2002.

***Table B1*. 2002 Results for Particulate Sampler Performance Audits Conducted by ARB**

Pollutant	Number of Samplers Audited	Number of AQDAs	Average % Difference	Probability Limits	
				95%UL	95%LL
PM2.5	93	4	0.2	3.9	-3.5
PM10	145	12	-0.1	6.1	-6.3
PM10 Partisol	26	0	-0.6	4.3	-5.5
TEOM	28	8	-2.1	3.9	-8.1
BAM PM10	3	2	0.4	9.1	-8.3
BAM PM2.5	24	5	0.7	5.7	-4.3
TSP	14	1	-0.1	11.7	-11.9.

Source: Quality Assurance Section, Accuracy Estimates

In addition, full system audits were initiated for the San Luis Obispo Co. Air Pollution Control District (SLOAPCD) and Santa Barbara Co. Air Pollution Control District (SBAPCD). Audit results will be presented in the 2003 report. QAS staff also conducted a system audit of the ARB's Air Quality Surveillance Branch's (AQSB) PM2.5 field operations program to determine if the program satisfied the U.S. EPA regulations (as stipulated in 40 CFR). The system audit findings concluded that the AQSB PM2.5 field operations complied with the U.S. EPA regulations (set forth in 40 CFR Part 50, Appendix L) and that the data generated were of good quality and should be considered data-for-record.

Precision (field): Precision data for non-continuous particulate samplers is obtained through collocated sampling whereby two identical samplers are operated side-by-side and the same laboratory conducts filter analyses. Collocated samplers are located at selected sites and are intended to represent overall network precision. Validity of the data is based on the percent difference of the mass concentrations of the two samplers. In 2002, collocated PM2.5 samplers were operated at Fresno-First, South Lake Tahoe, Truckee, Sacramento Del Paso Manor, and Yuba City sites. Collocated PM10 samplers were operated at Bakersfield-California, Visalia, Corcoran-Patterson, and Taft-College sites. Collocated TSP samplers were operated at the Bakersfield-California and San Diego 12th St. sites.

Particulate samplers (collocated PM10 and TSP) must have mass concentrations greater than or equal to 20µg/m3 to be used in data validity calculations. The difference between the mass concentrations must be no greater than 5µg/m3. If the mass concentrations are greater than 80µg/m3, the difference must be within +/-7% of each other. TSP (Pb) samplers must have both mass concentrations greater than or equal to 0.15µg/m3 to be used in data validity calculations. For collocated PM2.5 samplers, data validity is based on the sampler's coefficient of variation, which cannot exceed 10%. Both sample masses must also be greater than 6µg/m3.

Continuous TEOM and BAM precision is based on the comparison of the sampler's/analyzer's indicated and actual flow rates. The differences between the flow rates must be within +/-15%. The particulate sampler precision analysis results for 2002 are available in Table B2.

Overall, the precision data showed that there was an overall increase in the amount of precision data submitted as well as corresponding improvements in validity and useable data rates. However, there continues to be a problem with the submission of particulate matter precision data. For a more detailed description of the usability data rates for each district, please refer to Appendix B.

***Table B2*. 2002 Particulate Sampler Precision Analysis Results for California**

Pollutant	Submission Rate	Validity Rate	Usable Rate
PM2.5	51%	92%	49%
PM10	79%	94%	74%
PM10 Partisol	100%	100%	100%
TEOM	24%	75%	27%
BAM PM2.5	NA	NA	NA
BAM PM10	NA	NA	NA
TSP	47%	NA	NA

Source: Quality Assurance Section, Precision Data Analysis

Accuracy (lab): Annual performance audits for PM10 and PM2.5 mass analysis programs include an on-site check and assessment of the filter weighing balance, relative humidity and temperature sensors, and their documentation. The performance audits conducted in 2002 found that the district programs were operating in accordance with U.S. EPA guidelines and that the data were of good quality and should be considered data-for-record. Table B3 summarizes the performance audit findings.

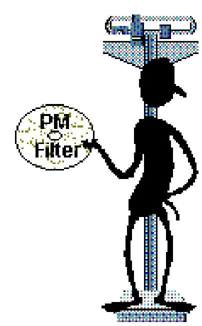


***Table B3*. 2002 PM10 and PM2.5 Particulate Matter Mass Analysis Performance Audits**

District	Conducted	Pass/Fail
California Air Resources Board (PM10 and PM2.5)	02/13/02	Pass
Bay Area AQMD (PM 2.5 only)	12/12/02	Pass
Great Basin UAPCD (PM10 and PM2.5)	06/13/02	Pass
Lake County AQMD (PM10 and PM2.5)	05/23/02	Pass
Mojave Desert AQMD (PM10 and PM2.5)	02/26/02	Pass
Monterey Bay Unified APCD	04/11/02	Pass
North Coast Unified AQMD	08/08/02	Pass
No. Sierra AQMD	09/30/02	Pass
No. Sonoma Co. APCD	12/03/02	Pass
Placer Co. APCD	02/14/02	Pass
Sacramento Metropolitan AQMD	02/13/02	Pass
San Luis Obispo Co. APCD	05/02/02	Pass
San Diego County APCD (PM 2.5 only)	10/23/02	Pass
Santa Barbara Co. APCD	06/06/02	Pass
Siskiyou Co. APCD	08/13/02	Pass
South Coast AQMD (PM 2.5 only)	07/26/02	Pass
Ventura Co. APCD (PM10 and PM2.5)	07/22/02	Pass

Laboratory audits were are also conducted for the PM10 ions program using NIST-traceable filter standards for nitrate (NO3-), sulfate ($SO4^{-2}$), chloride (Cl-), ammonium (NH4+), and potassium (K+). Audit results for the NLB ions program (conducted in the 1st and 3rd quarters of 2002) were within the targeted +/- 20% control limit established for the audit procedure. Laboratory audits for the TSP (Pb) program were conducted using NIST-traceable standards. The 2002 audit results were found to be within ARB's +/- 20% control limits indicating that NLB is accurately identifying TSP (Pb).

Precision (lab): Laboratories perform various quality control tasks to ensure that quality data are produced. Tasks include duplicate weighings on exposed and unexposed filters, replicate analysis on every 10th filter, and a calibration of the balance before each weighing session. Upon receipt of particulate matter filters from the field, laboratory staff have up to 30 days to analyze the PM10 and PM2.5 samples. Filters are visually inspected for pinholes, loose material, poor workmanship, discoloration, non-uniformity, and irregularities, and are equilibrated in a controlled environment for a minimum of 24 hours prior to the filters are weighed. If room conditions are not within the established U.S. EPA control limits, weighings are done only after the proper environment is re-established and maintained for 24 hours.

In 2002, there were no occurrences in which ARB's laboratory balance room was outside of control limits. The analytical precision results indicate that ARB is providing precise particulate matter data. Tables B4 and B5 show the unexposed and exposed filter replicate results for ARB's laboratory in 2002.

Table B4. **2002 Summary of ARB's Unexposed Filter Mass Replicates**

QC Checks for Pre-weighed Filters	PM10	PM2.5
Total # samples analyzed	4624	4325
# of replicates	576	749
% replicated	12.4	11.1
# out-of-range	0	0

Source: Inorganics Laboratory Section, Quality Control Report

Table B5. **2002 Summary of ARB's Exposed Filter Mass Replicates**

QC Checks for Post-weighed Filters	PM10	PM2.5
Total # samples analyzed	4339	3393
# of replicates	486	367
% replicated	11.2	10.8
# out-of-range	0	0

Source: Inorganics Laboratory Section, Quality Control Report

C. Toxic Air Contaminants

In 1985, the ARB established an ambient volatile organic compound (VOC) toxic monitoring network in major urban areas of the state to determine the average annual concentrations of toxic air contaminants (TAC). The program was established to assess the effectiveness of control measures in reducing air toxics exposures. Compounds identified as TACs vaporize at ambient temperatures, play a critical role in the formation of ozone, and have adverse chronic and acute health effects. Sources of TACs include motor vehicle exhaust, waste burning, gasoline marketing, industrial and consumer products, pesticides, industrial processes, degreasing operations, pharmaceutical manufacturing, and dry cleaning operations.

Stainless Steel Toxics Canister

Under the current ARB sampling schedule, ambient air is collected in a stainless steel canister (or cartridge) every 12 days over a 24 hour sampling period at each of the network stations. Toxic particulate samples are also collected and analyzed for toxic air contaminants to support the California Toxic Air Contaminant Identification and Control program. By using a low-flow multi-channel sampler capable of sampling onto filters or cartridges, ambient air is collected and analyzed for carbonyl and polycyclic aromatic hydrocarbons (PAH) compounds and toxic metals. The quality of the air toxic data set is governed by a series of quality assurance activities, including audits. However, because this is a descriptive data set, no mandatory corrections are made to the data based on audit results. The laboratory and monitoring staff are made aware of any exceedance found during an audit, and every effort is made to ensure that the data collected is as accurate as possible.

The audit programs contained three elements in 2002: TTP performance audits, laboratory audits, and a whole air comparison check. The audit results and several papers that discuss these elements of the QA program in detail are available at http://www.arb.ca.gov/aaqm/toxics.htm.

Accuracy (field): TTP performance audits for VOCs are typically conducted annually at each air toxic site to assess the accuracy of the total measurement system. System errors can include contamination during transport, artifacts created by the sample pump or the probe, and laboratory bias.

The 2002 TTP performance audit results are shown in Table C1. The values represent the average percent difference for each compound from all audits conducted at ARB sites and analyzed by the ARB Organics Laboratory Section (OLS). The 2002 audit results indicated that 1,3-butadiene, although within acceptable audit criteria, showed some low recoveries, which resulted in an overall high standard deviation.

Table C1. **2002 Toxic Air Contaminants TTP Audit Results for California's Toxic's Network**

Compound	TTP	
	Avg % Diff	Std Dev
Benzene	-4.0	7.2
1,3-Butadiene	-16.1	16.5
Carbon Tetrachloride	-6.9	8.6
Chloroform	-1.7	9.7
ortho-Dichlorobenzene	-11.2	6.6
Ethylbenzene	-9.2	5.8
Methyl Chloroform	-3.6	5.6
Methylene Chloride	0.5	6.2
Perchloroethylene	-12.9	6.2
Styrene	-14.9	7.7
Toluene	-7.2	6.5
Trichloroethylene	-10.0	5.7
m/p-Xylene	-9.1	6.6
o-Xylene	-3.3	5.6

In 2002, a whole air comparison check was also conducted to compare the analytical methods used by all the laboratories that measure ambient concentrations of toxic compounds. The purpose of the comparison check is to confirm the comparability of the analytical methods currently used by those laboratories measuring ambient concentrations of gaseous toxic compounds. A specially designed sampler draws ambient air for 3 hours, filling up to 10 canisters at a time, to an approximate pressure of 14 pounds per square inch gauge (psig) each. A canister is sent to each laboratory for analysis. The laboratories follow their standard operating procedures in assaying the contents and report their results to the QAS for comparison against other participating laboratories. As can be seen below in Figure C1 – C3, the ten participating laboratory's responses compared well for most compounds. If a laboratory's response for a compound was significantly different from the other laboratories, the laboratory was asked to investigate and report the cause.

