

California Environmental Protection Agency

Air Resources Board

Monitoring and Laboratory Division

Mission, Vision, and Accomplishments

2006

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Northern California Staff, December 2005 (not all staff present)



Southern California Staff, December 2005 (not all staff present)

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Monitoring and Laboratory Division

Mission Statement

Provide accurate, relevant, and timely measurements of air pollutants and their precursors, conduct engineering evaluations, and develop regulations to support California's Air Quality Management Program for the protection of public health.

1. Overview

California Environmental Protection Agency's Air Resources Board (ARB) implements the Air Quality Management Program in California. ARB's mission is to promote and protect public health, welfare, and ecological resources through the 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) within ARB contributes to the fulfillment of ARB's mission by providing accurate, relevant, and timely measurements of air pollutants and their precursors in California. Other MLD activities include research, engineering evaluations, development of regulations to reduce air pollution, and compliance assistance to private and public stakeholders.

Below is an overview of MLD organization and key program elements.

2. MLD Organizational Chart

3. Values

- Commitment to provide accurate, relevant, and timely information to the public, the regulated community, government agencies, and other stakeholders.
- Integrity that promotes trust and open communication.
- Competence that results in effective, high-quality work products.
- Pride in work that results from accountability and ownership.

4. Vision

- Anticipate emerging needs.
- Improve program and operational efficiency.
- Promote expertise of staff.
- Promote clear direction through effective communication.
- Encourage partnerships between public and private stakeholders.
- Provide a solid foundation for rulemaking and enforcement using the results of chemical and engineering analyses.
- Disseminate information about division products and activities.

5. Recent Accomplishments

The analytical chemists, engineers, air pollution specialists, technicians, and others at MLD make a significant contribution to improving and protecting public health in California. Some members of the MLD team develop, improve, and implement regulations that require reduction in emissions of pollutants - work that directly improves air quality. Others perform tasks that indirectly improve air quality, such as measuring pollutants in the air and from cars, trucks, industrial processes, and other sources. Pollutant measurements are used by staff to develop strategies and take actions to clean the air, and help keep it clean. Some recent accomplishments of which we are especially proud are listed below.

Protecting Public Health through Direct Action:

- Regulations to Cut Air Pollution from Small Off-Road Engines and Gas Cans

Staff at MLD lead the way in turning science into law. They conducted research and testing to demonstrate that small off-road engines (like those in lawn and garden equipment) and portable gasoline containers (i.e., gas cans) are major sources of gasoline spillage and evaporative vapor loss. These sources were identified as major contributors of smog-forming hydrocarbons. At the direction of the Board and working with affected industries, MLD staff developed tough but reasonable regulatory proposals to reduce emissions from these sources. The Board approved regulations which require phase-in of less polluting, small off-road engines and gas cans. We will all breathe a little easier as a result of the implementation of these regulations.

- Measuring Air Pollution in Emergency Response Situations

MLD experts in field monitoring and emergency response have improved California's ability to respond to emergency situations that may affect air quality. For instance, MLD staff designed and built a rapid response trailer for measuring the air quality effects of disasters and emergencies. The trailer and other equipment have been utilized to measure a variety of air pollutants at tire fires, wild fires, and other emergency situations across the State. Some information can be delivered through satellite uplink, for use in predicting the airborne spread of pollutants. This information can help enable disaster scene managers and others to protect the public by determining evacuation zones, advising emergency responders on health protection, and issuing health advisories to people in the area.

- Enhanced Gasoline Vapor Recovery

When consumers fill their car tanks with gasoline, the vapor recovery nozzles at the pump catch the hydrocarbon fumes that would otherwise cause smog and create a cancer risk. MLD staff evaluate and certify those nozzles and other parts that make up the gasoline vapor recovery system. MLD staff also ensure that industrial scale gasoline vapor recovery systems on gasoline cargo tanker trucks are working properly as they deliver fuel throughout the State. Gasoline vapor recovery systems are getting easier to use and more effective because of tighter performance standards and better testing methods developed by MLD staff.

- Testing to Support Enforcement of Regulations

To protect our health, California has some of the most stringent laws in the world to limit air pollution from smokestacks, vehicle tailpipes, and fuels. The value of these laws is only as great as our ability to make sure they are being obeyed. Fortunately, MLD has teams of experts who develop and apply emission test methods for stationary and mobile sources, and motor vehicle fuels. These tests have led to corrective actions by industrial facilities and recalls by vehicle manufacturers and fuel suppliers, thus reducing emissions which exceeded allowable limits.

Protecting Public Health by Providing the Foundation for Action:

- Measuring Very Low Concentrations of Highly Toxic Compounds

MLD staff are concluding a four and a half year study of ambient air concentrations of dioxins, furans, polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers (PBDEs). Each family of compounds contains ten or more congener species, each of which is reported in the results. Samples were collected in the San Francisco Bay Area and the South Coast Air Basin at nine sites for the first three years. These were reduced to one site in the final year; however, two sites were added in the Central Valley in the final year. Ambient concentrations are expressed in terms of toxic equivalency, except for PBDEs, because of the very low concentration values of these compounds. Equivalency is the product of the concentration and its applicable toxic factor. No approved factor exists for the newest compounds, PBDEs. Ambient sampling was conducted for a high percentage of the days each month. Annual averages, therefore, are representative of exposure in the communities the monitoring was done.

- Measuring Motor Vehicle Emissions

It's a challenge to measure the hydrocarbon and other air pollutants that come from the tailpipe and fuel tank of a car, but MLD staff have made it a science. They can detect not only how much air pollution is emitted, but also what specific kind—they can separate and identify over 200 different compounds. This is important because some air pollutants cause more smog or are more potent toxic air contaminants. MLD's work in developing methods and using them to measure speciated hydrocarbons at low levels from light-duty vehicles has allowed other ARB staff to develop low-emission vehicle regulations that get the most air pollution control benefit for the cost.

- Measuring Particulate Matter and Other Air Pollutants

ARB and the air districts in California have been successful in measuring and reducing ozone levels to control smog. Recent efforts to improve air quality have increasingly focused on measuring and reducing particulate matter (PM). MLD staff have led the way in evaluating and deploying both standard methods and new technology for determining the amount and composition of PM in the air. Monitoring experts at MLD have created a network of instruments that measure and report PM in real time. These monitoring activities provide a better understanding of PM sources, and enable more accurate public health advisories by taking into account both ozone and PM levels.

MLD staff continue to operate a statewide network of air pollution measuring and sampling equipment, to keep tabs on ozone and other health-damaging pollutants, including toxic air pollutants. All such MLD efforts undergo an independent review of measurement quality, including field audits to evaluate the performance of monitoring instruments.

6. Future Projects

MLD staff strive to improve the efficiency and value of their current projects. Even in times of limited resources, there are some important new public health issues that have to be addressed. MLD is working on the following new projects.

- Testing Indoor Ozone Emissions from Air Purifying Appliances

MLD staff are working with ARB's Research Division to measure emissions of ozone from a number of commercially popular air purifying appliances. Testing includes both the determination of emission factors and resulting room concentrations. Upon conclusion of the study, results will be widely publicized.

- Measurement of Particulate Matter Constituents and Their Gaseous Precursors

MLD staff are developing methodology for a unique system that simultaneously measures particulate matter constituents and the gaseous precursors from which they derive. The technology is Gas-Particle Ion Chromatography (GP-IC) and provides automated continuous measurement of ambient acidic gases and ammonia through the gaseous channel, and soluble anions and ammonium through the particulate

channel. The primary advantages of GP-IC monitoring are real time analytical results, low limits of detection, reduction in sampling losses, and the measurement of key reactive species that are often difficult to collect and analyze by current ambient monitoring methods.

- Measuring Diesel Vehicle Emissions

ARB's requirements for low-polluting diesel fuel are the toughest in the world. Even so, the ARB has decided that the health risk from particles in diesel exhaust is too high. Scientists and engineers in several ARB work teams are relying on MLD experts to develop methods to measure the components of diesel vehicle exhaust. The results will be used to gauge the effectiveness of air pollution prevention and control efforts in reducing the amount and toxicity of diesel particles. This is a very challenging problem because diesel exhaust is a complex mixture of thousands of compounds, but MLD staff are building on years of experience in measuring gasoline-fueled vehicles to develop reliable and cost-effective test methods. As we learn more about the pollutants that come out of the tailpipe, we are developing techniques to measure these pollutants and their byproducts in the ambient air.

- Measuring Greenhouse Gases from Motor Vehicles

The State legislature has directed ARB to evaluate the effects of greenhouse gases on the environment and develop control strategies. It is no surprise that motor vehicles are a big contributor. The first step in this effort is to determine what kind and how much of the greenhouse gases are emitted by vehicles in California. MLD chemists have developed new test methods for measuring greenhouse gases, and are testing a variety of vehicles to determine how much of these pollutants are put into the air.

- Measuring Wood Smoke in PM 2.5 Ambient Particulate Matter

ARB has the only State network for measuring the chemical composition of fine particulate matter (PM 2.5) in the country. As part of this network, the staff at MLD are developing methods to measure chemical tracers for wood smoke emissions. It has long been thought that wood smoke, primarily from residential fireplaces, represents a major constituent of PM 2.5, especially during the winter and in the Central Valley. However, until now, no one has been able to perform the monitoring to support that hypothesis. MLD scientists expect to have this ability by late 2006.