Figure C1. **2002 Whole Air Comparison Check for Toxic Air Contaminants**
(Continued on next page)

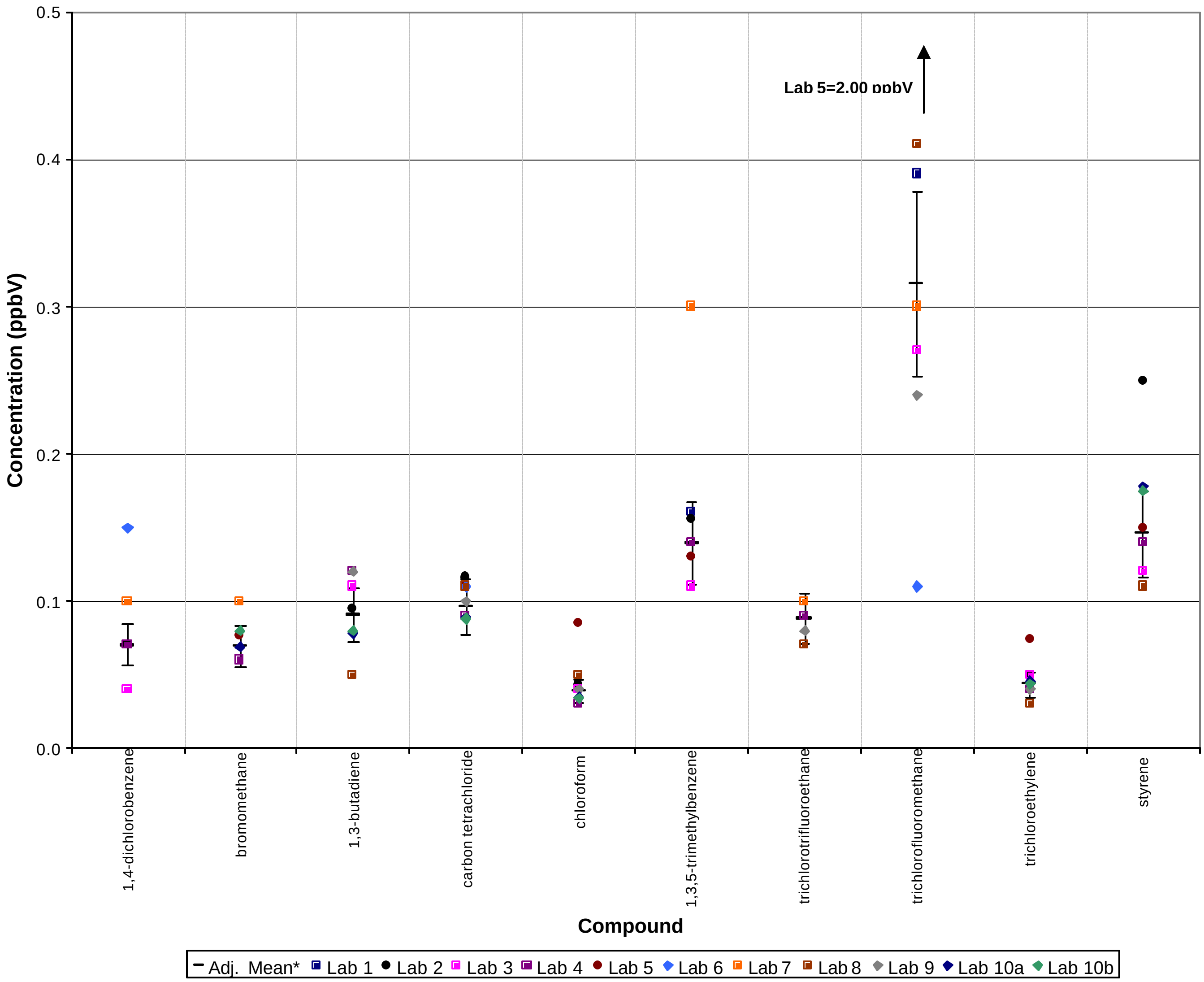


Figure C2. 2002 Whole Air Comparison Check for Toxic Air Contaminants
(Continued on next page)

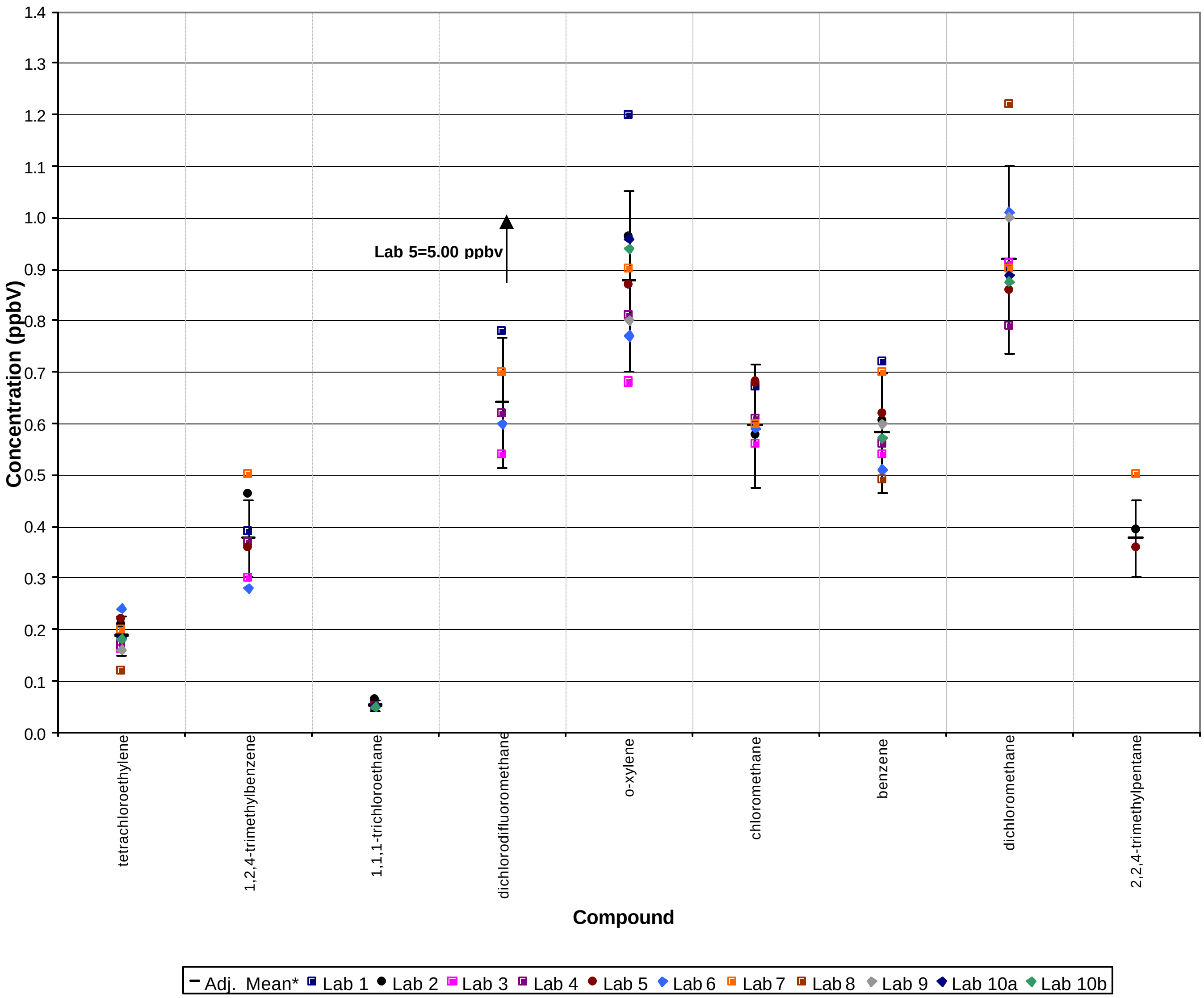
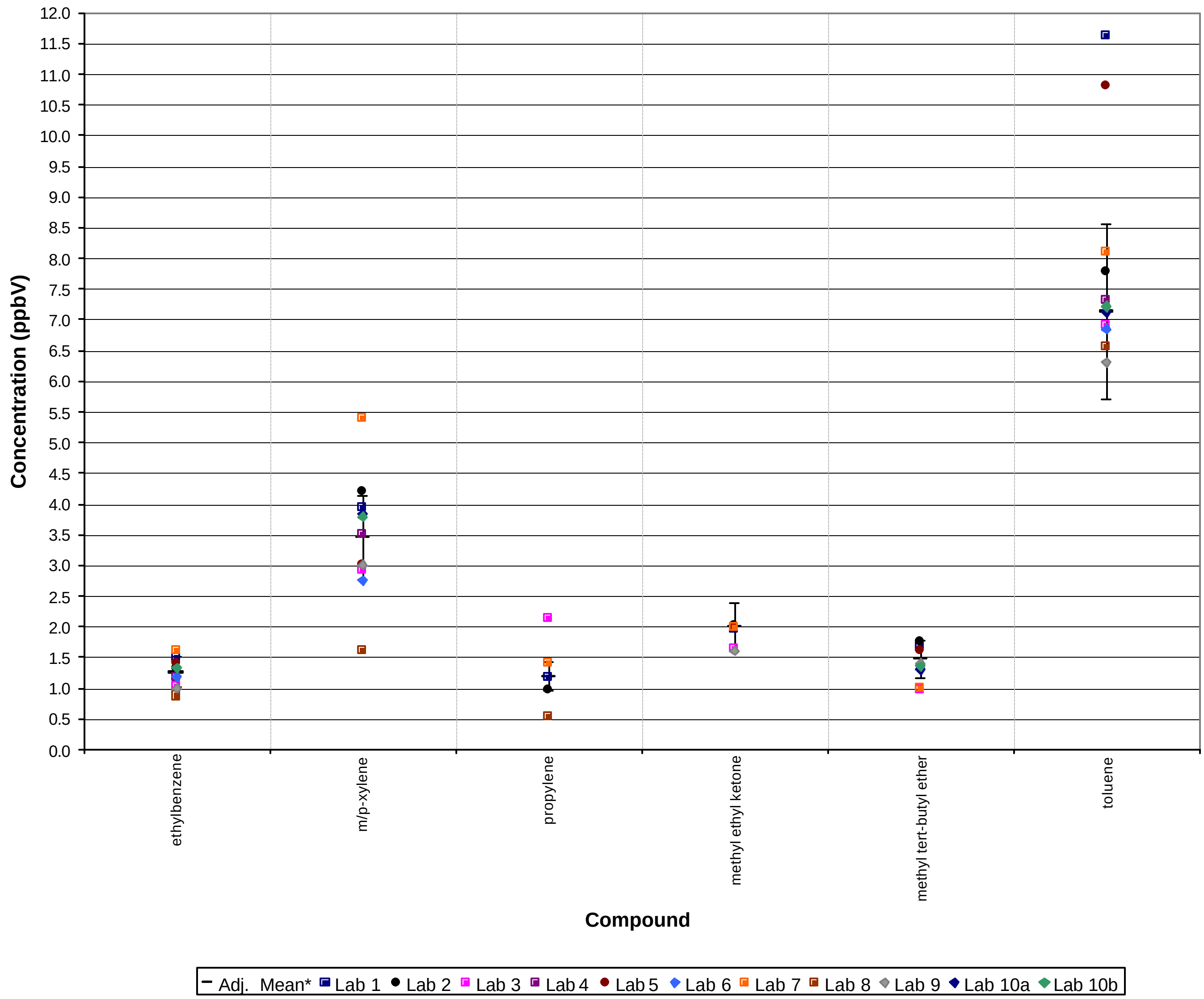


***Figure C3.* 2002 Whole Air Comparison Check for Toxic Air Contaminants**



Flow audits of the toxic metal and carbonyl sampler (shown right) are typically conducted annually at each site to ensure the accuracy of measuring toxic metals and carbonyl compounds. Flow rates are a determining factor in calculating concentration and are included as part of the quality assurance program.

Toxic Metals and Carbonyl Sampler

Overall, the 2002 results indicate that the samplers maintained stable flows. Ninety-four percent of the instruments audited operated within the ARB's control limits of +/-15%. Although toxics data are a descriptive data set, AQDAs are issued based on the operating parameters of the sampler. Corrections are made to the data if an audit is found to be outside the ARB's control limits. Instruments operating outside of ARB's control limits resulted in 52 days of invalidated flow rate data.

Table C2 shows the differences from the certified value of the individual audit points for each pollutant. The upper and lower probability limits represent the expected accuracy of 95 percent of all the single analyzer's individual percent differences for all audit test levels at a single site. Audit results were not used in the statistical analysis shown below if the ambient data was invalidated due to an AQDA.

Table C2. **2002 Results for Toxic Air Sampler Flow Rate Performance Audits Conducted by ARB**

Pollutant	Number of Samplers Audited	Number of AQDAs	Average % Difference	Probability Limits	
				95%UL	95%LL
Cr6+	27	3	2.0	10.3	-6.3
Total Metals	26	1	0.5	7.2	-6.2
Aldehydes	26	1	0.8	9.4	-7.8

Source: Quality Assurance Section, *Accuracy Estimates*

Accuracy (lab): Laboratory performance audits are conducted annually to determine the accuracy of a laboratory to measure ambient VOC concentrations. Summary statistics of ARB's audit results are shown in Table C3. The percent difference presented in the table represents the average difference between the laboratory's measured value and the NIST certified value. The 2002 audit results were within the audit criteria of +/-20%.