7. MLD Regulatory Activities

MLD has recently completed several regulatory packages to improve air quality in California, with several other regulations under development. Listed below are some recently Board approved regulations, along with those being pursued.

Regulations Adopted by the Board

Amendments to Portable Fuel Container Regulations, adopted in 2005. This rulemaking has two components. The first component specifies that kerosene containers and utility jugs (large capacity plastic containers) used to store and dispense kerosene and fuel are subject to the Portable Fuel Container regulations. These amendments are aimed at reducing reactive organic gas emissions. The second component of this rulemaking establishes a mandatory certification program and accompanying test procedures that will take effect on July 1, 2007. The emission reduction achieved by this regulation is 18 tons of volatile organic compounds (VOCs) per day.

Vapor Recovery Amendments –Onboard Refueling Vapor Recovery Effective and Operative Dates, adopted in 2004. These regulations amended the effective and operative dates for enhanced vapor recovery regulatory standards, to allow a more orderly implementation of required equipment upgrades.

Vapor Recovery Amendments – Unihose, adopted in 2004. This rulemaking amended the vapor recovery requirements to provide more flexibility for gas station owners to upgrade vapor recovery systems.

Small Off-Road Engine Regulations, adopted in 2003. These regulations imposed exhaust and evaporative emission control requirements for small off-road equipment and engines. That category includes lawn and garden equipment such as mowers and string trimmers. The emission reduction achieved by this regulation is 32 tons of VOCs per day.

Enhanced Vapor Recovery Technology Review, adopted in 2002. This rulemaking confirmed that enhanced vapor recovery standards are technologically feasible, and improved the certification process.

Vapor Recovery Equipment Defects List, adopted in 2001. ARB is required to identify and list defects that substantially impair the effectiveness of vapor recovery systems. The list must be considered for an update, through an executive officer hearing, at least once every three years. Enforcement of the list ensures that emission reductions credited to vapor recovery are achieved.

Vapor Recovery Amendments, adopted in 2001. This rulemaking provided improvements to vapor recovery certification and test procedures.

Vapor Recovery Certification and Test Procedure Regulations for Enhanced Vapor Recovery, adopted in 2000. This rulemaking required service station vapor recovery systems to be compatible with vehicular on-board refueling vapor recovery systems. It also required installation of diagnostic systems to alert the service station operators of vapor recovery equipment malfunction, and imposed several other standards.

Portable Fuel Container – Original Regulations, adopted in 1999. These regulations reduced emissions associated with the use of portable fuel containers (i.e., "gas cans") and spouts to refuel off-road engines. The regulations also reduced emissions associated with transporting and storing fuel in portable fuel containers. The emission reduction achieved by this regulation is 70 tons of VOCs per day.

Regulations under Development

Enhanced Vapor Recovery for Above Ground Storage Tanks. Emission control technologies are being investigated for above ground gasoline storage tanks used for agricultural, construction, maintenance, and emergency operations. The available emissions data are based on U.S. EPA's AP-42 methodology. Staff, in collaboration with industry, designed and conducted field studies to further investigate the emission impact from this category. The current uncontrolled emissions from this category are estimated to be approximately four tons of VOCs per day.

Auxiliary and Off-Road Fuel Tanks. This proposed rulemaking addresses tanks mounted in the beds of pickup trucks and on trailers used to supply off-road equipment. The control strategy would include evaporation and permeation controls. The current uncontrolled emissions inventory for this category has yet to be determined.

Cargo Tanks. Emission controls may be sought for tankers that distribute gasoline from the terminals to the service stations. The expected control strategy is to reduce the loss of gasoline vapor while the cargo tank is in transport. The emission estimates are based upon previous studies, field work, and empirical calculations performed by staff. Potential control measures include caps for product hoses, modifications to the standards for pressure vacuum vent valves, and closures for the vapor connection of the tanker. The current uncontrolled emissions from this category are estimated to be approximately 12 tons of VOCs per day.

Enhanced Vapor Recovery for Bulk Plants and Terminals. Future amendments to the bulk plant and terminal certification requirement will further reduce VOC emissions. Likely controls include enhanced vapor control devices and testing requirements. The current uncontrolled emissions inventory for this category has yet to be determined.

Marine Vessel External Fuel Tanks. The United States Environmental Protection Agency (U.S. EPA) is considering regulations for controlling evaporative emissions from marine vessels with external fuel tanks. ARB will evaluate U.S. EPA's regulation and may pursue more stringent evaporative and permeation controls for this category. The current uncontrolled emissions inventory for this category has yet to be determined.

Pleasure Craft: Spark Ignited Personal Watercraft and Marine Vessels. U.S. EPA is also considering regulations to reduce evaporative emissions from pleasure craft. ARB will evaluate the regulations and may undertake further regulatory action to implement existing on-road evaporative control technologies, such as low permeation fuel hoses, low permeation fuel tanks, and carbon canisters. The current uncontrolled emissions from this category are estimated to be approximately 18 tons of VOCs per day.

Recreational Vehicles. U.S. EPA has promulgated regulations controlling permeation emissions from recreational vehicles such as off-road motorcycles, all terrain vehicles, and snowmobiles. ARB's proposed regulation would reduce evaporative emissions from recreational vehicles by implementing existing on-road evaporative control technologies such as low permeation fuel hoses, low permeation fuel tanks, and carbon canisters. The current uncontrolled emissions from this category are estimated to be approximately 17 tons of VOCs per day.

8. Overview of MLD Branches

MLD consists of six branches, each fulfilling specialized functions toward the division's mission to support California's Air Quality Management Program for the protection of public health. For a graphic depiction of MLD branches, please refer to the organizational chart on page two of this document. The following is a brief description of the primary activities carried out by each branch.

Air Quality Surveillance Branch provides ambient air quality measurements, including pollutant concentrations and meteorological data to help define the nature, extent, and trends of air pollution in California.

Engineering and Certification Branch develops control measures for reducing emissions from gasoline dispensing facilities, and implements the gasoline vapor recovery certification program.

Northern Laboratory Branch develops laboratory and ambient air collection test procedures, performs near source ambient air monitoring, conducts analyses of ambient air samples and consumer products, and provides technical assistance to clients.

Quality Management Branch conducts quality assurance activities to ensure air quality data meet or exceed the data quality and program objectives of the end users. The branch plans, coordinates, and reports air quality levels from dioxin and other special monitoring projects.

Southern Laboratory Branch provides accurate and timely measurements for the analysis of mobile source emissions and fuel specifications; it provides technical expertise in support of ARB's motor vehicle and clean fuel programs.

Stationary Source Testing Branch develops regulations and conducts research and compliance testing of a variety of stationary sources. It issues certifications and advises public and private stakeholders regarding compliance with air pollution laws and regulations.

The remainder of this document discusses in detail the specific goals, activities, and capabilities of each of the MLD branches mentioned above.

Mission Statement

Support Air Resources Board's air pollution control program by providing accurate ambient air quality measurements, including pollutant concentrations and meteorological data to help define the nature, extent, and trends of air pollution in California.

1. Air Quality Surveillance Branch (AQSB) Organizational Chart

Branch Total = 46 py

2. Base Program

The AQSB consists of five sections: the Air Quality Monitoring (AQM)-North Section, the AQM-Central Section, the AQM-South Section (based in El Monte), the Special Purpose Monitoring Section, and the Operation Support Section.

Currently, the AQSB operates a total of 42 air monitoring sites. The AQSB base program also includes pesticide monitoring, upper-air meteorological monitoring, community health monitoring, emergency response, special studies in support of ARB and local air districts, and the data management and quality control activities associated with each of these tasks.

The AQSB provides calibration services, acceptance testing, and repair services to air districts. The AQSB provides technical assistance to the air monitoring community at large.

The AQSB staff operates an Air Quality Data Acquisition System and reports more than 275,000 hourly air quality and meteorological measurements each

month to the U.S. EPA's Air Quality Data System. The AQSB staff also provides real-time air quality data to the U.S. EPA's "Air Now" web site, which provides information on current and forecasted air quality to the public nationwide. Additionally, the AQSB provides real-time data to the Planning and Technical Support Division's Meteorology Section in support of the Board's AgBurn Control Program.

A. Air Monitoring - North Section

- Operates 21 air monitoring sites between Sacramento and the Oregon border.
- Collects and process air quality data for the statewide ambient air monitoring network.
- Provides technical assistance and calibration services to seven local air districts.
- Conducts sampling in support of ARB's AgBurn Control Program.

B. Air Monitoring - Central Section

- Operates 13 air monitoring sites between Modesto and Bakersfield.
- Provides technical assistance and calibration services to three local air districts.

C. Air Monitoring - South Section

- Operates eight air monitoring sites in southern California, including the coastal region from Paso Robles and south to Calexico.
- Oversees data collection and submittal for nine sites in the Mexico border region.
- Provides technical assistance and calibration services to three local air districts.

D. Special Purpose Monitoring and Data Support Section

- Conducts Community Health Program monitoring.
- Conducts special purpose air monitoring studies in support of other divisions, local air districts, or sister agencies.
- Conducts pesticide monitoring in support of the Department of Pesticide Regulations.
- Operates three radar wind profilers and four mini sodars to assess upper level wind speed, direction, and temperature.
- Conducts emergency response monitoring to assess public exposure.
- Operates the U.S. EPA Supersite platform in Fresno in cooperation with U.S. EPA and Desert Research Institute (U.S. EPA's contractor).

E. Operation Support Section

- Works with manufacturers in the development of sampling instrumentation and methods.
- Provides technical assistance to MLD staff and local air districts with deployment of new technologies.
- Repairs and services air monitoring instruments used by AQSB and local air districts.
- Evaluates prototype instruments and performs field tests for performance comparison to reference or equivalent methods.
- Provides shipping and receiving services and maintains equipment and parts inventory, as well as the gas cylinder inventory for field and laboratory needs.

3. Branch Capabilities

Measurement of Criteria and Non Criteria Pollutants and Meteorological Parameters

- Carbon monoxide (CO) by continuous nondispersive infrared analysis.
- Nitrogen dioxide (NO₂) by continuous chemiluminescence analysis.
- Sulfur dioxide (SO₂) by continuous fluorescence analysis.
- Ozone by continuous ultraviolet analysis.
- Particulate matter (PM 10, PM 2.5) by 24-hour integrated filter sampling using a high or low volume sampler with a size-selective inlet for subsequent mass and chemical speciation analyses.
- Particulate matter mass via continuous beta attenuation monitors.
- Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) continuous analysis by Gas Chromatography /Photo Ionization Detector (GC/PID).

- Sample collection for laboratory determination of oxygenates, aromatics, butadiene, halogenates, total metals, nitrate, sulfate, carbon, aldehydes, hexavalent chromium, dioxin, furans, PCB, PBDEs, Polycyclic Aromatic Hydrocarbons (PAHs), speciated hydrocarbons, various pesticides, asbestos, and PM mass.
- Non-methane organic compounds by continuous analyzer.
- Organic, elemental, and total carbon analyzer with semi-continuous sampling.
- Black carbon via continuous sampling and analyzer.
- Surface meteorology via continuous measurement of wind speed and direction, relative humidity, barometric pressure, and solar radiation.
- Upper air meteorology (wind speed and direction) by Doppler radar and sodar, and temperature by radio-acoustic sounding.

Special Studies

- Evaluate new and innovative air monitoring techniques and equipment.
- Conduct limited-term, focused monitoring studies such as pesticide, near-source hexavalent chromium, asbestos, and Community Health monitoring.
- Provide technical and field support for local and regional air quality studies.
- Emergency response: operate trailer equipped with real time PM, CO, SO₂, black carbon, met, and BTEX monitors with satellite uplink.

Mission Statement

Develop control measures for reducing emissions from gasoline dispensing facilities, and implement the vapor recovery certification program.

1. Engineering and Certification Branch (ECB) Organizational Chart

Branch Total = 18.5 py

2. Base Program

The Engineering and Certification Branch has two sections, the Engineering Evaluation Section and the Vapor Recovery Certification Section. The Engineering Evaluation Section develops and updates vapor recovery certification and test procedures. The Vapor Recovery Certification Section performs testing and certifies vapor recovery systems for gasoline dispensing facilities.

The activities carried out by each section are listed below.

A. Engineering Evaluation Section

- Develops new vapor recovery certification test procedures.
- Evaluates modifications to improve certification and test procedures for gasoline dispensing facilities and aboveground tank applications.
- Evaluates requests to use alternate test procedures for vapor recovery.
- Assists the Vapor Recovery Certification Section in conducting certification tests to certify vapor recovery systems.
- Tests and certifies in-station diagnostic systems.
- Coordinates E85 certification projects.
- Evaluates electronic antenna technologies for nozzles.
- Coordinates interagency issues with the California Water Resources Control Board.

B. Vapor Recovery Certification Section

- Tests and certifies vapor recovery systems for gasoline dispensing facilities.
- Evaluates modifications to certified systems.
- Meets quarterly with California Air Pollution Control Officers Association (CAPCOA).
- Assists the Engineering Evaluation Section in evaluating new or modified vapor recovery test procedures.
- Develops new vapor recovery certification test procedures.
- Performs public outreach to aid in implementing the Enhanced Vapor Recovery program.

3. Branch Capabilities

Regulations

- Work with stakeholders to identify improvements to the vapor recovery program and opportunities for further emission reductions.
- Develop new certification and compliance standards and specifications.
- Draft regulations and present vapor recovery procedures to the Board for adoption.

Vapor Recovery System Certification

- Perform engineering analysis of vapor recovery systems and components.
- Conduct field testing to evaluate system performance.
- Conduct data analysis of test results to verify standards and specifications are met.
- Prepare certification Executive Orders in cooperation with districts.
- Maintain web pages to allow Executive Order access worldwide.

Vapor Recovery Test Method Development and Evaluation

- Develop new certification and compliance procedures for vapor recovery standards and specifications.
- Evaluate alternatives to adopted procedures through equivalency determinations.
- Evaluate and approve inspection methods to facilitate easy checks of in-use vapor recovery system performance.

Outreach

- Post advisories on vapor recovery program.
- Conduct seminars for stakeholders on program implementation and regulatory changes.
- Participate in conferences to promote program and educate affected parties.
- Maintain extensive vapor recovery web pages.
- Broadcast list-serve alerts on vapor recovery news.

Testing

- Determine emission factor for Phase I systems at dispensing facilities (TP-201.1A).

- Determine volumetric efficiency for Phase I vapor recovery systems (TP-201.1).
- Determine static torque of rotatable product and vapor adaptors (TP-201.1B).
- Determine leak rate of drop tube and drain valve (TP-201.1C).
- Determine leak rate of drop tube overflow protection device and drain valve (TP-201.1D).
- Determine leak rate and cracking pressure of pressure/vacuum vent valves (TP-201.1E).
- Determine efficiency and emission factor for Phase II vapor recovery systems (TP-201.2).
- Determine flow and pressure measurement of vapor recovery equipment (TP-201.2B).
- Determine spillage from Phase II vapor recovery systems (TP-201.2C).
- Determine nozzle post-fueling drips (TP-201.2D).
- Determine gasoline liquid retention in nozzles and hoses (TP-201.2E).
- Determine pressure-related fugitive emissions (TP-201.2F).
- Determine bend radius for underground vapor piping (TP-201.2G).
- Determine hazardous air pollutants from vapor recovery processors (TP-201.2H).
- Evaluate In-Station Diagnostics (TP-201.2I).
- Determine pressure drop of vapor recovery components through bench testing (TP-201.2J).
- Perform two-inch static pressure test (TP-201.3).
- Perform static pressure of vapor recovery system on aboveground tanks (TP-201.3B).
- Determine vapor pipe connections to underground gasoline storage tanks (TP-201.3C).
- Perform dynamic back pressure test (TP-201.4).
- Perform air to liquid volume test (TP-201.5).
- Perform liquid removal of vapor recovery system (TP-201.6).
- Perform continuous pressure monitoring (TP-201.7)

Mission Statement

Support the Air Resources Board's ambient air monitoring, stationary source, and consumer products programs by developing laboratory and ambient air collection test procedures. Perform near source ambient air monitoring, conduct analyses of ambient air samples and consumer products, and provide technical assistance to clients.

1. Northern Laboratory Branch (NLB) Organizational Chart

Branch Total = 33 py

2. Base Program

The Northern Laboratory Branch consists of three sections: Special Analysis Section, Inorganics Laboratory Section, and Organics Laboratory Section. Together these sections analyze consumer products, stationary source air samples, and ambient air samples. The following information lists the activities performed by each section.

A. Special Analysis Section

- Performs consumer product method development and compliance testing.
- Performs VOC determinations of paints and coatings.
- Performs analyses of ambient and application pesticide samples.
- Performs analyses of stationary source samples.
- Develops various analytical test methods.

B. Inorganics Laboratory Section

- Performs PM 2.5/PM 10 mass, elemental, and ionic speciation determinations.
- Performs lead and sulfate determinations.
- Performs organic/elemental carbon determinations.
- Performs Toxics Air Contaminants (metals and hexavalent chromium) determinations.
- Maintains the electronic database, provides computer support, and updates and maintains the Laboratory Information System (LIMS).
- Reports ambient air monitoring data to the national U.S. EPA database.

C. Organics Laboratory Section

- Performs TAC determinations for halogenated organics, aromatics, acrolein, and carbonyl compounds.
- Performs method development in support of Children's Environmental Health Protection Program and Neighborhood Assessment Program.
- Performs PM 2.5 organic chemical speciation, such as levoglucosan and acids.

3. Branch Capabilities

Stationary Source Testing/Near Source Monitoring

- Perform total particulate matter determination by ARB Method 5.
- Perform metals (19 elements) determinations by inductively coupled plasma atomic emission spectroscopy and atomic absorption (AA) spectroscopy (ARB Method 436).
- Perform hexavalent chromium (Cr⁺⁶) determinations by ion chromatography.
- Perform formaldehyde and acetaldehyde determinations by ARB Method 430.
- Perform determinations by Gas Chromatography and High Performance Liquid Chromatography for pesticides and 58 breakdown products.