Table C3. **ARB's 2002 Toxic Air Contaminants Laboratory Performance Audit Results**

Compound	ARB Laboratory % Diff
Benzene	4.2
Carbon Tetrachloride	18.3
1,3-Butadiene	18.0
Chloroform	-6.3
ortho-Dichlorobenzene	3.9
Ethylbenzene	-2.5
Methyl Chloroform	2.9
Methylene Chloride	1.0
Perchloroethylene	-10.7
Toluene	-1.6
Styrene	-18.8
Methyl tert-Butyl Ether	-1.7
Trichloroethylene	0.0
m/p-Xylene	-1.1
o-Xylene	7.8

Precision (field and lab): As part of the TAC Program laboratory analyses, internal QC techniques such as blanks, control samples, and duplicate samples are applied to ensure the precision of the analytical methods and that the toxics data are within statistical control. Precision data for non-continuous toxics particulate samplers are obtained through collocated sampling whereby two identical samplers operate side-by-side simultaneously and the same laboratory conducts filter analyses. Collocated toxic samplers are located at selected sites and are intended to represent overall network precision. Collocated samplers, located at Bakersfield-California and Riverside-Rubidoux monitoring stations are intended to represent overall network precision.

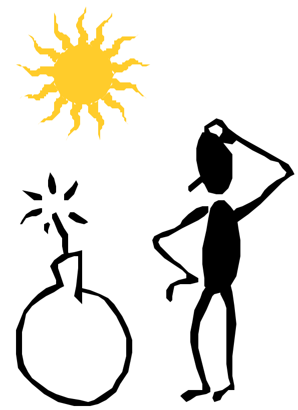
In 2002, all compounds analyzed were well within their respective control limits and results for blanks, spikes, and duplicate samples established in the Laboratory QC Manual. Duplicate analyses were performed on 10% of the toxic samples. In 2002, all duplicate results (concentrations must be greater than five times the published LODs) were within the established limits for all target analytes. Data exceeding duplicate criteria of three times the assigned percent relative standard deviation (from control samples collected during the control limit evaluation) are deleted from the toxics database and samples reanalyzed.

Stainless steel canisters used to collect ambient air samples are also checked for contamination. Canisters are analyzed for aromatic and halogenated hydrocarbons. One canister per batch of eight is assayed to ensure individual compound measurements fall below the limit of detection. In the event a compound exceeds canister cleanliness criteria, the canister and all other canisters represented in the batch are re-cleaned until compounds meet the cleanliness criteria. In addition, Xontech 910A air samplers are checked for cleanliness. Failed air collection media are re-cleaned and re-tested until they pass Xontech 910A cleanliness criteria (Xontech 910A checks are independent of canister batch checks). Overall, the network is providing precise toxic air contaminants data.

The toxics audit results audits, which serve to assure the validity of the toxics data, and several papers that discuss the elements of the QA program in detail are available at http://www.arb.ca.gov/aaqm/qmosqual/perfaudit/toxics/qa_toxic.htm.

D. Non-Methane Hydrocarbons

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS



In 1989, ARB began a routine seasonal sampling program to gather information about non-methane hydrocarbon (NMHC) species that were precursors to ozone formation in high ozone areas. In 1994, Federal regulations required states to establish photochemical assessment monitoring stations (PAMS) as part of their State Implementation Plan monitoring networks in areas designated as serious or higher for ozone. Monitoring is to continue until the ozone standard is reached. The PAMS program is intended to supplement ozone monitoring and add detailed sampling for its precursors. PAMS sites collect data on ozone, oxides of nitrogen, real-time total NMHC, speciated hydrocarbons, carbonyls, and various ground level and aloft meteorological parameters. As this is a descriptive data set, there are currently no mandatory data quality objectives or regulations for the data. However, efforts are made to ensure that accurate data are collected and that the analyzers are operating within ARB's audit standards. Due to limited resources in 2002, the OLS' involvement in the PAMS program was suspended indefinitely.

Three types of ongoing hydrocarbon performance audits are conducted (laboratory, TTP sampler, and TTP continuous analyzer) that support the canister-type collection system and the real-time analyzers. A cross-check is also run by the QAS that allows all laboratories to compare their results from a *whole air sample* representing an identical parcel of air. The whole air sample element of the QA was added after the 1997 South Coast Ozone Study and uses a system developed by QAS staff. Staff presented a paper on the program at the 2000 International Symposium on the Measurement of Toxic and Related Air Pollutants. A copy of the paper as well as other information about the PAMS quality assurance program is available at http://www.arb.ca.gov/aaqm/qmosqual/perfaudit/nmhc/qa_nmhc.htm.

Accuracy (field and lab):
Laboratory performance audits are conducted annually to assess the participating laboratory's ability to measure ambient levels of hydrocarbons. *TTP Sampler* performance audits are typically conducted annually at each monitoring site to assess the integrity of the sampling, analysis, and transport system. TTP sampler audits were suspended for calendar year 2002 because of budgetary constraints.

The 2002 laboratory performance audit results are shown Table D1. The average percent difference represents the combined differences from the certified value for all the laboratories audited. The 2002 audit results were within the ARB's control limits of

+/-20%. Two of the laboratories experienced fluctuating high and low recoveries of 2-methylbutane (isopentane), 2-methylpropane (isobutane), and pentane, which although within acceptable audit criteria, resulted in an overall high standard deviation.

Table D1. **2002 Laboratory NMHC Audit Results for California's PAMS Network**

Compound	Laboratory	
	Avg %Diff	Std Dev
Ethane	3.4	4.6
Propane	1.4	3.8
Propene	-0.4	4.2
2-Methylpropane	3.6	20.0
Butane	0.6	3.1
2-Methylpropene	-8.0	6.2
2-Methylbutane	4.7	13.0
Pentane	1.3	14.1
1-Pentene	-2.3	9.4
Hexane	0.7	3.7
Benzene	-0.5	3.4
Octane	0.7	4.7
Toluene	-2.0	7.0
o-Xylene	-2.0	5.1
Decane	-2.9	6.9

TTP continuous NMHC analyzer performance audits include audits of total NMHC analyzers (i.e., TECO 55). The 2002 TTP continuous analyzer NMHC PAMS audit results are shown in Table D2. The purpose of this table is to estimate the accuracy of the hydrocarbon data in the database. The upper and lower probability limits represent the expected accuracy of 95 percent of all the analyzer's individual percent differences for all audit test levels at a single site. Based on the audit results, eighty-five percent of the instruments audited were found to be operating within the ARB's control limits of +/-15%. Audit results were not used in the statistical analysis (Table D2) if the audit was invalidated due to an AQDA that resulted in data invalidation. Out of control events were again typically due to instruments that were inoperable at time of the audit, contamination of the analyzers clean air source, and inconsistent span check readings. Instruments operating outside of ARB's control limits resulted in 135 days of invalidated data and 102 days of corrected data.

***Table D2*. 2002 Results for TTP Continuous Analyzer NMHC PAMS Audits**

Pollutant	Number of Analyzers Audited	Number of AQDAs	Average % Difference	Probability Limits 95%UL	95%LL
NMHC	17	3	2.4	13.2	-8.4.

Source: Quality Assurance Section, Accuracy Estimates

The *Whole Air Sampler* performance checks are a valuable complement to the TTP and laboratory audits. Specifically they are a means of assessing performance using a sample that includes non-target species and other aspects of a real world sample that could potentially affect sample results. It involves all California PAMS laboratories that measure ambient concentrations of hydrocarbons as well as others choosing to participate. The performance check uses a specially designed sampler that draws ambient air for 3 hours into 10 canisters at a time. They reach approximately 14 pounds per square inch gauge (psig) each. This replicates a normal sample duration and pressure. A canister is sent to each participating laboratory for speciated NMHC analysis. The laboratories follow their standard operating procedures in assaying the contents and report their results to the QAS.

The 2002 Whole Air Comparison Check results are shown in Figure D1. Based on the results, the laboratory responses compared well for most compounds. If a laboratory's response for a compound was significantly different from the other laboratories, the laboratory was asked to investigate the cause. The results for 2-methylpropane (isobutane) and pentane, which were of slight concern in the laboratory audits because of high standard deviations, were relatively good with very little variation in the whole air sample. The whole air comparison check results are available at http://www.arb.ca.gov/aaqm/qmosqual/perfaudit/nmhc/whole/wholetable.htm

Figure D1. **2002 Whole Air Comparison Check for NMHC**
(Continued on next page)

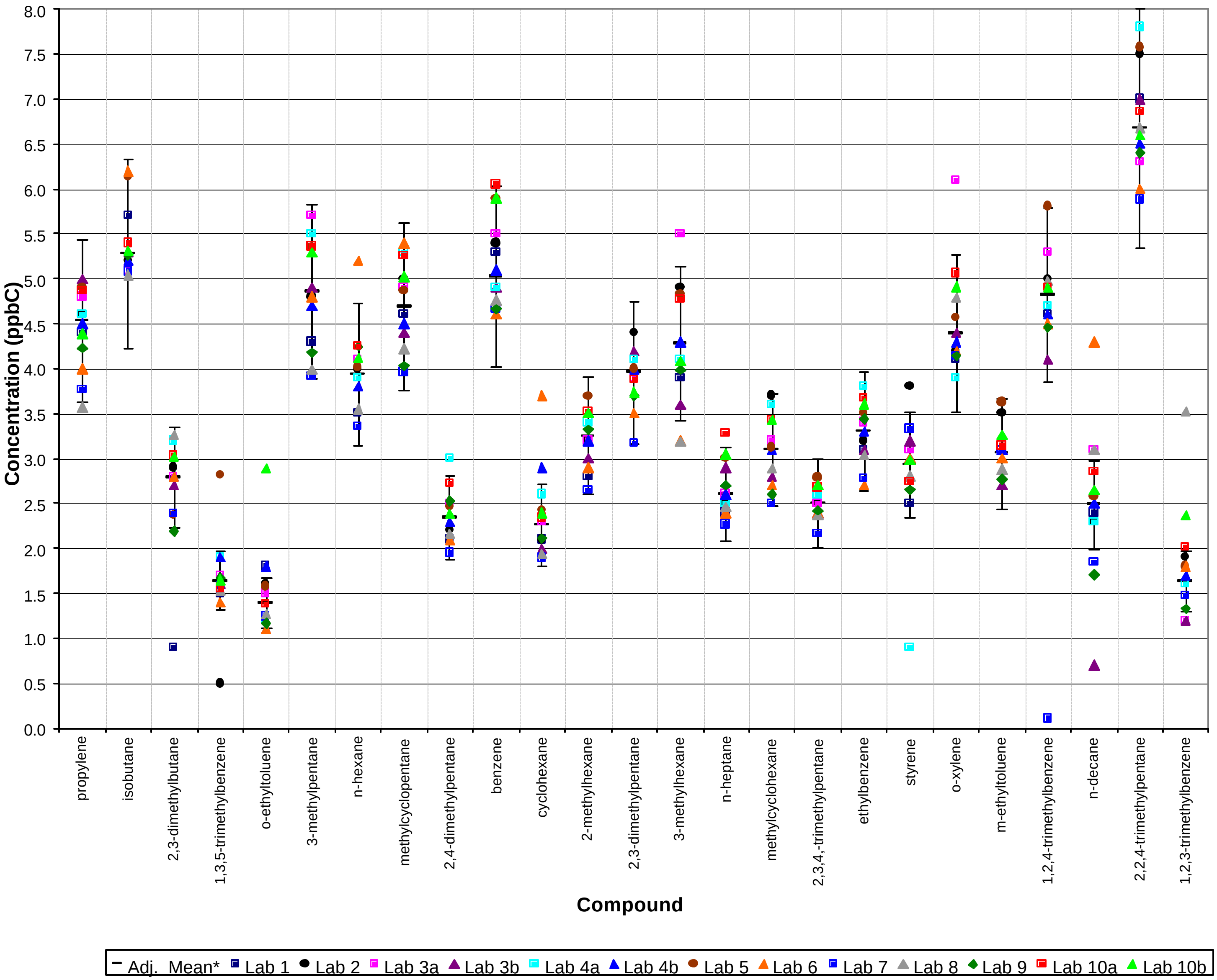


Figure D1. **2002 Whole Air Comparison Check for NMHC**
(Continued on next page)