Consumer Products

- Perform VOC determinations of antiperspirant/deodorant, consumer products, and aerosol coating products by ARB Method 310.
- Perform total volatile determination by gravimetric procedure

- (MLD SOP SAS 01).
- Perform ammonia determination by specific ion electrode (MLD SOP SAS 02).
 - Perform water determination by Karl Fischer or Gas Chromatography (MLD SOP SAS 03 or MLD SOP SAS 04).
 - Perform compound determinations for exempt pollutants in aerosol propellant by Gas Chromatography/Thermal Conductivity Detector (MLD SOP SAS 05). Compounds exempt under Title 17 California Code of Regulations include CO, CO₂, methane, ethane, and four halogenated organic compounds.
 - Perform compound determinations for 31 exempt and prohibited compounds (i.e., exempt or prohibited per Title 17 California Code of Regulations) by Gas Chromatography/Mass Spectrometry (MLD SOP SAS 06).
 - Perform acetone and low molecular weight alcohol determinations in consumer products by Gas Chromatography-Flame Ionization Detector (MLD SOP SAS 07).
 - Perform vapor pressure determination by Isoteniscope (MLD SOP SAS 08).
 - Perform boiling point determination by Gas Chromatography/Flame Ionization Detector (MLD SOP SAS 09).
 - Perform boiling point determination by distillation (MLD SOP SAS 10).

Ambient Air

(a) Particulate Matter

- Perform mass determination of PM 10 filters by electronic analytical balance (MLD SOP 16).
- Perform mass determination of PM 2.5 (Federal Reference Method) by electronic analytical balance (MLD SOP 55).
- Perform ionic species determinations from PM 10 and TSP filters by Ion Chromatography (MLD SOPs 7, 23, and 33).
- Perform elemental/organic carbon determination from PM 2.5 filters from chemical speciation network (MLD SOP 65).
- Perform metals determination (30 elements) from PM 2.5 chemical speciation Teflon filters, and Total Suspended Particulate (TSP) filters by X-Ray Fluorescence (MLD SOP 34).
- Perform ionic species determination from PM 2.5 chemical speciation filters by Ion Chromatography (MLD SOP 64).
- Perform sulfate determination from TSP filters by Ion Chromatography (MLD SOP 33).

(b) Toxics

- Perform hexavalent chromium determination from TSP filters by Ion Chromatography (MLD SOP 39).
- Perform 1, 3-butadiene, halogenated, and aromatic compounds determinations by Gas Chromatography/Mass Spectrometry (MLD SOP 58).
- Perform formaldehyde, acetaldehyde, and methyl ethyl ketone determinations by High Performance Liquid Chromatography/Ultraviolet Detector (MLD SOP 22).
- Perform acrolein, acetone, acetonitrile, and acrylonitrile determinations by Gas Chromatography/Mass Spectrometry (MLD SOP 66).
- Perform PM 2.5 organic speciation for saccharides and organic acid by derivatization and gas chromatography/mass spectrometry (MLD SOP TBD).

Mission Statement

Plan, conduct, review, and report quality assurance, quality assessment, and quality control activities to ensure air quality data meet or exceed the data quality and program objectives of the end users. Plan, coordinate, and report air quality levels from dioxin, and other special monitoring projects.

1. Quality Management Branch (QMB) Organizational Chart

Branch Total = 17 py

2. Base Program

The Quality Management Branch is made up of two sections: the Quality Assurance Section and the Operations Planning and Assessment Section. The Quality Assurance Section includes an audit group and the Standards Laboratory. The section is set up along classic quality assurance lines, with three elements: quality assurance, quality assessment, and quality control, as described below, providing a foundation for the work. The Operations Planning and Assessment Section staff incorporates the same three elements into the overall planning and coordination of various specialty and non-routine monitoring projects carried out by the Division. From preparing sampling and analysis protocols to participating in monitoring site selection and instrument deployment, the Operations Planning and Assessment Section staff provide guidance and serve as leads throughout all stages of a monitoring project.

Listed below are the classic quality assurance elements.

Quality Assurance: *Ensure the quality of the Division's products meet the users' needs.*

- Perform site reviews and system audits, consult with stakeholders to develop new monitoring and analytical programs, and assess the effect of changes in measurement methods. Report quality assessment and quality

control results and provide independent review of quality control activities and results.

Quality Assessment: *Provide instruments, analyzers, and samplers with known standards to quantitatively evaluate the performance of measurement systems.*

- Perform field audits of criteria and non-criteria pollutant gaseous analyzers, particulate samplers, meteorological equipment, and criteria and non-criteria pollutant laboratory analyses for ambient and source level measurements.

Quality Control: *Ensure aspects of daily operations utilize high level practices, procedures, and standards.*

- Evaluate the performance of, and perform first level troubleshooting for instruments; assay the composition and concentration of pollutant gas mixtures; compare results to Standard Reference Materials and instruments from the National Institute of Standards and Technology (NIST).

Through the implementation of the base programs, the Branch provides a wide range of operation support and activities extending beyond the limits of the Division.

A. Quality Assurance Section

The Quality Assurance Section provides underlying quality assurance of ambient air data collected in California. The section is directly responsible for the precision and accuracy of all data generated and collected by the Division, and indirectly responsible for precision and accuracy of all data of local and private air monitoring agencies in the California air monitoring network. The section assures that ambient air data are in compliance with quality assurance criteria of State and Federal monitoring regulations and guidance documents.

The Quality Assurance Section staff performs a complex array of field and laboratory performance and system audits for all air monitoring stations in California using a mobile audit van. The audit van is equipped with instruments capable of determining the accuracy of instruments involved in all ambient air monitoring programs being conducted in the State. Audits are performed annually and include laboratory performance audits, whole air sampler performance checks, through the probe (TTP) continuous analyzer performance audits, particulate matter sampler audits, and meteorology equipment audits (descriptions follow).

Laboratory performance audits provide a regulator and a NIST cylinder containing a mixture of gases to specific laboratories throughout the State for analysis. The audit assesses the accuracy of the methods used by the laboratory in measuring the concentration of pollutants in ambient air.

A *whole air sampler performance check* is a means for evaluating data quality and comparing sample results generated by various laboratories throughout the State. Whole air samples are collected using one sampler with separate sampling lines to pull ambient air into several canisters over a specified period of time. After sampling is completed, samples are shipped to participating laboratories for analysis. Results are sent to Quality Assurance Section staff for comparisons, interpretation, and distribution to participating laboratories.

TTP continuous analyzer performance audits are conducted at sites with continuous analyzers capable of monitoring criteria pollutants such as carbon monoxide, nitrogen dioxide, hydrogen sulfide, sulfur dioxide, and ozone; non-criteria pollutants such as propane; and total non-methane organic compounds (TNMOC) pollutants. The audit is conducted by introducing a diluted mixture of NIST gases and pure air (a mixture at ambient levels) into the sampling probe inlet at varying concentrations. Quality Assurance staff compare results obtained from the continuous analyzer to the known values specified by the NIST. The audit is performed to measure the integrity of the monitoring system.

Particulate matter samplers are audited using either a certified calibrated mass flow meter or a certified critical flow orifice, both standardized against a NIST traceable flow device or calibrator. The samplers are audited for flow rate and difference from assigned specifications. The audit device is connected in-line with the sampler's flow path. The flow rate is measured while the sampler is operating under normal sampling conditions. The indicated flow rate is corrected based on its calibration, and the true flow is calculated from the audit device's calibration curve. The sampler's corrected flow is then compared to the true flow, and a percent difference is determined.

The Quality Assurance Section audits meteorology parameters that include wind speed, wind direction, ambient temperature, relative humidity, barometric pressure, and total solar radiation.

In addition to conducting audits, the Quality Assurance Section maintains standard procedures for auditing each of the field analyzers in the State ambient network. Quality Assurance information about each air monitoring station that is audited is available via the World Wide Web. Included on the web page are maps, GPS coordinates, station photos, a list of pollutants monitored, and a site survey for each air monitoring station. A site survey is an in-depth overview of ambient air monitoring activities and includes the physical features of an air

monitoring station (traffic descriptions, distances to trees, and obstacles) and equipment details (instrument calibration dates and residence times).

- **Standards Laboratory**

The Quality Assurance Section's Standards Laboratory performs verifications, certifications, and calibrations of ozone and flow rate standards and compressed gas cylinders that are used to calibrate ambient monitor samplers and analyzers. The Laboratory uses U.S. EPA protocols and procedures using NIST primary standards.

The laboratory can certify low concentration ambient standards for air monitoring stations and high concentration source level standards used in source testing. Clients include government agencies and private entities in California and around the world. Laboratory work for agencies other than the ARB and air districts is done on a fee-for-service basis.

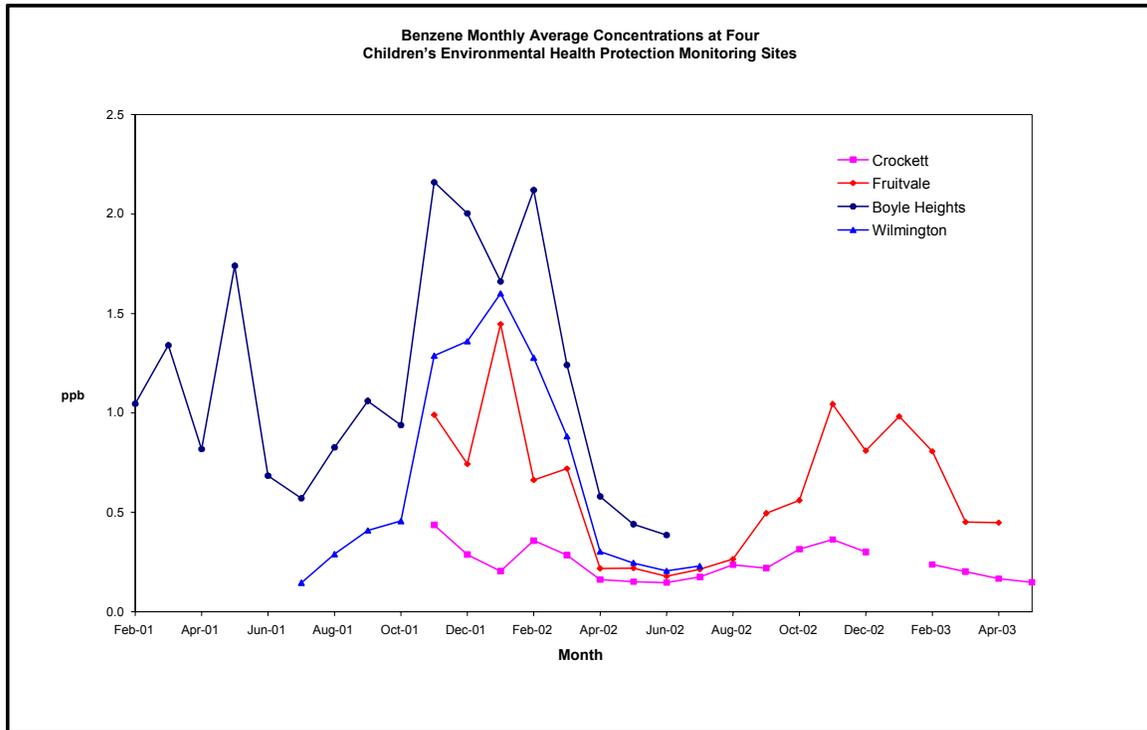
B. Operations Planning and Assessment Section

Operations Planning and Assessment staff is responsible for planning, coordinating, and assessing special purpose air monitoring projects for the Division. Staff provide internal and external clients with air monitoring data collected for a variety of programs, including ARB's Community Health Program, and the California Ambient Dioxin Air Monitoring Program (CADAMP). The section also plans and coordinates special projects, including air sampling for naturally occurring asbestos, often conducted in support of air district monitoring and regulatory activities.

Planning air monitoring projects involves staff preparing clear and detailed data quality objectives, writing Request for Proposal documents for contract laboratory work, and coordinating sampling and analysis efforts within the Division. Another key function of this section is coordinating MLD activities with other divisions within the ARB, such as the Planning and Technical Support Division, Stationary Source Division, Research Division, and with other agencies, communities, and air districts.

From preparing sampling and analysis protocols to participating in monitoring site selection and instrument deployment, staff provide guidance and oversight and serve as leads throughout all stages of a monitoring project. Staff perform primary data analyses and prepare reports for user groups. The section staff aim to ensure that operations meet the overall requirements of the monitoring program and the needs of the data users.

The graph below is an example of data reported for the California Ambient Dioxin Air Monitoring Program.



Examples of projects recently completed or currently underway by the Operations Planning and Assessment Section include:

- Ambient air monitoring of dioxins and dioxin-like compounds in highly populated urban areas, including the San Francisco Bay Area and four in the South Coast Air Basin. Currently, monitoring is being conducted in the San Joaquin Valley at sites in Fresno and in the rural community of Five Points. Section staff will compile data as monthly and annually averages to help understand variations in ambient concentrations potentially resulting from changing emissions and/or meteorology.
- A comprehensive evaluation and update of Test Method 435, *Determination of Asbestos Content of Serpentine Aggregate* is underway, as well as a determination of the feasibility of developing a separate test method specific to asbestos in soil.
- Air toxics monitoring in the San Joaquin Valley community of Parlier. This air monitoring project is conducted to measure the ambient air concentrations of toxic pollutants and airborne pesticides that may be impacting community residents.

3. Branch Capabilities

Data Analysis and Program Evaluation

- Perform data analysis for ambient air monitoring programs including: Toxics program, Barrio Logan, Multiple Air Toxics Exposure Study (MATES I/II), Children's Environmental Health Protection Program, and Photochemical Ambient Monitoring Stations (PAMS).
- Evaluate method comparison data from Bakersfield PM sampler performance study where select monitoring equipment is compared head-to-head to identify a continuous monitor suitable for attainment designation purposes.
- Perform research in search of diesel particulate measurements based on method tracers and elemental carbon (PM 10).

Audits

- Conduct field and laboratory performance audits for ambient air monitoring.
- Conduct system audits.
- Maintain site survey inventory.
- Submit precision and accuracy data to the Aerometric Information Retrieval System (AIRS).

Air Monitoring Programs

- Coordinate monitoring program for hexavalent chromium in Hinkley, CA.
- Coordinate monitoring efforts for Children's Environmental Health Protection Monitoring programs in Boyle Heights, Crockett, Fresno, Fruitvale, Wilmington, and Barrio Logan.
- Facilitate California Ambient Dioxin Air Monitoring Program (CADAMP) dioxin and dioxin-like PCB monitoring in San Francisco Air Basin and South Coast Air Basin.
- Recommend specific air monitoring methods for Ambient Air Quality Standards.

Quality Improvement

- Perform assessment of sampling and analysis methods, monitoring techniques, data analysis and programs, and resolve data quality issues.
- Coordinate laboratory round robin studies for consumer products and automotive exhaust.
- Perform independent review of QC manuals, SOPs, and QC reports.
- Research and provide recommendations for lowering the current limit of detection (LOD) for high-risk compounds where ambient levels approach the laboratory's current LOD.
- Perform technical quality assurance to support special studies.
- Update Quality Assurance Manuals and continue further development.
- Continue Quality Assurance policy development with U.S. EPA.
- Coordinate with clients to define the program and project Data Quality Objectives (DQOs) for ambient air monitoring projects.
- Assist in the preparation of DQOs for monitoring programs.
- Track the progress of monitoring programs to assure that DQOs are being met.
- Assess the monitoring results to determine compliance with DQOs.
- Review and validate field and laboratory data and documentation.
- Submit precision and accuracy assessment data to management for review.

Report Writing

- Prepare technical papers for air monitoring projects.
- Maintain and conduct site survey evaluations of ambient air monitoring stations.
- Prepare Quality Assurance Project Plans (QAPPs) to clearly define and describe the critical aspects of non-routine ambient air monitoring projects.

- Prepare monitoring protocols for individual non-routine ambient air monitoring projects.
- Prepare monitoring reports that include data assessment results.

Ambient Gas Standards

- Conduct calibration, verification, and certification of flow transfer standards.
- Conduct calibration, verification, and certification of ozone transfer and primary standards using a standard reference photometer.
- Maintain current SOPs for the Standards Laboratory that are available on World Wide Web.
 - SOP 5721: Calibration, Certification, and Verification of Low Flow Primary and Transfer Standards.
 - SOP 5722: Certification of Calibration and Audit Gas Standards.
 - SOP 5723: Certification of High Volume Standards.

Public Outreach

- Provide background information to public through the World Wide Web on audit programs and monitoring activities, the QA Manual, and monitoring site attributes.
- Provide monitoring results in clear formats via the World Wide Web.
- Coordinate with State and local government agencies, communities, school districts, and private businesses to plan monitoring projects.

Mission Statement

Provide accurate and timely measurements for the analysis of mobile source emissions and fuel specifications, and provide technical expertise in support of the Air Resources Board's motor vehicle and clean fuels programs.

1. Southern Laboratory Branch (SLB) Organizational Chart

Branch Total = 28 py

2. Base Program

The Southern Laboratory Branch has three sections: the Organics Analysis Section, the Fuel Analysis and Methods Evaluation Section, and the Environmental Studies and Operations Support Section. The Organics Analysis Section has the primary responsibility for performing speciated exhaust and evaporative emission analyses for new and used vehicles. The Fuel Analysis and Methods Evaluation Section analyzes fuels, including Cleaner Burning Gasoline and Clean Diesel. The Environmental Studies and Operations Support Section provides varied safety, quality control, and data management functions for the Branch.

A. Organic Analysis Section

Low-Emission Vehicle (LEV) /LEVII Program The Organics Analysis Section identifies and quantifies over 200 compounds of motor vehicles emissions for the purposes of determining smog forming potential (reactivity) and toxicity. Fleets of vehicles equipped with advanced emission control technologies such as ultra-low emission vehicles (ULEVs) are tested. Hybrid electric vehicles (HEVs) and vehicles powered by clean fuels such as compressed natural gas (CNG) and liquefied petroleum gas (LPG) are also tested.

Surveillance Program – Provide exhaust and evaporative emissions analyses for in-use vehicles in order to develop or refine emission factors for the mobile source emissions inventory.