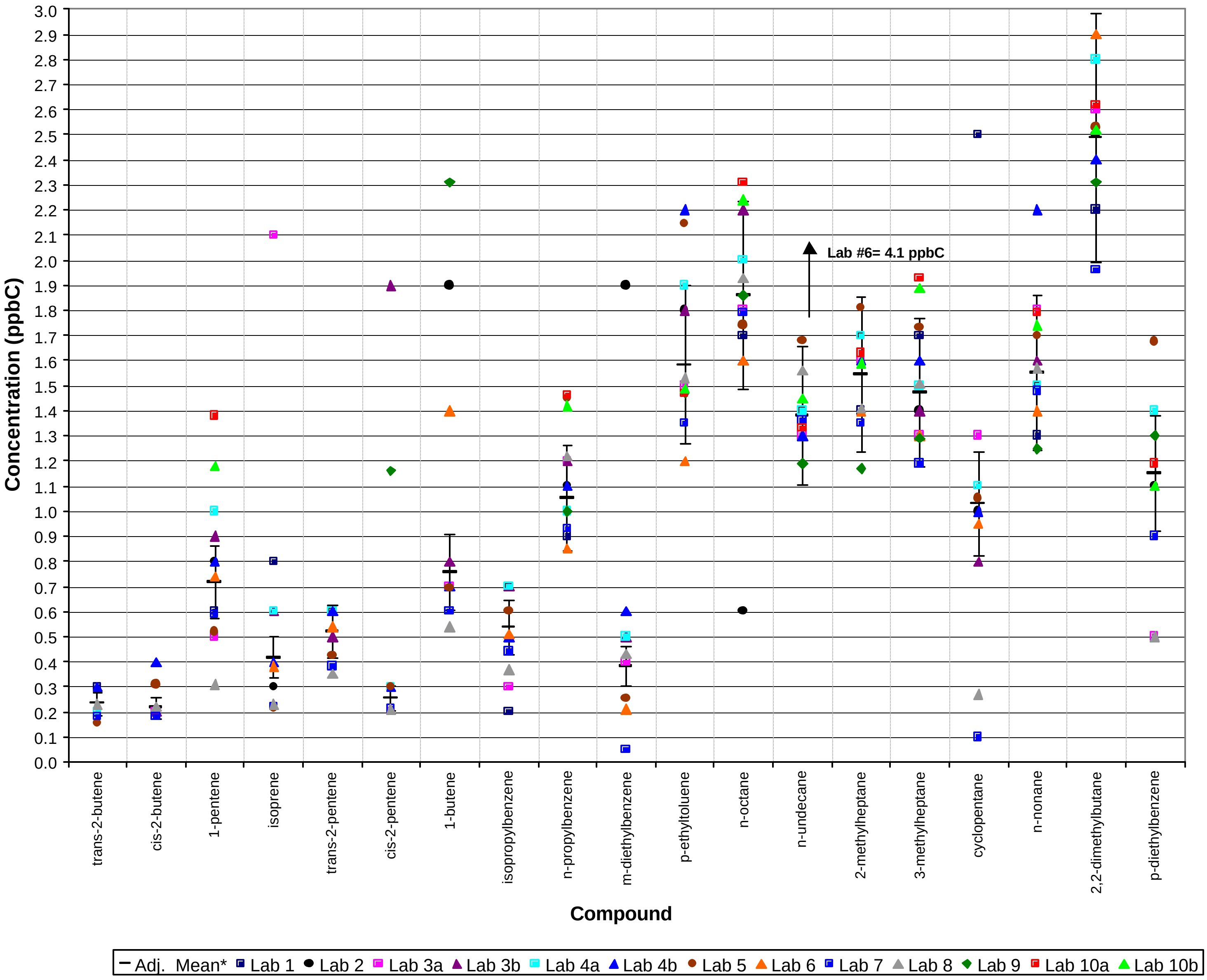
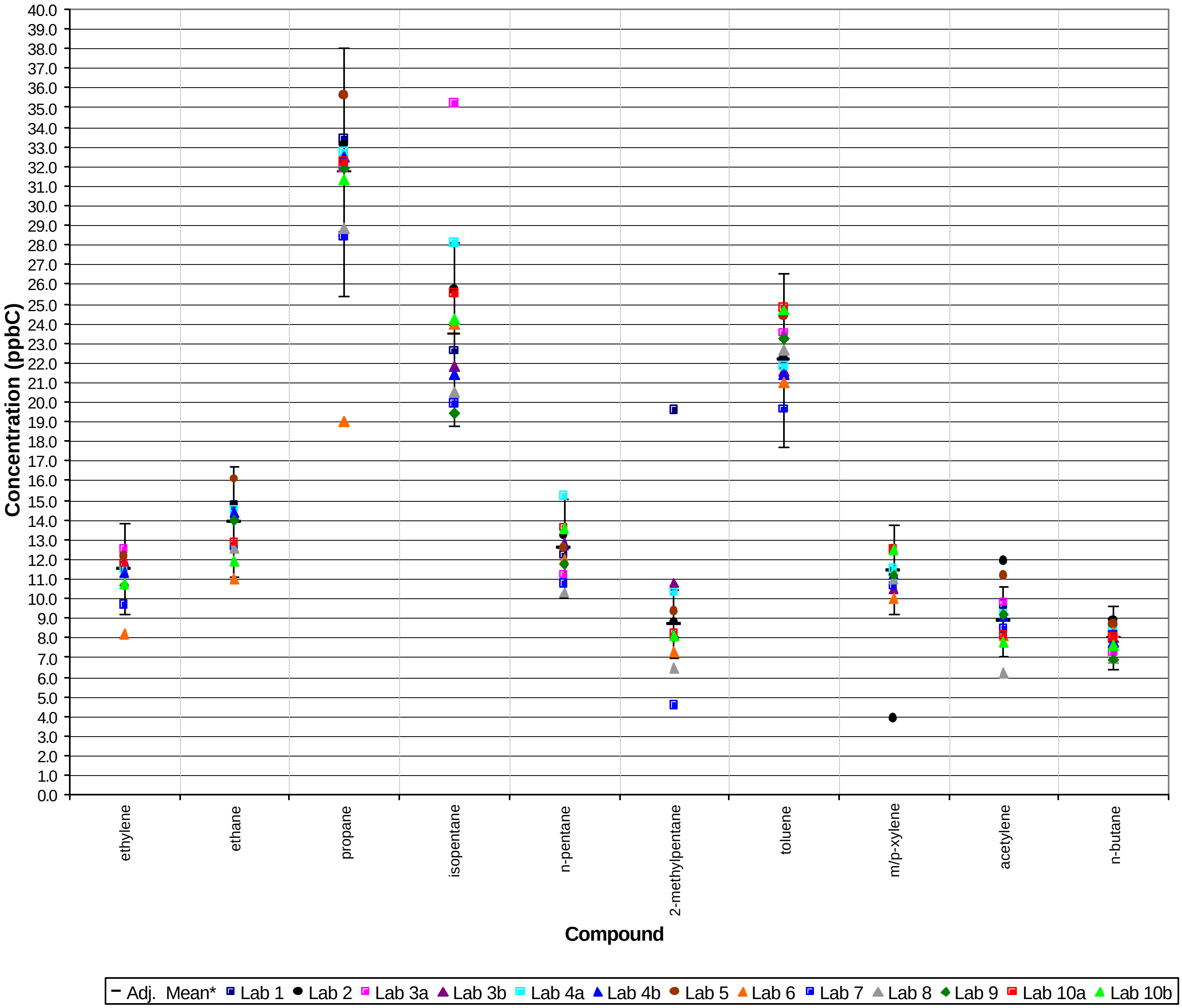


***Figure D1.* 2002 Whole Air Comparison Check for NMHC**

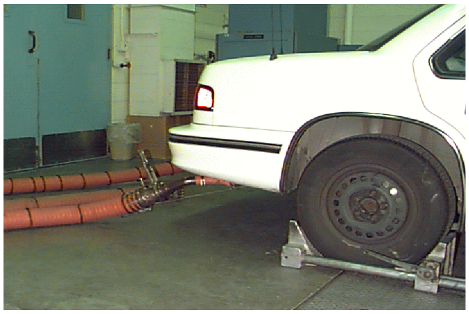


The QAS also conducts carbonyl sampler flow and TTP audits. TTP carbonyl performance audits are typically conducted annually by QAS to assess the accuracy of the total measurement system, including errors inherent in transport, effects of sample pump and probe, and laboratory error. Because the accuracy of measuring carbonyl compounds is dependent upon the sampling flow rate, flow audits of the three channels are conducted in conjunction with the TTP audits. However, due to budgetary constraints and limited resources, the ARB's OLS suspended involvement in the PAMS program and the QAS did not conduct flow and TTP audits of the carbonyl samplers in 2002.

Precision (field and lab):
The ARB's OLS did not participate in the PAMS program in 2002 because of limited resources.

MOTOR VEHICLE EXHAUST PROGRAM

The QAS motor vehicle exhaust audit program supports ARB's efforts in determining the reactivity of fuel components found in automotive exhaust samples. The exhaust and fuels information can be compared to the regulatory standard for non-methane organic gases tail-pipe emissions, fuel composition, and a number of ozone precursors. Special studies are currently being conducted to determine emissions generated from vehicles operated under manufacturers recommendations.

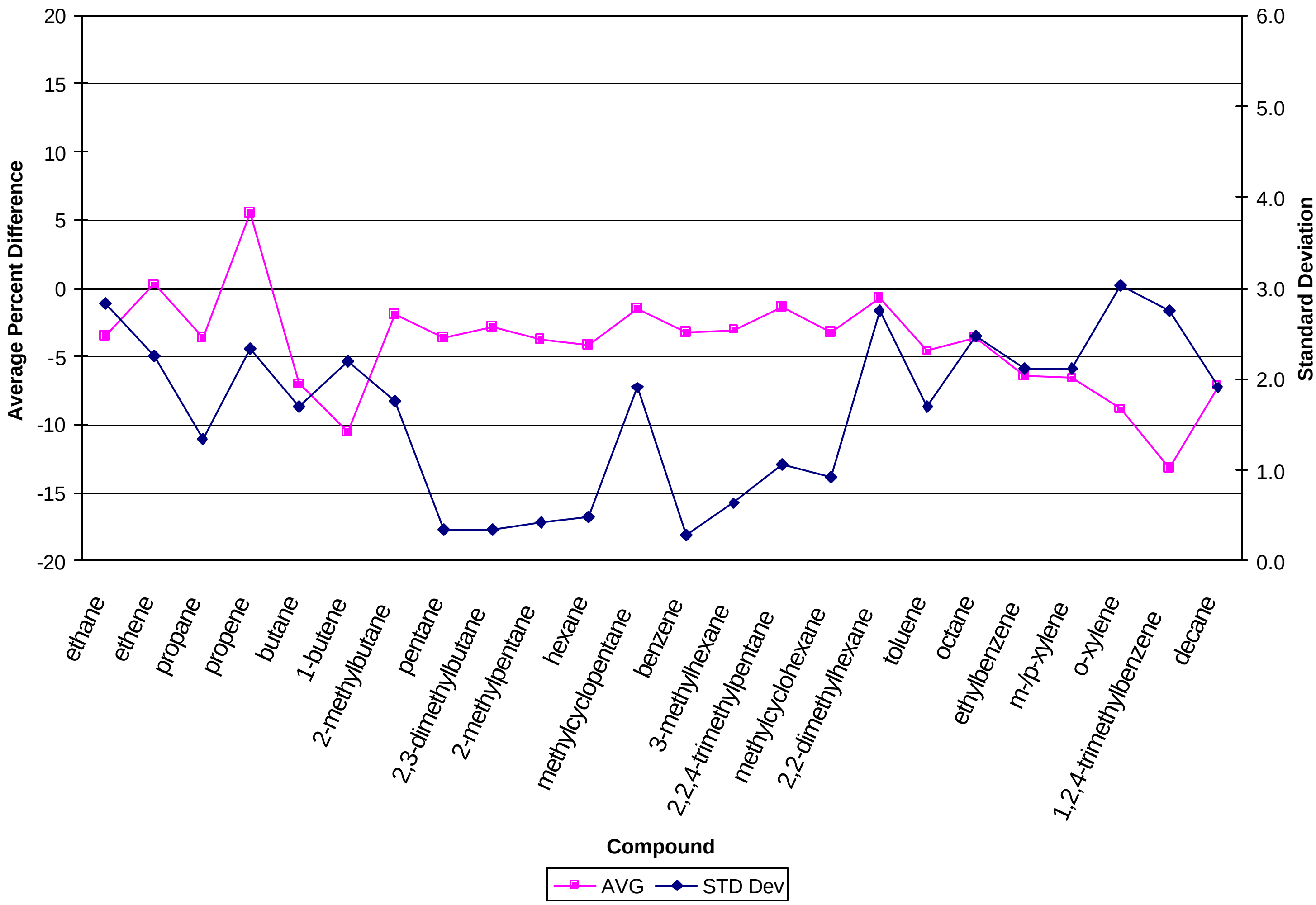


Emissions Sampling

Accuracy: Laboratory performance audits are conducted annually of the Southern Laboratory Branch of ARB for components of motor vehicle exhaust collected while a vehicle was operated on a dynomometer. In 2002, two of the laboratory's five gas chromatographs (GC) were audited. At the time of the audit, three GCs were experiencing instrumentation problems and were out of operation (to be replaced in 2003). The total NMHC analysis system (pre-concentration direct flame ionization detector (PDFID)) was checked and audit results were –6.5% from true (sum of all species). The PDFID audit results are for informational purposes.