In-Use Compliance Program – Verify that vehicle manufacturers comply with emissions standards, and evaluate the manufacturers' self-certification for new vehicles (Title 13 testing).

Off-Road Emissions Testing – Perform exhaust analyses and provide technical expertise for testing sources such as personal water craft, marine outboard engines, portable fuel containers, and lawn and garden equipment.

Diesel Risk Reduction Program – Establish methods for measuring gas, semi-volatile, and condensed phases of the exhaust from diesel-powered vehicles, to help evaluate the benefits of various emission control strategies.

AB 1493 – Carry out chemical analysis of motor vehicle exhaust to determine levels of greenhouse gases such as nitrous oxide and refrigerant R134.

B. Fuel Analysis and Methods Evaluation Section

Compliance Testing of Cleaner Burning Gasoline (CBG) - Develop and evaluate analytical methods for measuring regulated fuel components in Phase 3 CBG. Perform routine testing of CBG to determine compliance with regulations.

Compliance Testing of California Clean Diesel Fuel - Develop methods for enforcement testing of adopted specifications.

Fuel Adulteration Testing - Analyze diesel fuel for red dye content to determine compliance with the Internal Revenue Service regulations. Develop fingerprinting methods for fuels in support of tax evasion regulations for the Board of Equalization and the Internal Revenue Service.

Emissions Inventory - Analyze fuels used for surveillance testing for the development of speciated mobile source emission factors.

Marine Engine Testing - Analyze petroleum blow-by and combustion products of small marine engines in tanks of water.

C. Environmental Studies and Operations Support Section

Motor Vehicle Programs - Perform data and records management and provide analytical support for the LEV and in-use vehicle programs.

Quality Assurance and Quality Control - Conduct quality assurance and quality control review of analytical data generated by the Organics Analysis Section and the Fuel Analysis and Methods Evaluation Section.

Safety - Provide oversight of the laboratory safety program.

Network Communications – Provide technical support for connectivity and web site development.

3. Branch Capabilities

California Non-Methane Organic Gas Test Procedures for Vehicle Emissions

- Analyze exhaust and evaporative emissions for speciated hydrocarbons by Gas Chromatography/Flame Ionization Detector (GC/FID).

- Analyze exhaust and evaporative emissions for carbonyl compounds by High Performance Liquid Chromatography (HPLC).
- Analyze exhaust and evaporative emissions for alcohols by GC/FID.

Specialized Analyses of Vehicle Emissions

- Perform analysis of exhaust and evaporative emissions by Gas Chromatography/Mass Spectroscopy (GC/MS).
- Perform real-time analysis of exhaust and evaporative emissions by Fourier Transform Infrared Spectroscopy (FTIR).
- Perform analysis of exhaust and evaporative emissions for methane and total non-methane organic compounds.
- Develop methods for speciation of diesel exhaust in the vapor and condensed phases.

Routine Analyses for Vehicle Fuels

- Perform sulfur in gasoline determination by both x-ray fluorescence (XRF) (ASTM D2622) and ultraviolet fluorescence (ASTM D5453).
- Perform lead, phosphorous, and manganese in gasoline determination by XRF.
- Perform oxygenates in gasoline determination by Gas Chromatography/Flame Ionization Detection (GC/FID) (ASTM D4815).
- Perform benzene and total aromatics in gasoline determination by GC/FID (ASTM D5580).
- Perform gasoline C-H ratio determination by multidimensional GC/FID (ASTM D6293).
- Perform olefin determination by Supercritical Fluid Chromatography (SFC) (ASTM D6550).
- Perform detailed hydrocarbon analysis of gasoline by high resolution GC/FID (ASTM 6730).
- Perform Reid Vapor Pressure of gasoline (based on ASTM 5191).
- Determine distillation temperatures of petroleum products (ASTM D86).
- Determine density of petroleum products by digital density meter (ASTM D4052).
- Perform analyses of total aromatics and polycyclic aromatic hydrocarbons (PAH) in diesel fuel by SFC (ASTM D5186).
- Perform analysis of red dye in diesel fuel by ultraviolet/visible spectroscopy (ASTM 6258).

Specialized Analysis for Vehicle Fuels

- Perform individual compound identification in petroleum products using GC/MS.
- Perform confirmatory testing of gasoline using FTIR.
- Perform fingerprint analysis of diesel fuel and similar products for determination of adulterants and tax evasion.

Emerging Capabilities

- U.S. EPA 2007-compliant gravimetric determinations of total PM emissions from mobile sources in a Class 1000 clean room.
- Elemental and organic carbon analysis of mobile source PM.
- Nitrate and sulfate analysis of mobile source PM.
- PAH analysis of mobile source PM, semi volatile, and gas phase.

Mission Statement

Support the Air Resources Board's air pollution reduction programs through development of regulations, research, compliance testing of a variety of emission sources, issuance of certifications, and by advising public and private stakeholders regarding compliance issues.

1. Stationary Source Testing Branch (SSTB) Organizational Chart

Branch Total = 22 py

2. Base Program

The Stationary Source Testing Branch has three sections: the Vapor Recovery In-Use Program Section, the Source Test Section, and the Engineering Development & Testing Section. The branch has the following major activities: it writes regulations designed to cut emissions of ozone precursors, conducts testing and research to support development of regulations, conducts compliance testing, and issues certifications for testers and equipment components. The branch also advises and assists other engineers, scientists, regulators and private stakeholders who either test air pollution control equipment or use the information from those tests to help reduce air pollution.

The Vapor Recovery In-Use Program Section improves the emission reduction benefits of vapor recovery systems by developing regulations to control emissions from cargo tanks and by assessing the performance of Phase I & II installations at service stations. The Source Test Section contributes to the reduction of hydrocarbon emissions through the development of regulations, such as the one for Portable Fuel Containers. It also conducts source testing to support the Board's air pollution control programs. The Engineering Development & Testing Section develops regulations to control evaporative emissions.

The activities carried out by each section are listed in more detail below.

A. Vapor Recovery In-Use Section

- Develops control measure to reduce emissions from gasoline cargo tanks and associated fittings.
- Determines the effectiveness of potential control measures for evaporative gasoline emissions.
- Updates and maintains a list of vapor recovery equipment defects.
- Evaluates in-use performance of certified vapor recovery equipment.
- Evaluates vapor recovery systems to determine whether or not the certification will be renewed.
- Assists other ARB divisions, local air districts and interested public with vapor recovery compliance issues.

- Tracks public complaints received by local air districts concerning vapor recovery equipment.
- Provides training for inspection and testing of gasoline dispensing equipment for local air district personnel and testing contractors.
- Performs field trials of vapor recovery tests for regulatory development.
- Tests and evaluates vapor recovery equipment being offered for sale at parts suppliers for compliance with certification standards.
- Ensures that vapor recovery system components are properly tested at the factory before use.
- Conducts assessments of independent contractors for approval as compliance testers.
- Evaluates any report of non-conforming work by approved independent contractors and determine corrective action as necessary.
- Determines capability of independent testing company to test according to a given test.

B. Source Test Section

- Develops control measures to reduce emissions from portable gasoline containers.
- Conducts compliance testing of portable gasoline containers.
- Conducts certification source tests of Phase I and Phase II vapor recovery systems at gasoline bulk terminals, bulk plants, and gasoline dispensing facilities, including aboveground tank systems.
- Performs compliance source tests of stationary sources as requested by the ARB Enforcement Division and Program Review Section, and local districts.
- Conducts special testing and other technical investigations of stationary source compliance, local air quality problems and public nuisance cases.
- Develops control measures to reduce emissions from external marine tanks.
- Develops control measures to reduce emissions from auxiliary tanks.

C. Engineering Development and Testing

- Develops and implements control measures to reduce evaporative and permeation emissions from mobile and stationary sources.
- Develops statewide emission inventories for sources of evaporative and permeation emissions.
- Determines the hydrocarbon emissions from suspected sources; evaluates control technologies.
- Develops test plans; conducts research, analysis, and testing.
- Prepares technical reports, develops certification and test procedures, and regulations.
- Presents information to stakeholders by conducting public workshops.
- Presents proposed control measures and regulations to the Board.
- Implements adopted regulations and assures compliance.
- Issues certifications for small off-road engine components.
- Tests and certifies abrasives used for dry, unconfined blasting.
- Updates and maintains a list of certified abrasives used for dry, unconfined blasting.
- Performs setup and fabrication of test equipment to support other ARB programs.
- Develops control measures to reduce evaporative emissions from small off-road engines.
- Performs stationary source testing.
- Assesses, modifies and writes field test protocols. Test protocols are implemented in the field for practical use. Modifications are made to the

test protocol based on field experience, source impact, and comments by other staff and clients.

- Writes test reports on stationary source testing.
- Performs electrical and mechanical modifications of source sampling equipment.
- Performs setup and fabrication of test equipment to support other ARB programs.
- Develops and updates stationary source test methods for ARB approval.
- Assists ARB staff, local air districts, source testers, and other interested parties with any stationary source test problems.

3. Branch Capabilities

Vapor Recovery In-Use Section

- Perform two-inch static pressure test on in-use underground gasoline storage tanks by ARB test procedure 201.3 (TP 201.3).
- Perform five-inch static pressure test on in-use aboveground gasoline storage tanks by ARB test procedure 201.3A (TP 201.3A).
- Perform two-inch static pressure test of vapor recovery system on in-use aboveground tanks by ARB test procedure 201.3B (TP 201.3B).
- Perform dynamic back pressure performance test of in-use systems by ARB test procedure 201.4 (TP 201.4).
- Perform air to liquid volume test by ARB test procedure 201.5 (TP 201.5).
- Perform determination of liquid removal of vapor recovery system by ARB test procedure 201.6 (TP 201.6).
- Perform compliance determination of liquid removal rate by ARB test procedure 201.6C (TP 201.6C).
- Determine pressure integrity of drop tube overfill protection devices by ARB test procedure 201.2D (TP 201.2D).
- Determine leak rate and cracking pressure of pressure/vacuum vent valves.
- Perform bag test for multi-nozzle vacuum assist systems using BAAQMD test method GDF-01.
- Perform bag test for single-nozzle vacuum assist systems using BAAQMD test method GDF-02.
- Perform pressure integrity performance verification for vacuum assist systems [squeeze-bulb test] using BAAQMD test method GDF-03.
- Perform Phase II vapor recovery test procedure bootless nozzle pseudo-spillage using BAAQMD test method GDF-04.

- Perform Phase II balance system nozzle insertion interlock operation determination using BAAQMD test method GDF-09.

Source Test Section

- Perform carbon dioxide, carbon monoxide, total hydrocarbons, oxides of nitrogen, oxygen, and sulfur dioxide determinations by ARB Method 100.
- Perform vapor recovery system testing by ARB certification and test procedures.
- Perform total particulate matter determination by ARB Method 5.
- Perform particle sizing/PM 10 determination by ARB Method 501.
- Perform sampling for dioxins, furans, polybrominated diphenyl ethers, and polychlorinated biphenyls (ARB Methods 428 and 429).
- Perform sampling for formaldehyde and acetaldehyde by ARB Method 430.
- Perform certification testing of vapor recovery systems serving bulk terminals, bulk plants and gasoline dispensing facilities (TP-201, 202, 203, 205).
- Perform determination of Hazardous Air Pollutants and Toxic Air Contaminants (TAC) from vapor recovery processors (TP-201.2H).
- Perform two-inch static pressure test (TP-201.3).
- Perform five-inch static pressure test (TP-201.3A).
- Perform static pressure test of vapor recovery system on aboveground tanks (TP-201.3B).
- Conduct dynamic backpressure performance tests (TP-201.4).
- Perform air to liquid volume test (TP-201.5).
- TECO Organic Vapor Analyzers FID/PID.

Engineering Development & Testing Section

- Determine evaporative and permeation emissions from mobile and stationary sources using sealed housing for evaporative determination (SHED) enclosures or gravimetric methods.

Appendix A

MLD Papers, Presentations, and Publications

Recent MLD Papers, Presentations, and Publications:

Air Quality Surveillance Branch

Park K., Chow J.C., Watson J.G., Arnott W. P., Trimble D.L., Doraiswamy P., Stroud K., Bowers K., Bode R., Petzold A., and Hansen A.D.A., "Comparison of Continuous and Filter-Based Carbon Measurements at the Fresno Supersite". Accepted for publication by the Journal of Air and Waste Management for April, 2006.

McDougall E. and Quok M., "Comparison of the ARB Continuous PM 2.5 Monitoring Network to the PM 2.5 Federal Reference Method Network", January 2006.

Stroud Kenneth, "CARB Continuous PM 2.5 Network Experience", U.S. EPA's Standing Air Monitoring Working Group Annual Meeting, San Francisco, October 2003.

McDougall Eric M., Stroud Kenneth R., Cahill Thomas, Chang Daniel, Chung Albert, and Kleeman Michael, "Comparison of Real-Time Instruments Used to Monitor Airborne Particulate Matter", Journal Air & Waste Management Association, January 2001.

Bloudoff Dean P., Jenkins Peggy L., Phillips Thomas J., and Stroud Kenneth R., "Ozone Emissions from a Personal Air Purifier" Journal of Exposure Analysis and Environmental Epidemiology, September 1999.

Engineering and Certification Branch

Castronovo Cynthia L., "Enhanced Vapor Recovery", Eighth Annual California Unified Program Conference, Burlingame, February 6, 2006.

Castronovo Cynthia L., "Enhanced Vapor Recovery for Gasoline Dispensing Facilities", Air & Waste Management Association 96th Annual Conference, San Diego, June 24, 2003.

Castronovo Cynthia L., and McKinney Laura M., "It's Time to Talk about EVR", California CUPA Forum, Santa Clara, February 7, 2002.

McKinney Laura M., "CARB Vapor Recovery Certification Program", AMPES Expo-Gas 2001 in Guadalajara, Mexico, June 1, 2001.

McKinney Laura M., "CARB Vapor Recovery Certification Program", California CUPA Forum, February 8, 2001.

McKinney Laura M., "Enhanced Vapor Recovery – An Update", Petroleum Equipment Institute's CONVEX2000, October 2, 2000.

Castronovo Cynthia L., "Enhanced Vapor Recovery", American Petroleum Institute Underground Storage Tank Conference; Austin, Texas; September 19, 2000.

Cameron Frances, "Lubricity of California Diesel Fuel", SAE Technical Paper 981362, May 4-6, 1998.

Northern Laboratory Branch

Chang B., and LaPurga N., "Analysis of Polar Volatile Organics in Ambient Air by GC/MS Collected Summa Canisters", presented at the 39th American Chemical Society Western Regional Meeting, October 28, 2004.

Poore Michael W., "Levoglucosan in PM 2.5 Particulate Matter at the Fresno Supersite", J. Air & Waste Manage. Assoc., 52: 3-4, January 2002

Poore Michael W., "Oxalic Acid in PM 2.5 Particulate Matter in California", J. Air & Waste Manage. Assoc., 50: 1874-1875, November 2000.

Poore Michael W., "Laboratory Data: How Good Is Good?" presented at the National Bar Association Annual Meeting, 1999, San Diego, CA.

Houston T.E., "Methods for the Determination of Water in Consumer Products," Metal Finishing Journal, 95(10): 36-38 (1997).

Tostado L., et. al., "Video on Dichotomous PM 10 Analysis," presented to U.S. EPA and Districts, October 1997.

Houston T. E., and Poore, Michael W. "The Application of the Karl Fischer Oven for the Determination of Water in Consumer Products," Journal of Air and Waste Management Association, 46: 990-992 (1996).

Poore Michael W., and Houston T.E., "Determination of Exempt and Prohibited Compounds in Consumer Products by Headspace Gas Chromatography/Mass Spectrometry," Journal Air and Waste Management Association, 46: 1093-1095 (1996).

Quality Management Branch

Mongar Kevin E., Komlenic Michelle, and Gill Kathleen, "The California Ambient Dioxin Air Monitoring Program (CADAMP): Measurement of CDDs, CDFs and Dioxin-like PCBs at Nine Urban Sites in California: December 2001-December 2002", presented at the 23rd International Symposium on Halogenated Organics and Persistent Organic Pollutants (Dioxin 2003), Boston Massachusetts, August 24-29, 2003.

Hammond Donald, "Essential Standards used in California for the Measurement of Toxics in Ambient Air, Ozone Precursors from Automotive Emissions and Cleaner Burning Gasoline", Pittsburgh Conference in New Orleans, Impact of NIST Chemical Measurement and Standards Programs: Customer Views, March 4-9, 2001.

Tasat Webster, and Albright Eric, "Interlaboratory Comparison of Ambient Air Samples", Air and Waste Management Association International Symposium on Measurement of Toxic and Related Air Pollutants, Research Triangle Park, North Carolina, September 12-14, 2000.

Miguel Michael G., "Through-the-Probe Performance Audits of Non-Methane Hydrocarbon Samplers," Air & Waste Management Association International Symposium on Measurement of Toxic and Related Air Pollutants, Research Triangle Park, North Carolina, September 1-3, 1998.

Watson James P., "Automated Gaseous Criteria Pollutant Audits," Air & Waste Management Association 91st Annual Meeting & Exhibition, San Diego, CA, June 14-18, 1998.

Burriell Fredrick L., "Comprehensive Quality Assurance Site Survey," Air & Waste Management 91st Annual Meeting and Exhibition, San Diego, CA, June 14-18, 1998.

Achtelik Gerhard H., and Omand Jim, "Effects of Environmental Conditions on Particulate Nitrate Stability during Post Sampling Phase", presented at the Air & Waste Management Association Specialty Conference on Particulate Matter, Long Beach, California, January 28-30, 1998.

Pomales Thomas J., "PM 10 Mass Analysis System Audit Findings: A Prelude to PM 2.5 (Fine) Mass Analysis," Air & Waste Management Association's 90th Annual Meeting & Exhibition, Toronto, Ontario, Canada, June 8-13, 1997.

Warren Michael V., "Through-the-Probe Performance Audits of Continuous Ambient Air Analyzers," Air & Waste Management Association Symposium on Measurement of Toxic and Related Air Pollutants, Research Triangle Park, North Carolina, April 29-May 1, 1997.