Figure D1 illustrates the results for speciated hydrocarbon audits for 2002. The average percent differences of the audit values and laboratory results were calculated using the average reported concentration for each GC. The audit results indicated that the speciated compounds for each GC were within +/-20% of the NIST traceable cylinder. Overall, the laboratory performed well and provides accurate data to support the motor vehicle exhaust program. Audit results have remained consistent over the last two years.

Figure D1. **ARB's 2002 Motor Vehicle Exhaust Laboratory Speciated Hydrocarbon Audit Results**



E. Pesticides

Pesticides Sampler

Ambient and near field (application) pesticide monitoring is performed by the ARB at the request of the California Department of Pesticide Regulation (DPR) to determine the airborne concentration of pesticides at times and in areas of pesticide use. Some of the active ingredients found in pesticides are known to cause a wide range of adverse health effects in people, vegetation, and wildlife. The data are descriptive sets and are not subject to strict data quality objectives.

Two types of monitoring are conducted; ambient and application. During ambient, or community air measurements, ARB collects samples at approximately half a dozen locations (usually schools or other public buildings) in communities near agricultural areas expected to receive applications of the pesticide. Samples of 24 hours in duration are typically collected for four days per week for four or more consecutive weeks. Application-site monitoring (e.g., sampling before and after a specific application), samples are collected immediately before, during, and for approximately 72 hours following pesticide application.

In 2002, the ARB conducted multiple pesticide monitoring studies at the request of DPR. In July and August, the ARB conducted ambient air monitoring for the insecticides acephate and methamidophos in highly populated areas of Fresno County (e.g., schools or school district offices, fire stations, or other public buildings). Acephate and methamidophos are used in agriculture to control a variety of plant and soil insects. Background samples were also collected at the ARB's ambient air monitoring site in Fresno. Air samples were collected by passing ambient air through resin cartridge tubes.

In September, the ARB conducted application monitoring in San Joaquin Valley to determine airborne concentrations of chlorothalonil and methamidophos during and after the application onto a variety of crops. The monitoring also included collecting background samples during and after the application. The purpose of the background sampling was to determine the ambient concentrations of chlorothalonil and methamidophos in an area not impacted by the fungicide and insecticide. Air samples were collected by passing ambient air through resin cartridge tubes (both pesticides were collected on the same cartridge).

In October and November, the ARB conducted ambient air monitoring in Sacramento County during and after the fumigation of a residential building with sulfuryl fluoride. The study was conducted around a fumigation for powderpost beetles. Because the product label for sulfuryl fluoride required that the warning agent, chloropicrin, be used during fumigation, chloropicrin was also monitored. The ambient air monitoring study also included samples collected for one background period outside/inside the structure both during and after the fumigation. Air samples were collected by passing ambient air through charcoal cartridge tubes.

Accuracy (field): Since accurate measurement of pesticides in ambient air is dependent upon flow rate, flow audits are performed on pesticide samplers after calibration and prior to sampling to assure data quality. Table E1 represents the 2002 pesticide flow rate audit data. The flow audit results indicate that the program is providing accurate flow rate data.

Table E1. **ARB's 2002 Pesticide Flow Rate Audit Results**

Number of Samplers Audited	Average % Difference	Std Dev
241	-1.7	1.0

Precision (lab): Field quality control tasks are conducted for ambient and application monitoring to assess system precision for a variety of pesticides used. Collocated samplers provide data for use in assessment of the precision of the monitoring results. These tasks are for evaluation purposes, as there are no formal data quality objectives or established criteria.

During the Fresno County study (July 8 through August 23, 2002), 42 collocated sample pairs were collected for acephate and methamidophos. The RPDs of the data pairs for methamidophos (for which 2 collocated sample pairs had both results above the quantitation limit) were 4.1% and 15.7%. RPDs for collocated methamidophos samples indicate acceptable precision for the method. Precision for the acephate monitoring method could not be determined because sample measurements were not above the quantitation limit.

During the San Joaquin Valley study (September 2 through September 6, 2002), eight collocated sample pairs were collected for both chlorothalonil and methamidophos. The relative percent difference (RPD=(|difference |/average) X 100) provides an indication of the precision of the monitoring method (i.e., the lower the RPD the better the precision). The RPDs of the data pairs for chlorothalonil (for which six collocated sample pairs had both results above the quantitation limit) ranged from 1.0% to 49.5% and averaged 12.0%. The RPDs of the data pairs for methamidophos (for which six collocated sample pairs had both results above the quantitation limit) ranged from 0.2% to 19.7% and averaged 10.0%. RPDs for collocated chlorothalonil and methamidophos samples indicate acceptable precision for the methods.

During the Sacramento County study (October 28 through November 3, 2002), ten collocated sample pairs were collected for sulfuryl fluoride and its warning agent chloropicrin. The RPDs of the data pairs for chloropicrin (for which six collocated sample pairs had both results above the quantitation limit) ranged from 9.0% to 64.0% and averaged 23.0%. RPDs for collocated chloropicrin samples indicate acceptable precision for the method. Precision for the sulfuryl fluoride monitoring method could not be determined because sample measurements were not above the quantitation limit.

<u>Accuracy (lab)</u>: The QAS does not conduct performance audits at this time, however, laboratory quality control tasks are conducted to assess the accuracy of the sampling and analytical methods. These tasks include analyses of laboratory spikes, field spikes, trip spikes, and trip blanks. The purpose of collecting spiked samples is to assess the accuracy (% recovery) of the sampling and analytical methods. The field spikes provide an assessment of the accuracy of the entire method and are collected under the same environmental conditions as those at the time of ambient sampling. The laboratory and trip spikes are used to confirm the field spike results or to help identify the source of loss (or other problems) when/if they occur in the field spikes. Trip blanks are used to assess any contribution to contamination via shipping procedures and are blank samples not exposed to the sampling conditions. These tasks are for evaluation purposes, as there are no formal data quality objectives or established criteria. Table E2 represents the laboratory, trip, and field spikes results for chlorothalonil, methamidophos, sulfuryl fluoride, chloropicrin, and acephate conducted in San Joaquin Valley and Sacramento and Fresno Counties.

Fresno County study (July 8 through August 23, 2002):
The laboratory and trip spike results for acephate indicate that the sampling, sample transport, storage and analytical procedures produced acceptable results. Field spike recoveries for acephate were high and averaged 105.0%. According to the laboratory, acephate is very unstable after extraction. High field spike recoveries may indicate that the actual concentrations of acephate in ambient air are lower. The field spike results for acephate indicate that the sample, transport, storage, and analytical procedures produced acceptable results.

The laboratory and trip spike results for methamidophos indicate that the sample, transport, storage, and analytical procedures produced acceptable results. The field spike recoveries however, were relatively low. According to the laboratory there was no explanation for the low recoveries. The consistently low recoveries of the field spikes may indicate that the ambient sample results reported were lower than actual.

San Joaquin Valley study September 2 through September 6, 2002:
The laboratory, trip, and field, spike recoveries for chlorothalonil were generally low and averaged 71.0%, 48.0%, and 74.0%, respectively. The laboratory performed a review of the spiking, extraction, and analysis procedures to determine the cause of the low trip spike recoveries but found no errors or miscalculations. The low trip spike recoveries are considered anomalies. The laboratory and field spike results for chlorothalonil indicate that the sampling, sample transport, storage and analytical procedures produced acceptable results.

The laboratory, trip, and field spike results for methamidophos indicate that the sample, transport, storage, and analytical procedures produced acceptable results.

Sacramento County study October 28 through November 3, 2002:
The sampling procedures used for sulfuryl fluoride for the study were not valid. According to the laboratory, all samples with quantifiable results from the primary collection bed demonstrated extensive breakthrough into the secondary bed of the cartridge. The laboratory, trip, and field spike recoveries in the summary table are for the front portion of the cartridge only. The laboratory underwent method development to determine appropriate sampling strategies prior to conducting further tests.

The laboratory, trip, and field spike results for chloropicrin indicate that the sampling, sample transport, storage, and analytical procedures produced acceptable results.

Table E2. Laboratory, Trip, and Field Spike Results for Chlorothalonil, Methamidophos, Sulfuryl Fluoride, Chloropicrin, and Acephate.

Type of Spike	[1] Chlorothalonil Avg % Rec.	[1] Methamidophos Avg % Rec.	[2] Sulfuryl Fluoride Avg % Rec.	[2] Chloropicrin Avg % Rec.	[3] Acephate Avg % Rec.	[3] Methamidophos Avg % Rec.
Laboratory	71	106	101	91	103	90
Trip	48	76	96	85	102	91
Field	74	82	94	83	105	62

Sources: [1] *Ambient Air Monitoring for Chlorothalonil and Methamidophos in San Joaquin - Summer 2002*
[2] *Ambient Air Monitoring for Sulfuryl Fluoride and Chloropicrin in Sacramento County - Fall 2002*
[3] *Ambient Air Monitoring for Acephate and Methamidophos in Fresno County - Summer 2002*

Trip blank results analyzed for chlorothalonil, methamidophos, acephate, sulfuryl fluoride, and chloropicrin for each monitoring study (San Joaquin Valley and Sacramento and Fresno Counties) were less than the method detection limit and indicate acceptable accuracy for the methods.

F. Dioxin

Dioxin Sampler

Dioxins and furans are highly toxic chemicals that are formed as unwanted by-products during the combustion of materials and the manufacturing of certain chlorinated chemicals. Dioxins and furans are emitted into the atmosphere from a variety of sources including vehicles, waste incinerators, chemical manufacturing plants, and other industrial sources that burn fuel. Dioxins are highly persistent and can accumulate in the lungs and abdominal cavity for long periods of time. Studies have shown that exposure to dioxins can cause cancer and other health problems including birth defects and liver damage. Infants and children are especially susceptible to illness from dioxin exposure, which can cause immune and developmental system toxicity.

In efforts of reducing the public's exposure to known sources of dioxins, the ARB identified dioxins as a TAC and in 1990 adopted a control measure to reduce dioxin emissions. Under the Children's Environmental Health Protection Act, the ARB is required to evaluate the control measure to ensure that it protects public health, particularly infants and children.

The ARB administered the California Ambient Dioxin Air Monitoring Program (CADAMP) to provide information on ambient levels of dioxins and dioxin-like compounds (furans, polychlorinated biphenyls and polybrominated diphenyl ethers) in highly populated urban areas over a two-year period. Ten sampling sites make up the CADAMP network, five in the San Francisco Bay Area, an additional site in Sacramento, and four in the Los Angeles basin. Several of the dioxin monitors operate in parallel with stations in ARB's Children's Environmental Health Protection Program monitoring network.

Between December 20, 2001 through November 21, 2002, the ARB conducted ambient air monitoring for dioxins, furans and dioxin-like polychlorinated biphenyls (PCBs) at CADAMP sites. The monitoring schedule consisted of 13 sampling periods in which samplers operated continuously for six days followed by one day of inactivity, totaling 24 days of sample (or 576 hrs of sample) per sampling period. Ambient air samples were sent to a contract laboratory in British Columbia for dioxins/furans and PCBs analyses.

Accuracy (field): In 2003, the QAS initiated the flow rate audit program of the dioxins/furans and PCBs polyurathane foam samplers. No audit data are available for 2002.

Precision (field and lab): Field quality control tasks are conducted for dioxins/furans and PCBs monitoring to assess system precision. Collocated samplers, in place at the Boyle Heights site in the Los Angeles Basin, provide data for use in assessment of the precision of the monitoring results. These tasks are for evaluation purposes, as there are no formal data quality objectives or established criteria.

Between December 20, 2001 through November 21, 2002 seven collocated sample pairs were collected at the Boyle Heights site for both dioxins/furans and PCBs. The relative percent difference (RPD=(|difference |/average) X 100) provides an indication of the precision of the monitoring method (i.e., the lower the RPD the better the precision). The RPDs of the data pairs for dioxins/furans (for which all collocated sample pairs had both results above the quantitation limit) ranged from -2.7% to 13.2% and averaged 2.2%. The RPDs of the data pairs for PCBs (for which all collocated sample pairs had both results above the quantitation limit) ranged from -8.0% to 15.6%. and averaged -1.0%. RPDs for collocated dioxins/furans and PCBs samples indicate acceptable precision for the methods.

Accuracy (lab): The QAS does not conduct performance audits at this time; however, internal laboratory quality control tasks are conducted to assess the accuracy of the sampling and analytical methods. These tasks include analyses of laboratory spikes, field spikes, trip spikes, and field blanks. These tasks are for evaluation purposes, as there are no formal data quality objectives or established criteria. The purpose of collecting spiked samples is to assess the accuracy of the sampling and analytical methods. Field blanks are exposed to the sampling conditions and provide data for evaluating contamination introduced into the samples from field activities. Field blanks results (only field blank results were available) for dioxins/furans and PCBs averaged 0.44 fg/m^3 and 0.035 fg/m^3, respectively, and indicate acceptable accuracy for the methods.

Information about the California Ambient Dioxin Air Monitoring Program (CADAMP) is available at http://www.arb.ca.gov/aaqm/qmosopas/dioxins/dioxins.htm.

Information about the ambient air monitoring that supports measuring children's exposure to air pollution in our communities is at http://www.arb.ca.gov/ch/ch.htm.

G. Asbestos

Asbestos samplers

Asbestos is a term used for several types of asbestiform fibers that include naturally occurring fibrous minerals commonly found in serpentine in many parts of California. Naturally Occurring Asbestos (NOA) is released when ultramafic and serpentine rock is broken or crushed. Once released from the rock, asbestos can become airborne and may remain for long periods of time in the air. Asbestos is a known carcinogen and inhalation of asbestos may result in the development of lung cancer or mesothelioma. Emissions sources may include unpaved roads or driveways with ultramafic rock surfaces, construction activities in ultramafic rock deposits, or rock quarrying activities where ultramafic rock is present. Other sources of asbestos are in man-made products. It also released naturally through weathering and erosion.

In 1986, the ARB identified naturally-occurring asbestos as a TAC and subsequently adopted two Airborne Toxic Control Measures (ATCMs) to address some of the health concerns associated with asbestos exposure caused by these activities. The measures prohibit the use of serpentine or ultramafic rock for unpaved surfacing and controls dust emissions from construction, grading, and surface mining in areas where ultramafic and serpentine rock is present.

The ARB conducts short term air monitoring to determine the concentrations of asbestos ambient air to help evaluate the extent of the public's exposure to asbestos. The ARB has conducted asbestos air monitoring projects since 1998 and retains a contract with an analytical laboratory to perform asbestos analyses. In 2002 there were no requests for ambient air monitoring for asbestos from agencies within Cal/EPA or local air districts. Information about naturally occurring asbestos is available at http://www.arb.ca.gov/toxics/asbestos/asbestos.htm

F. Consumer Products

Consumer products are chemically formulated products used by the public in homes and businesses. These compounds are reported to emit approximately 260 tons per day of smog-forming VOCs. Monitoring VOC levels in consumer products and finding ways to reduce VOC emissions they contain facilitates ARB's effort to reduce smog in the State.

Consumer products are descriptive data sets. Informal data quality objectives have been established and staff ensure the accuracy and precision for data quality are met. Information about the Consumer Products Program is available at http://www.arb.ca.gov/consprod/consprod.htm.

Accuracy (lab): The QAS does not conduct performance audits on the Consumer Product Program at this time. The Special Analysis Section of the Consumer Products Laboratory performs internal quality control activities such as limits of detection, duplicates/replicates, calibrations, control samples, blanks, and trip standards to verify statistical control among analytical methods and ensure valid data are generated.

Precision (lab): Analytical precision is derived from duplicate analysis performed on a minimum of 10% of the samples. The results from the analyses are compared, and for the sample to be valid, the difference should be less than 3%. Duplicate data that do not meet the criteria may be invalidated. Sample data analyzed on the same date may also be invalidated. Following an investigation of the problem, samples are re-analyzed. Table F1 shows the duplicate data for the 1st through 4th quarters of 2002.

Table F1. **Duplicate Final %VOC Results for 1st – 4th Quarters 2002.**

Sample #	Dup 1 %VOC	Dup 2 %VOC	Diff
1	48.6	48.4	0.2
2	51.4	52.2	0.8
3	66.1	65.9	0.1
4	98.9	98.9	0.0
5	99.0	99.0	0.0
6	9.7	10.1	0.4
7	58.9	58.6	0.3
8	9.8	9.4	0.4
9	51.1	51.1	0.1
10	75.3	75.3	0.0
11	60.0	60.1	0.1
12	58.0	58.1	0.1
13	8.2	7.0	1.2
14	48.2	48.2	0.0
15	99.7	99.7	0.0
16	53.0	53.9	0.9
17	4.5	3.0	1.5
18	55.5	55.5	0.1
19	57.6	56.1	1.5
20	54.5	54.4	0.1
21	48.6	49.9	1.3
22	57.3	57.3	0.0
23	56.2	56.1	0.0
24	55.4	55.3	0.2
25	80.8	80.4	0.5
26	58.7	58.9	0.2
27	56.8	57.0	0.2
28	47.7	47.6	0.1
29	53.9	54.8	0.9
30	4.7	2.5	2.1
31	77.1	77.5	0.4
32	48.4	49.3	0.9

Note: Diff = ABS (Dup 1 – Dup 2)

The Consumer Product laboratory analyzes known standards (trip standards) to establish control limits and limits of detection, runs system blanks to confirm the system is not contaminated, and conducts yearly multi-point calibrations to assess the instrument linearity. Presently, trip standards should meet the established acceptance criteria of +/-3% difference or have corrective action(s) taken. A sample outside the acceptance criteria prompts staff to investigate quality control activities to verify data generated are valid. Overall, the analytical precision results indicate that the laboratory is providing precise consumer product data. Table F2 represents the trip standard results for the 1st through 4th quarters of 2002.

***Table F2.* Trip Standard Results for 1st – 4th Quarters 2002.**

Sample #	% Difference *						
	Total Volatile Material wt. fraction	Water (KFO) wt. fraction	Water (GC/TCD) wt. fraction	Acetone wt. fraction	Methanol wt. fraction	Ethanol wt. fraction	% VOC** (Total-Exempt)
1	0.0	1.2	1.6	0.2	0.2	0.2	1.6
2	0.0	0.9	N/A	0.2	0.4	0.0	0.7
3	0.0	N/A	1.6	0.1	0.2	0.2	1.7
4	0.0	N/A	1.5	0.6	0.6	0.1	2.1
5	0.0	1.6	0.2	0.1	0.2	0.3	1.0
6	0.0	1.2	2.0	0.5	0.5	0.0	2.1
7	0.0	2.3	0.7	0.5	0.3	0.6	2.0
8	0.0	2.3	0.7	0.0	0.1	0.2	0.8
9	0.0	0.5	1.8	0.1	0.1	0.5	0.5
10	0.0	2.4	2.0	0.4	0.4	0.8	2.6
11	0.0	2.0	1.1	0.5	0.5	1.0	0.9
12	0.0	1.6	2.0	0.1	0.1	0.4	1.7
13	0.0	0.8	N/A	0.8	0.7	1.0	0.0
14	0.0	N/A	0.9	0.0	0.1	0.4	0.9
15	0.0	N/A	1.2	0.2	0.2	0.1	1.4
16	0.0	1.9	0.3	0.2	0.6	0.3	1.3
17	0.0	N/A	0.7	0.6	0.4	0.8	0.1
18	0.0	2.3	1.1	0.1	0.2	0.2	0.5
19	0.1	3.2	0.4	0.2	0.1	0.2	1.7
20	0.0	0.0	0.6	0.2	0.1	0.4	0.1
21	0.0	0.0	0.7	0.3	0.2	0.6	0.1
22	0.0	3.6	0.8	0.4	0.1	0.1	2.3
23	0.0	3.6	0.8	0.4	0.1	0.1	2.3
24	0.1	1.9	1.1	0.0	0.3	0.1	1.6
25	0.1	3.2	N/A	0.2	0.2	0.2	3.1
26	0.0	4.3	1.6	0.2	0.2	0.1	3.0
27	0.0	1.7	0.8	0.3	0.1	0.3	1.6
28	0.1	1.5	1.4	0.3	0.1	0.6	1.3

N/A = analysis not run

* ABS (Measured - Target)(100)

**ABS (Measured - Target)

G. Meteorology

Meteorological Tower

The ARB monitors meteorological parameters such as wind speed, wind direction, ambient temperature, relative humidity, barometric pressure, and total solar radiation. Real-time meteorological data are generated to characterize meteorological processes such as transport and diffusion, and to make air quality forecasts and burn-day decisions. The data are also used for control strategy modeling and urban airshed modeling. A State/local meteorology subcommittee of the Air Monitoring Technical Advisory Committee (AMTAC) agreed to define the level of acceptability for meteorological data as those used by the U.S. EPA for both the Prevention of Significant Deterioration (PSD) and Photochemical Assessment Monitoring Stations (PAMS) programs. The QAS audits to those levels.

The data variability collected by this element of the monitoring program are generally described as meeting or not meeting the PSD requirements. No mandatory corrections are made to the data. However, station operators are notified whether they passed the audit or not. Most operators make the effort to meet the audit standards. The wind speed, wind direction and outside temperature data sets are controlled data sets, and subject to meeting PAMS objectives. Since the inception of the meteorological audit program, the data quality have improved significantly.

Accuracy (field): The accuracy of meteorological sensors are checked by annual performance audits. Table G1 summarizes the 2002 audit results. The average difference (average degree difference with respect to ambient temperature) represents the combined differences from the certified value of all the individual audit points for each sensor. The upper and lower probability limits represent the expected accuracy of 95 percent of all the single sensor's individual percent differences for all audit test levels at a single site. Based on the audit results, ninety-seven percent of the instruments audited were found to be operating within the ARB's control limits. Instruments operating outside of ARB's control limits resulted in 785 days of invalidated data and 519 days of corrected data. Audit results were not used in statistical analysis if the audit was invalidated due to an AQDA that resulted in data invalidation. AQDAs do not apply to relative humidity, solar radiation, and vertical wind speed audit results. Information about the meteorological monitoring program is available at http://www.arb.ca.gov/aaqm/met.htm.

***Table G1*. 2002 Results for Meteorological Sensor Performance Audits Conducted by ARB**

Sensor	Number of Sensors Audited	Number of AQDAs	Avg Diff or Avg % Diff	Probability Limits	
				95%UL	95%LL
Ambient Temp	104	3	0.0	0.8	-0.8
Horiz Wind Speed	110	2	-0.3	1.7	-2.3
Relative Humidity	38	NA	0.4	8.4	-7.6
Solar Radiation	25	NA	1.0	9.9	-7.9
Vert Wind Speed	7	NA	0.0	0.2	-0.2
Wind Direction	95	9	-0.3	3.9	-4.5

NA= Not applicable
Source: Quality Assurance Section, Accuracy Estimates

III. QUALITY CONTROL REPORTS

Quality Control (QC) reports are summaries of the quality control activities conducted by all MLD laboratories to support accurate and precise measurements. These activities include: blanks, duplicates, controls, spiked samples, limits of detection, calibrations, and audit results. Currently, all MLD QC reports are reviewed by the Operations Planning and Assessment Section (OPAS) to verify that good laboratory practices are followed and to identify opportunities for data quality or process improvement. The OPAS Section makes suggestions, where appropriate, to help improve the overall quality and/or effectiveness of the data. Depending on the program, QC reports are typically prepared quarterly. Table 1 lists the QC reports submitted for review in 2002.

***Table 1*. Quality Control Reports Submitted to OPAS Section for Review in 2002**

Submittal Frequency	Title of QC Report	Program (s) Supported
Quarterly	Special Analysis Section, Consumer Products	Consumer Products
Quarterly	Analysis of Motor Vehicle Exhaust	Motor Vehicle Exhaust
Quarterly	Analysis of Motor Vehicle Fuel	Motor Vehicle Exhaust and Fuel Specifications
Quarterly	Inorganic Procedures	Particulate Matter
Quarterly	Organic Procedures	Toxics, Non-Methane Hydrocarbons
Quarterly	Standards Laboratory	All

IV. STANDARDS LABORATORY

Cylinder Bay

Instrument Rack

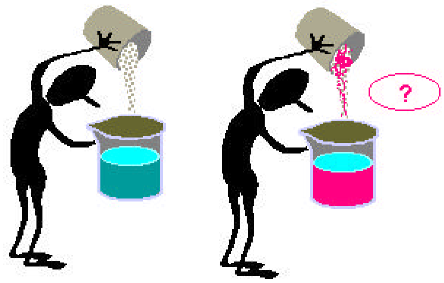
The Standards Laboratory performs technical support and certification and verification services of calibration instruments, gases, and devices. Clients include ARB divisions, air districts, and U.S. EPA Region 9 (California, Nevada, Arizona, and Hawaii). Calibrations and certifications are performed for ozone and flow rate transfer standards, certifications of compressed gas cylinders, and verifications of ozone and flow rate primary standards, to ensure that all are traceable to standards of the NIST. A calibration establishes a correction factor to adjust or correct the output of an instrument, a certification establishes traceability of a transfer standard to a NIST-traceable standard, and a verification establishes comparability of a standard to a NIST-traceable standard of equal rank.

The Standards Laboratory also certifies and calibrates on a quarterly basis the instruments used by the ARB's QAS auditors. Table 1 shows the types of services and volume for 2002. Information about the Standards Laboratory and the services that they provide is available at http://www.arb.ca.gov/aaqm/qmosprog/stdslab/stdslab.htm.

Table 1. Standards Laboratory Services Provided for 2002

Service Provided	Number Conducted
Ozone Certifications	44
Ozone Verifications	53
Ozone Calibrations	0
Low Flow Certifications	279
Low Flow Verifications	0
Low Flow Calibrations	60
High Flow Certifications	55
Ambient Gas Cylinders Certified	179
Source Gas Cylinders Certified	155

V. LABORATORY AND FIELD STANDARD OPERATING PROCEDURES



Laboratory and field standard operating procedures (SOPs) are guidance documents for the operation of quality assurance programs used by the ARB, local districts and private industry. The SOPs are intended for field operators and supervisors; laboratory, data processing and engineering personnel; and program managers responsible for implementing, designing, and coordinating air quality monitoring projects. Each SOP has a specific method that must be followed to produce data-for-record. The SOPs are developed and published to ensure that, regardless of the person performing the operation, the results will be consistent. Most of the SOPs are available on the Internet at http://www.arb.ca.gov/aaqm/qmosqual/qamanual/qamanual.htm.

VI. SITING EVALUATIONS

To generate accurate and representative data, air monitoring stations should meet specific siting requirements and conditions. It is assumed that the stations met the siting criteria in place at the time initial operation began. As such, non-conformance today is the result of changing regulations, or changes in surrounding conditions and land use. The siting requirements of the ARB's Quality Assurance Manual Volume II; 40 CFR 58, Appendix E; U.S. EPA's Quality Assurance Handbook Volume IV: U.S. EPA's Prevention of Significant Deterioration (PSD); and U.S. EPA's PAMS guidelines, present siting criteria to ensure the collection of accurate and representative data.

The siting criterion for each pollutant varies depending on the pollutant's properties, monitoring objective and intended spatial scale. The U.S. EPA's siting criteria are stated as either "must meet" or "should meet". According to 40 CFR 58, Appendix E, the "must meet" requirements are necessary for high quality data. Any exception from the "must meet" requirements must be formally approved through the Appendix E waiver provision. The "should meet" criteria establish a goal for data consistency.

Siting criteria are requirements for locating and establishing stations and samplers to meet selected monitoring objectives, and to help ensure that the data from each site are collected uniformly. There are four main monitoring objectives: to determine highest concentrations expected to occur in the area covered by the network; to determine representative concentrations in areas of high population density; to determine the impact on ambient pollution levels of significant sources or source categories; and to determine general background concentration levels. Typical siting designations are: micro, middle, neighborhood, and regional. These designations represent the size of the area surrounding the monitoring site which experiences relatively uniform pollutant concentrations. Typical considerations for each of these site designations are, for example, the terrain, climate, population, existing emission sources, and distances from trees and roadways.

Siting evaluations are conducted annually by the QAS. Physical measurements and observations include probe/sensor height above ground level, distance from trees, type of ground cover, residence time, obstructions to air flow, and distance to local sources, are taken to determine compliance with 40 CFR Part 58, Appendix E requirements. If a criteria deficiency is found during a site evaluation, the site operator will be informed and an AQDA may be issued. For siting criteria distances, please refer to Appendix C.

VII. SPECIAL STUDIES

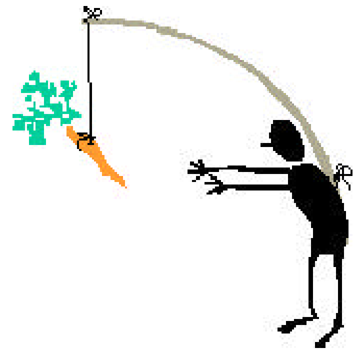
During the course of the year, in-house studies as well as studies abroad are conducted to further the information available about the trends of pollutants and to support regulations to promote the welfare of the public. Descriptions of the special studies conducted by MLD are available in the Division Report at http://www.arb.ca.gov/aaqm/qmosprog/papers_studies/mission.pdf. The QAS often summarizes air monitoring information as an assessment of the monitoring activities in a specific area. The report "Review of Current Ambient Air Monitoring Activities Related to California Bay Area and South Coast Refineries" is an example of a QAS special study. A copy of the paper as well as other QAS special studies is available at http://www.arb.ca.gov/aaqm/qmosqual/special/specialprojects.htm.

In addition, the QAS initiated a web based audit software program to streamline and improve the efficiency of the entire audit process. It allows QAS staff to generate statistical reports, perform trends analyses, decimate air quality reports to staff electronically, and make air quality data available on the World Wide Web.

VIII. PROGRAM CONTACTS

Program	Contact	Phone	Email
Gaseous Pollutants	Fred Burriell	(916) 327-0886	fburriel@arb.ca.gov
Particulate Matter	Michael Werst	(916) 327-4757	mwerst@arb.ca.gov
Toxic Air Contaminants	Julie Cooper	(916) 327-0885	jcooper@arb.ca.gov
Non-Methane Hydrocarbons	Julie Cooper	(916) 327-0885	jcooper@arb.ca.gov
Pesticides	Don Fitzell	(916) 322-3892	dfitzell@arb.ca.gov
Dioxin	Michael Werst	(916) 327-4757	mwerst@arb.ca.gov
Asbestos	Michael Werst	(916) 327-4757	mwerst@arb.ca.gov
Consumer Products	Don Fitzell	(916) 322-3892	dfitzell@arb.ca.gov
Meteorology	Fred Burriell	(916) 327-0886	fburriel@arb.ca.gov

IX. UPCOMING ADDITIONS



This report will continue to evolve to include additional QA/QC measurements, new analyses of that information, and summary conclusions about the data meeting our clients' needs for stated objectives. Several elements we expect to include in the next annual issue of this report include:

- Purchase new audit van
- Emergency Response Team Lead
- CADAMP:
  - -Coordinate analysis of performance evaluation samples.
  - -Conduct sampler flow audits.
  - -Install data loggers.

APPENDIX A

AIR MONITORING NETWORK SURVEY

Quality Assurance Section
Monitoring and Laboratory Division

Air Resources Board

Welcome to California

Gaseous Criteria Pollutant Monitoring as of December 31, 2002

Parameter Measured	**Ozone**	**Nitrogen Dioxide**	**Carbon Monoxide**	**Sulfur Dioxide**	**Hydrogen Sulfide***
Sampling Schedule	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average
Number of ARB Sites	38	25	25	5	1
Number of District Sites	144	90	72	35	12
Number of Sites in Mexico	8	8	8	6	0
Method Used By ARB	Ultraviolet Photometry	Gas Phase Chemiluminescence	Non-Dispersive Infrared Photometry	Ultraviolet Fluorescence Detector	Thermal Oxidizer with Ultraviolet Fluorescence Detector
EPA Reference Method	Ultraviolet Photometry	Gas Phase Chemiluminescence	Non-Dispersive Infrared Photometry	Spectrophotometry (Pararosaniline Method)	Not Applicable
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 322-6076; U.S. EPA Aerometric Information Retrieval System (AIRS)				

*Hydrogen Sulfide is only a State criteria pollutant. A Federal standard has not been set.

Air Resources Board

Welcome to California

Particulate Matter Monitoring as of December 31, 2002

Parameter Measured	**PM10 (0 - 10 microns)**		**PM2.5**	
	Mass*	Nitrate, Sulfate, Chloride, Ammonium, Potassium	Mass (fine)**	Speciated
Sampling Schedule	Every 6 days (24-hr samples), TEOM & BAM (continuous 24-hr) (Ag Burn sites every 3 days from Sep to Nov)		Every 3 Days, BAM (continuous 24-hr) (Bakersfield and Fresno- First St sites everyday)	
ARB Collection Method	High Volume Selective Size Inlet Sampler		Mass Sequential, Single Channel & Continuous	
Sampling Media	Quartz Microfiber Filter - 8 X 10 inchr BAM - filter tape, Teflon Filter - 46.2 mm		Teflon Filter - 46.2 mm BAM - filter tape	
Number of Sites Analyzed by the ARB	79* (Includes 12 sites in Mexico)	10 (Includes 1 site in Mexico)	32**	7
Number of ARB Collocated Sites	5	2	5	0
Additional Sites Analyzed by other Agencies	14 BAAQMD* 18 SCAQMD* 4 SDAPCD* 118 other*	18 SCAQMD	79**	14***
ARB Analysis Method	Method 016 Electronic Analytical Balance	Method 007 and Method 023 Ion Chromatography	Method 055 Electronic Analytical Balance	Method 055 Electronic Balance Method 034 X-Ray Fluorescence Method 064 Ion Chromatography Method 065 Thermal/Optical Carbon
Laboratory Analyst	Scott Randall	Roxana Walker	Mike Humenny	George Dunstan
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 323-4887; U.S. EPA Aerometric Information Retrieval System (AIRS)			

*These figures also include sites where PM10 mass is monitored using low-vol method or continuously (1-hr averages) using TEOM or BAM.

**These figures also include sites where PM2.5 mass is monitored continuously (1-hr averages) using BAM.

***Analysis performed by EPA or SCAQMD laboratory.

Air Resources Board
Welcome to California

Organic Toxic Air Contaminant Monitoring as of December 31, 2002

	Volatile Organic Compounds (VOCs)			**Polynuclear Aromatic Hydrocarbons (PAHs)**
Parameter Measured	Aromatic and Halogenated Compounds*	Methyl tert-Butyl Ether (MTBE)	Ethanal (Acetaldehyde) Methanal (Formaldehyde) Butanone (Methylethyl-ketone)	Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Dibenz(a,h)anthracene Benzo(g,h,i)perylene Indeno(1,2,3-cd)pyrene
Sampling Schedule	Every 12 Days (24 hr samples)			
ARB Collection Method	XonTech 910A Gaseous Sampler		Xontech 920 Toxic Air Contaminant Sampler	High Volume Size Selective Inlet Sampler
Sampling Media	Polished Stainless Steel Canister		DNPH-Coated Silica Cartridges	Quartz Microfiber Filter 8 X 10 inch
Number of Sites Analyzed by the ARB	22 (2 in Mexico)		23	14
Number of ARB Collocated Sites	4 (Bakersfield, San Francisco, San Jose, Rubidoux)		2 (Bakersfield, Stockton)	2 (Bakersfield, Simi Valley)
Additional Sites Analyzed by other Agencies	20 BAAQMD		0	0
ARB Analysis Method	Method 058 Cryogenic Trap Preconcentration Capillary GC/MS	Method 050 Cryogenic Trap Preconcentration Capillary GC/PID	Method 022 High-Performance Liquid Chromatography/ Ultraviolet Detector	Method 028 High-Performance Liquid Chromatography/ Fluorescence Detector
Laboratory Analyst	Ferry Niyati, Pam Gupta, Ben Chang Nati Lapurga,Vince Scola		Paul Chima Dave Hartmann	Dave Hartmann
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 323-4887; U.S. EPA Aerometric Information Retrieval System (AIRS)			

* Dichloromethane, trichoromethane, tetrachloromethane, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, bezene, toluene, styrene, 1, 2-dichlorobenzene, 1, 4-dichlorobenzene, o-xylene, m/p xylene, ethylbenzene, and 1,3-butadiene.

Air Resources Board

Welcome to California

Hydrocarbon Monitoring as of December 31, 2002

Parameter Measured	**Non-Methane Hydrocarbon Compound (NMHC)**		**Continuous Non-Methane Hydrocarbons**	**Carbonyl Compounds**
	Total NMHC	Speciated NMHC (69 species, C2 through C12)		Acetone Formaldehyde Acetaldehyde
Sampling Schedule	Every 3 days, July through September plus episodes (3-hr samples)		Continuous Hourly Average	3-hr sampler
ARB Collection Method	XonTech 910A Gaseous Sampler with XonTech 912 Multisampler		Thermal Environmental (TECO) 55C Hydrocarbon Analyzer	Xontech 925 or other Carbonyl Samplers
Sampling Media	Polished Stainless Steel Canister		Not Applicable	DNPH-Coated Silica Gel Cartridges
Number of Sites Analyzed by the ARB	0		2	0
Additional Sites Analyzed by other Agencies	7 SCAQMD (includes 2 continuous GC) 4 San Diego County APCD 6 San Joaquin Valley APCD 3 Ventura County APCD		14	4 SCAQMD 2 San Diego County APCD 2 San Joaquin Valley APCD 1 Ventura County APCD
ARB Analysis Method	Method 024 Cryofocusing Direct GC/FID	Method 032 Cryfocusing GC/FID	Flame Ionization Detector	Method 022 High-Performance Liquid Chromatography/ Ultraviolet Detector
Laboratory Analyst	Sean Roy	Sean Roy, Barry Taylor	Not Applicable	Paul Chima
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 322-6076; U.S. EPA Aerometric Information Retrieval System (AIRS)			

Air Resources Board

Welcome to California

Meteorological Monitoring as of December 31, 2002

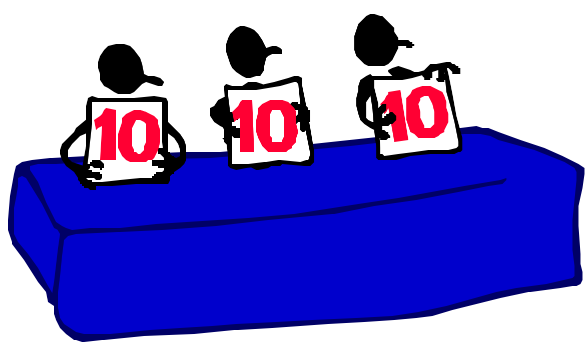
Parameter Measured	**Wind Speed**	**Wind Direction**	**Ambient Temperature**	**Relative Humidity**	**Atmospheric Pressure**	**Solar Radiation**
Sampling Schedule	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average
Number of ARB Sites	37	37	38	19	17	6
Number of District Sites	141*	133	119	70	43	40
Number of Mexico Sites	8	8	8	0	0	0
Method Used By ARB	Propeller or Cup Anemometer	Wind Vane Potentiometer	Aspirated Thermocouple or Thermistor	Thin Film Capacitor	Not Applicable	Thermopile or Pyranometer
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 322-6076; U.S. EPA Aerometric Information Retrieval System (AIRS)					

* Includes 8 vertical wind speed sensors.

APPENDIX B

2002
DISTRICT USABLE DATA ANALYSIS

Quality Assurance Section
Monitoring and Laboratory Division



Precision Data Analysis By District For Usable Data – 2002

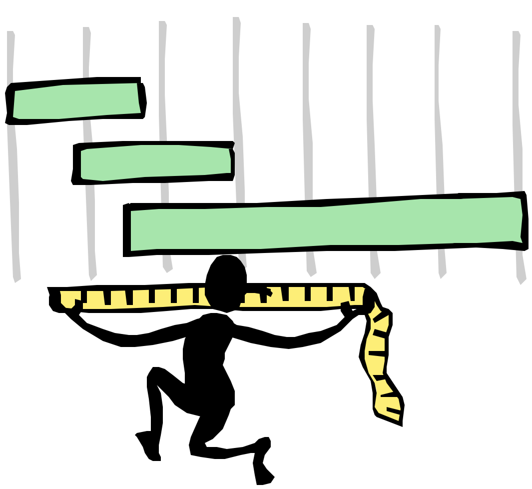
District	Criteria Pollutants (%)					Particulate Samplers (%)					
	CO	NO_2	O_3	SO_2	H_2S	PM2.5	PM10	PM10 Partisol	TEOM	BAM	TSP
Antelope Valley APCD	65	65	63						0		
Bay Area AQMD	100	100	96	100		52	0				
California ARB	98	92	94	100		80	93				
Environmental Monitoring Company			100								
Glenn County APCD											
Great Basin Unified APCD	0					39		100	79		
Imperial County APCD	100	72	55								
Lake County APCD			92								
Mendocino County APCD	100	100	100			0					
Mojave Desert AQMD	100	99	99	98	100	3			0		
Monterey Bay Unified APCD	100	100	100	100		0					
National Park Service (NPS)		0	97								
Northern Sierra AQMD			86			80			0		
Northern Sonoma County APCD			100								
Placer County APCD			48								
RMESI (previously known as XonTech, Inc.)				100			76				
Sacramento Metropolitan AQMD	88	87	89	90		59	80		42		
San Diego County APCD	91	92	95	94		51	91				
San Joaquin Valley Unified APCD	98	100	98				60				
San Luis Obispo County APCD	100	95	93	92		90			69		
Santa Barbara County APCD	100	97	99	100	100		97				
SEMARNAT (Mexico – Tracer Technologies)	0	0	0	0					0		
Shasta County APCD			100								
Siskiyou County APCD			57								
South Coast AQMD	100	94	99	93		80	72				
Tehama County APCD			100								
Ventura County APCD	100	100	100	100		49	97				
Yolo-Solano APCD			69								

Note: ARB's goal for usable data is 85%. Precision checks are not required for Kern, Modoc, North Coast, Butte, and Lassen counties for PM2.5 and PM10 (also applies to Coso and EMC companies).

APPENDIX C

SITING CRITERIA DISTANCES

Quality Assurance Section
Monitoring and Laboratory Division



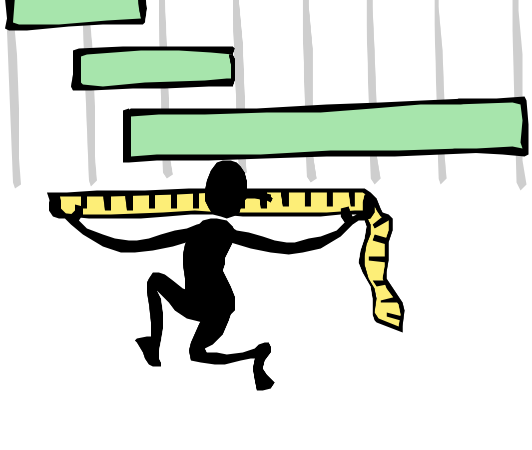
Siting Criteria Distances

Instrument	Height above ground Micro	Height above ground Other	Spacing between samplers	Height above obstructions	Distance from obstacles	Distance from tree dripline	Distance from walls, parapets, etc.	Airflow arc
PM10, AISI Nephelometer	2-7m	2-15m	<4>2m,		2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	2m	270
Dichot, TEOM, PM2.5	2-7m	2-15m	<4>1m,		2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	2m	270
Lead, TSP	2-7m	2-15m	<4>2m		2 times height of obstacle above inlet	micro and middle: no trees between sampler and source, neighborhood: should be 20m, must be 10m if considered an obstruction	2m	270
O_3	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	1m	270, or on side of building 180
CO	2 1/2 - 3 1/2m	3-15m		1m	2 times height of obstacle above inlet	micro: must be no trees between sampler and road, others: must be 10m if trees 5m above sampler.	1m	270, or on side of building 180
NO_2	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, if individual tree >5m above probe, must be 10m from dripline	1m	270, or on side of building 180
SO_2	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	1m	270, or on side of building 180
H_2S	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	1m	270,or on side of building 180
CH_4, THC, NMHC, PAMS	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m in direction of urban core	1m	270, or on side of building 180
Toxics Gaseous 910, 910A, 920	3-15m	3-15m		2m	2 times height of obstacle above inlet			
Temperature and Relative Humidity	1.25-2m	1.25-2m			4 times height of obstacle above sensor	1 tower width from tower side	4.5m	
Wind Speed and Direction					1.5 times height of obstacle above sensor	2 tower widths from tower side, 1 tower width from tower top		
Solar Radiation								

APPENDIX D

ARB's INSTRUMENT CONTROL LIMITS

Quality Assurance Section
Monitoring and Laboratory Division



Instrument/Sensor Control Limits

ARB's Control And Warning Limits

Limits: Control	Limits: Warning	Instrument
±15%	±10%	All Gaseous Criteria and Non-Criteria Analyzers
±15%	±10%	Total Suspended Particulate (TSP) Samplers
±10%	±7%	PM_{10}, Dichotomous (Dichot), Lead (Pb), Tapered Element Oscillating Microbalance (TEOM), Toxic Air Contaminant (XonTech 920) Samplers, Beta Attenuated Monitors (BAM), and Carbonyl (XonTech 925) Samplers
±4% (Flow) ±5% (Design)	None None	$PM_{2.5}$
±20%	None	Laboratory Audits (Toxics, PAMS, Motor Vehicle Exhaust, and Total Metals)

Acceptance Criteria For Meteorological (MET) Sensors

Limits	Sensor
±1.0° Celsius (±0.5°C PAMS only)	Ambient Temperature
±2.25mm of Mercury (Hg)	Barometric Pressure
±3%RH for 10-90%RH ±5%RH for <10 or >90%RH	Relative Humidity
±5% Watts/m^2	Solar Radiation
less than or equal to 5° combined accuracy and orientation error	Wind Direction
less than or equal to 0.5m/s	Wind Direction Starting Threshold
±0.25m/s between 0.5 and 5m/s and less than 5% difference above 5m/s	Horizontal Wind Speed
less than or equal to 0.5m/s	Horizontal Wind Speed Starting Threshold
±0.25m/s between 0.5 and 5m/s and less than 5% difference above 5m/s	Vertical Wind Speed
less than or equal to 0.5m/s	Vertical Wind Speed Starting Threshold

References

1. Quality Assurance Handbook for Air Pollution Measurement Systems. Volume I. Principles, EPA-600/9-76-005, January 1984.

2. Quality Assurance Handbook for Air Pollution Measure Systems. Volume II. Ambient Air Specific Methods, EPA-600/4-77-027a, May 1977.

3. State and Local Air Monitoring Network Plan, California Air Resources Board, May 1993.

4. Code of Federal Regulations, Title 40, Protection of the Environment, Part 58, Ambient Air Quality Surveillance (July 1992).

5. Air Monitoring Quality Assurance Manual. Volume I. Quality Assurance Plan, Monitoring and Laboratory Division, California Air Resources Board, February 1995.

6. Strategic Plan, California Air Resources Board, 1997.

7. Technical Assistance Document for Analysis of Ozone Precursors (TAD), September 30, 1998.