Hammond Donald, "Ambient Trends of Benzene in California from 1990 through 1995," Presented at The U.S. EPA / Air & Waste Management Association International Symposium on Measurement of Toxic and Related Air Pollutants, Research Triangle Park, North Carolina, May 7-9, 1996.

Westerinen Alice, and Reisman Barry R., "Study to Determine the Effect of Moisture on Volatile Organic Compound Recovery Rates for Through-The-Probe Audits into Stainless Steel Canisters," Air & Waste Management Association International Symposium on Measurement of Toxic and Related Air Pollutants, Research Triangle Park, North Carolina, May 7-9, 1996.

Southern Laboratory Branch

Behrentz Eduardo, Ling Richard, Rieger Paul, and Weiner Arthur, "Measurements of Nitrous Oxide Emissions from Light Duty Motor Vehicles," Presented at the 14th CRC On-Road Vehicle Emissions Workshop in San Diego, CA, on March 29-31, 2004.

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Stationary Source Testing Branch

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Appendix B

MLD Web Sites

MLD Web Sites

Air Resources Board

<http://www.arb.ca.gov>

Air Resources Board Home Page

<http://www.arb.ca.gov/research/seminars/seminars.htm>

Chairman's Air Pollution Seminar Series

Air Quality Surveillance Branch

<http://www.arb.ca.gov/aaqm/aaqm.htm>

Ambient Air Quality Monitoring

<http://www.arb.ca.gov/aqdas/amwm.php>

Air Monitoring Web Manual

Engineering and Certification Branch

<http://www.arb.ca.gov/testmeth/testmeth.htm>

ARB Test Methods Home Page

<http://www.arb.ca.gov/testmeth/vol2/vol2.htm>

Gasoline Vapor Recovery Systems Certification Procedures and Test Methods

<http://www.arb.ca.gov/vapor/vapor.htm>

Vapor Recovery Home Page

Quality Management Branch

http://arb.ca.gov/aaqm/qmosprog/am_tables/pm25/costanalysis.htm

Excel and QuattroPro spreadsheets developed by ARB staff to estimate the costs of setting up and operating a PM 2.5 monitoring network. The user enters specific information related to the size of the monitoring network, the frequency of sampling, and type of analyses desired (e.g., mass, ions, and elements). The spreadsheet returns summaries of field and laboratory equipment and personnel costs.

<http://arb.ca.gov/aaqm/qmosprog/stdslab.html>

Information about calibrations, certifications, and verifications of ozone and flow rate primary and transfer standards, and certifications of compressed gas cylinders.

<http://arb.ca.gov/qmosqual/qmosqual.htm>

Information about the quality assurance activities conducted by the Air Resources Board (ARB). The ARB supports and conducts appropriate quality assurance activities to ensure that data collected are in compliance with procedures and regulations set forth by the U.S. EPA and can be considered good quality data for record. Information about air monitoring accuracy programs, the Quality Assurance Manual, site Information, precision and accuracy results, and monitoring activities in general, is accessible using the above web page and those below.

<http://www.arb.ca.gov/aaqm/qmosqual/qamannual/qamannual.htm>

Quality Assurance Manual

http://www.arb.ca.gov/aaqm/qmosqual/PERFAUDIT/CRITERIA/FIELD/ANNUAL_REPORTS/districtreport/AirMonitoringDistrictAccuracy.htm

Precision and Accuracy Results

<http://arb.ca.gov/aaqm/aaqm.htm>

All MLD-quality assurance activities can be found under this link.

<http://arb.ca.gov/aaqm/qmosopas/dioxins/dioxins.htm>

Information about the California Ambient Dioxin Air Monitoring Program. Includes information on the monitoring sites, sampling schedule, a summary of the analytical methods, and the quality assurance project plan (QAPP) for the program.

Northern Laboratory Branch

<http://www.arb.ca.gov/testmeth/cptm/cptm.htm>

Consumer Product Test Method

<http://www.arb.ca.gov/aaqm/sop/summary/summary.htm>

Laboratory Operating Procedures for Ambient Air Samples

<http://www.arb.ca.gov/aaqm/elbinor/pm10.htm>

PM 10 Laboratory Analysis for Ambient Air Samples

<http://www.arb.ca.gov/aaqm/toxics.htm>
Toxic Air Contaminants Monitoring

<http://www.arb.ca.gov/aaqm/hcarbons.htm>
Hydrocarbon Pollutant Monitoring

<http://www.arb.ca.gov/aaqm/elbinor/icanalysis.htm>
Ion Chromatography Analysis of PM 10 Filter

<http://www.arb.ca.gov/aaqm/elbinor/toc.htm>
Total Carbon Analysis of PM 10

<http://www.arb.ca.gov/aaqm/elbinor/xrf.htm>
X-ray Fluorescence Spectroscopy

<http://www.arb.ca.gov/aaqm/elbinor/pm10.htm#dichot>
PM 10 Dichot Monitoring

<http://www.arb.ca.gov/aaqm/elbinor/drydep.htm>
Dry Deposition Laboratory Analysis

Southern Laboratory Branch

<http://www.arb.ca.gov/fuels/fuels.htm>
ARB Fuels program; Fuel Analysis and Methods Evaluation (FAMES)

<http://www.arb.ca.gov/msprog/levprog/cleandoc/nmogtps.pdf>
California non-methane organic gas (NMOG) test procedures; Organic Analysis Section (OAS)

<http://www.arb.ca.gov/testmeth/testmeth.htm>
ARB Test Methods Home Page

Stationary Source Testing Branch

<http://www.arb.ca.gov/vapor/vapor.htm>
Vapor Recovery Home Page

<http://www.arb.ca.gov/ba/icp/icp.htm>
The Independent Contractor Program web page. This program was designed to approve private, independent testing contractors for sources

who may choose to have the contractors conduct compliance testing instead of ARB.

<http://www.arb.ca.gov/ba/certabr/certabr.htm>

The Abrasive Blasting Program web page. ARB is required to certify abrasives used for permissible dry outdoor blasting as complying with specific performance standards.

<http://www.arb.ca.gov/smp/dnww/dnww.htm>

The Nonindustrial Wood Waste Burning Web page. The Health and Safety code provides a means for cities and counties to use open outdoor fires to dispose of non-industrial wood waste at designated disposal sites on permissive burn days. The ARB is required to authorize burning at these sites.

<http://www.arb.ca.gov/msprog/offroad/orrec/orrec.htm>

Off-Road Recreational Vehicles

<http://www.arb.ca.gov/msprog/offroad/recmarine/recmarine.htm>

Recreational Marine Engine Activities

<http://www.arb.ca.gov/msprog/offroad/sore/sore.htm>

Small Off-Road Engines and Equipment

<http://www.arb.ca.gov/msprog/offroad/sore/sorectp/sorectp.htm>

Small Off-Road Engine or Equipment Regulatory and Certification Documents

Appendix C

List of Acronyms

Acronym	Description
AA	Atomic Absorption
AIRS	Aerometric Information Retrieval System
AQM	Air Quality Monitoring
AQSB	Air Quality Surveillance Branch
ARB	Air Resources Board
ASTM	American Society for Testing and Materials
BAAQMD	Bay Area Air Quality Management District
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CADAMP	California Ambient Dioxin Air Monitoring Program
CAPCOA	California Air Pollution Control Officers Association
CBG	Cleaner Burning Gasoline
CCR	California Code of Regulations
CNG	Compressed Natural Gas
CO	Carbon Monoxide
DQO	Data Quality Objective
ECB	Engineering and Certification Branch
EVR	Enhanced Vapor Recovery
FID/PID	Flame Ionization Detector/Photo Ionization Detector
FTIR	Fourier Transform Infrared Spectroscopy
GC/FID	Gas Chromatography/Flame Ionization Detector
GC/MS	Gas Chromatography/Mass Spectroscopy
GC/PID	Gas Chromatography/Photo Ionization Detector
GDF	Gasoline Dispensing Facilities
GP	Gas-Particle Ion Chromatography
GPS	Global Positioning System
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEV	Hybrid Electric Vehicle
HPLC	High Performance Liquid Chromatography
IR	Infrared
LEV	Low Emission Vehicle
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LPG	Liquefied Petroleum Gas
MATES	Multiple Air Toxics Exposure Study
MLD	Monitoring and Laboratory Division
MS	Mobile Source
NIST	National Institute of Standards and Technology
NLB	Northern Laboratory Branch
PAH	Polycyclic Aromatic Hydrocarbon
PAMS	Photochemical Ambient Monitoring Stations
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyls

Acronym	Description
PM	Particulate Matter
PY	Person Year
QA	Quality Assurance
QAPPS	Quality Assurance Project Plans
QC	Quality Control
QMB	Quality Management Branch
SFC	Supercritical Fluid Chromatography
SHED	Sealed Housing for Evaporative Determination
SLB	Southern Laboratory Branch
SO ₂	Sulfur Dioxide
SOP	Standard Operating Procedure
SSTB	Stationary Source Testing Branch
TAC	Toxic Air Contaminant
TLV	Threshold Limit Value
TNMOC	Total Non-Methane Organic Compounds
TP	Test Procedure
TTP	Through the Probe
U.S. EPA	Unites States Environmental Protection Agency
ULEV	Ultra Low Emission Vehicle
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence