SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT

AMBIENT MEASUREMENTS OF AIR TOXIC POLLUTANTS AT RESURRECTION CATHOLIC SCHOOL IN BOYLE HEIGHTS

FINAL REPORT

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SUMMARY REPORT

BACKGROUND AND OBJECTIVES

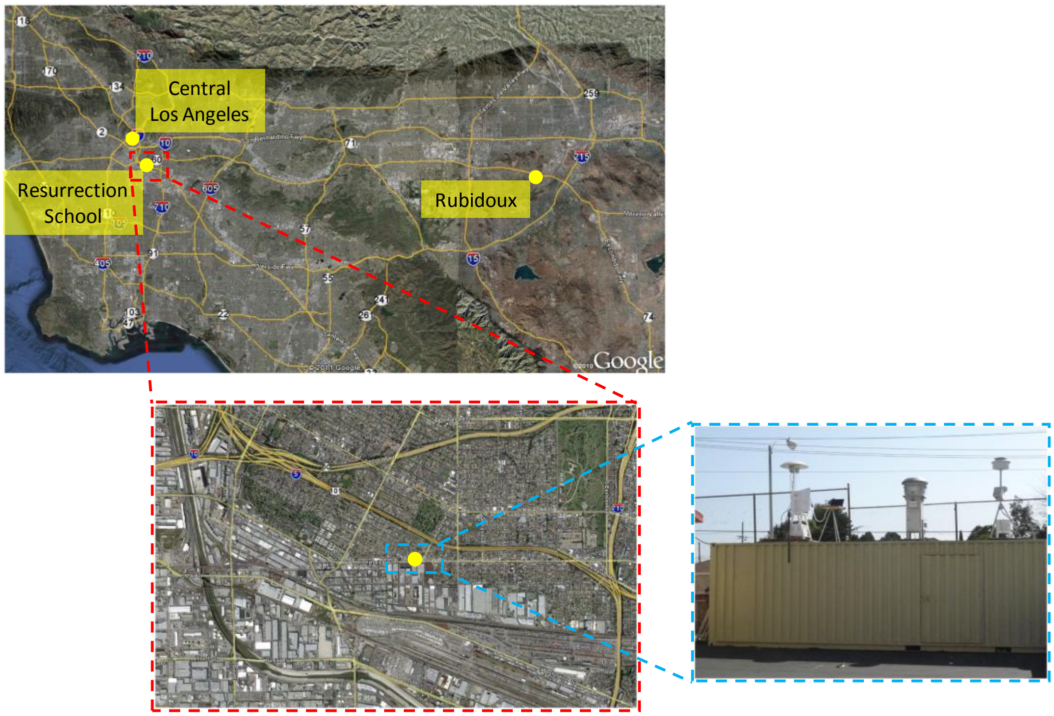
Boyle Heights is a neighborhood located on the eastern bank of the Los Angeles River, east of downtown Los Angeles. The extensive East Los Angeles Interchange (the busiest freeway interchange in the world) passes through Boyle Heights, allowing access to the Golden State (I-5), Hollywood (U.S. Route 101), Pomona (SR 60), San Bernardino (I-10), Santa Ana (I-5), and Santa Monica (I-10) freeways. The area in and around Boyle Heights is also a major goods movement hub, with goods moving through warehouses and rail-yards on their way to and from the busy ports of Long Beach and Los Angeles. Boyle Heights is also bordered by heavy industrial areas such as the city of Vernon, home to facilities such as Exide Technologies (a lead-acid battery recycling facility) and rendering plants such as Baker Commodities, D&D Disposal Inc, West Coast Rendering, and Darling International. Local residents and community groups have expressed concern about increased levels of air toxics emitted from on-road and off-road vehicles (heavy duty diesel trucks and trains in particular) and industrial facilities, and the potential health consequences related to exposure to such pollutants, especially among children.

Following numerous requests from concerned residents and community leaders, AQMD began a comprehensive year-long monitoring study in April of 2009 of air toxic levels at the Resurrection Catholic School in Boyle Heights, in an area impacted by both local and regional pollution sources. This report discusses the air quality data collected at the Resurrection School and compares them to those obtained in other parts of the South Coast Air Basin during the same time period.

METHODS

Sampling was conducted from 04/01/09 to 06/01/10 at a monitoring station located in the parking lot of the Resurrection Catholic School (3324 East Opal Street, Los Angeles, CA 90023), about 320 m south of the intersection between the Interstate 5 (I-5) and South Lorena Street (Figure 1). The monitors at Resurrection were located immediately above and only a few meters from East 8th Street. Thus, the measured levels may reflect this very local traffic influence that does not exist to the same extent in other areas of Los Angeles. Since many residents in Boyle Heights, including the children at Resurrection School, live, work or play in similar proximity to traffic sources, the Resurrection site can be considered representative of typical exposures in the area. Several particle and gaseous pollutants were monitored at this location including: fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}, respectively), elemental carbon (EC, an indicator of diesel particulate emissions), hexavalent chromium (Cr^{6+}), lead (Pb), volatile organic compounds (VOCs) and carbonyl compounds. Data collected at the Resurrection School site were then compared to those obtained at the Central Los Angeles and Rubidoux monitoring stations during the same time period. The Central Los Angeles and Rubidoux sites are two permanent AQMD's network stations used to monitor air quality where air toxics are measured year-round.

Figure 1 Map showing the locations of the Resurrection School, Central Los Angeles and Rubidoux monitoring sites. A picture of the measurement station used at the Resurrection School is also included



RESULTS

The air pollutant known as particulate matter (PM) is made up of microscopic particles that can be inhaled into the lung and is known to have serious health impacts. Particulate matter is a criteria pollutant regulated by the U.S. EPA based on the size of the particles. All particles less than 10 microns (µm) in diameter are known as PM_{10} (or coarse particles) and particles less than 2.5 µm in diameter are known as $PM_{2.5}$ (or fine particles). One micron is 1000 times smaller than a millimeter.

The study average PM_{10} mass concentration at the Resurrection School site (33.0 µg/m^3) was similar to that in Central Los Angeles (31.3 µg/m^3), and both were lower than the corresponding value measured in Rubidoux (40.7 µg/m^3), probably because of increased re-suspension of dust particles at the latter location (Figure 2a). Because of the larger size of coarse particles, the coarse portion (2.5 to 10 µm) of PM_{10} particles is generally not transported far away from its source, except under high wind conditions. All daily average PM_{10} levels observed during this study were well below the U.S. EPA National Ambient Air Quality Standard (NAAQS) for this pollutant, which is 150 µg/m^3 over a 24-hour period.

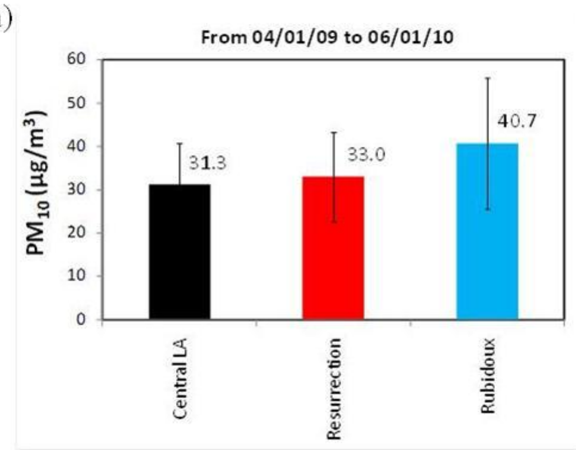
The study average $PM_{2.5}$ level at the Resurrection School site (16.3 µg/m^3) was slightly higher than that observed in Central Los Angeles (14.7 µg/m^3). This difference may be due to the fact that a different sampling method was used to measure $PM_{2.5}$ at the Resurrection School site than at the Central Los Angeles (and Rubidoux) stations. This method is known to read slightly higher values (Figure 2b; see Appendix A for further details). However, the highest study average $PM_{2.5}$ mass concentration was measured in Rubidoux (16.7 µg/m^3), probably because the atmospheric levels of this air pollutant is primarily influenced by regional particles that are formed chemically in the atmosphere. However, emissions from motor vehicles, industrial facilities and other local PM contributions can also be important. The study average $PM_{2.5}$ concentration at both the Resurrection School and Rubidoux stations exceeded the annual NAAQS for this pollutant set by the U.S. EPA (15 µg/m^3). Also, the daily average $PM_{2.5}$ levels at these two locations were higher than the corresponding 24-hr average NAAQS (35 µg/m^3) on more than one occasion.

The study average concentration of EC found in fine particles ($PM_{2.5}$ EC) was slightly higher at the Resurrection School site (2.04 µg/m^3) than at the Central Los Angeles and Rubidoux stations (1.72 and 1.63 µg/m^3, respectively) (Figure 2c). Elemental carbon is an indicator of diesel PM, considered by the State of California to be an air toxic. Although the EC levels at Resurrection School are similar to those observed in other dense urban areas of the Los Angeles Basin, they may reflect the close proximity of the Resurrection School site to mobile sources, such as the I-5, where heavy duty diesel trucks comprise about 6% of the total traffic volume.

Fine PM samples were analyzed for their chemical composition, which can provide information on the origin of the particles. The $PM_{2.5}$ collected at the Resurrection Church, Central Los Angeles and Rubidoux stations had a similar chemical composition, probably because of the presence of similar emission sources at all three locations (Figure 3). There were slightly higher levels of crustal material and nitrate at Rubidoux as expected for an inland, dustier location. Higher levels of EC at Resurrection and Central Los Angeles reflect the proximity of those sites to diesel sources.

Figure 2 Study average concentrations of a) coarse particulate matter (PM_{10}), b) fine particulate matter ($PM_{2.5}$), and c) elemental carbon in fine particles ($PM_{2.5}$ EC) at the Resurrection School site and at the Central Los Angeles and Rubidoux stations

a)



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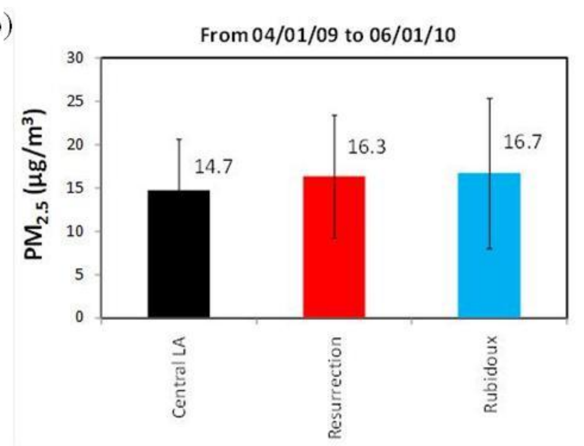

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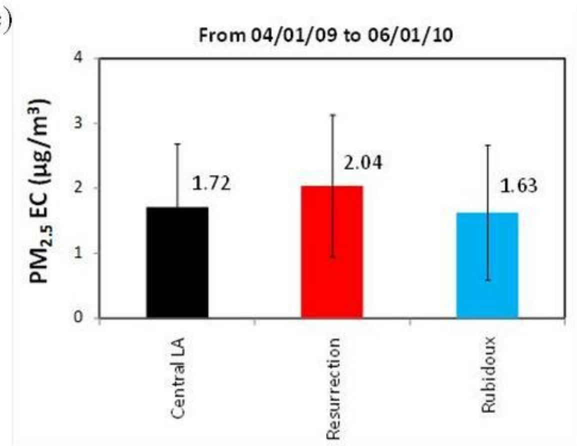
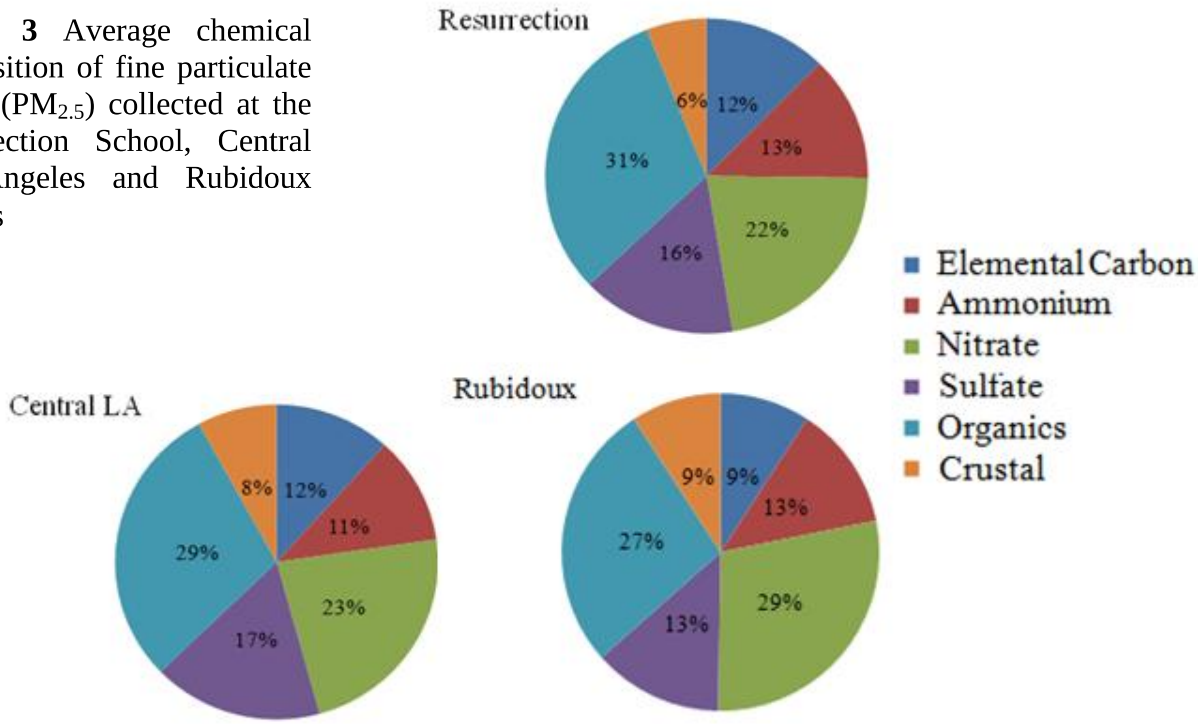
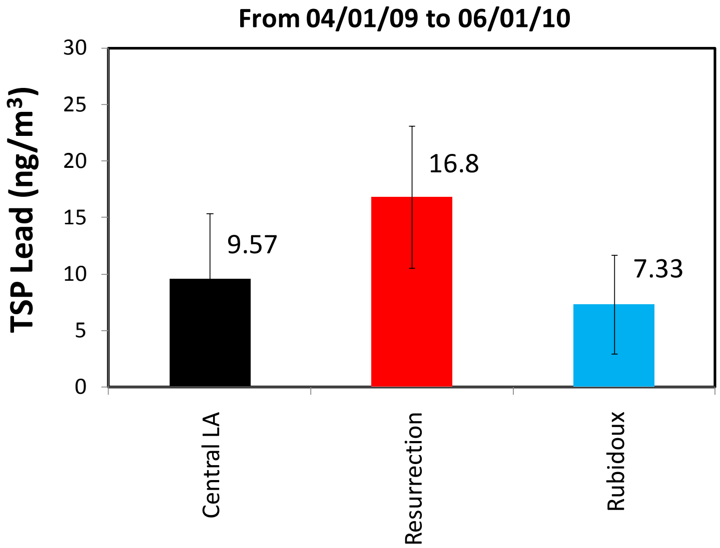


Figure 3 Average chemical composition of fine particulate matter ($PM_{2.5}$) collected at the Resurrection School, Central Los Angeles and Rubidoux stations



Airborne lead is measured by collecting and analyzing all particulate in the air, known as total suspended particulate (TSP). Like PM, airborne lead is regulated by the U.S. EPA with associated NAAQS. The highest study average lead concentration (16.8 ng/m^3) was measured at the Resurrection School site. The corresponding average lead levels at the Central Los Angeles and Rubidoux stations during the same time period were 9.6 and 7.3 ng/m^3 (Figure 4). Increased lead concentrations in the Boyle Heights area may be due to re-suspension of historically deposited dust accumulated on or near the nearby freeways. While lead has been completely removed from gasoline for over 30 years, some studies have shown higher lead levels leftover in soils next to busy roadways. Lead emissions from Exide Technologies or transport of re-suspended particles containing lead from the Exide facility might have also contributed to increase the atmospheric concentration of lead at the Resurrection School. However, this seems unlikely because the school is relatively far from the Exide plant (about 2.2 Km north-west) and the wind rarely blew from the Exide plant toward the Resurrection School site. In addition, the lead data collected at the Resurrection School site are not well correlated to those measured right next to the Exide plant during the same time period. In October 2008 the U.S. EPA strengthened the NAAQS for lead, lowering it from 1500 ng/m^3 (quarterly average) to a more stringent 150 ng/m^3 (rolling 3-month average). Although higher than the other sites, the lead levels at Resurrection School were still very low and none of the daily average or three-month average concentrations measured at the three monitoring sites during this study were close to or above the current NAAQS for lead.

Figure 4 Study average total suspended particulate (TSP) lead concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



Most of the trace elements in the particles measured at all three monitoring stations mainly originate from mechanical processes such as vehicle brake or engine wear (Fe) or from re-suspension of crustal materials (i.e. Mg, Ca, K, Fe, Si, and Al), and their concentrations were well within those reported in previous studies conducted in urban areas. Arsenic (As), Chromium (Cr) and other toxic trace elements were either not detected or were present in concentrations close to urban background levels. Sulfur (S), typically generated from combustion of sulfur-containing fuel and emitted as sulfate or SO_2, was the most abundant trace element in all collected samples (Figure 5).

The study average Cr^{6+} level at the Resurrection School site (0.11 ng/m^3) was similar to that measured in Central Los Angeles and in Rubidoux (0.10 and 0.11 ng/m^3, respectively) (Figure 6). These levels are consistent with what is considered the urban background in Southern California, and thus do not indicate the presence of any local sources of hexavalent chromium.

Figure 5 Study average concentrations of selected trace elements in $PM_{2.5}$ samples collected at the Resurrection School site and at the Central Los Angeles and Rubidoux stations

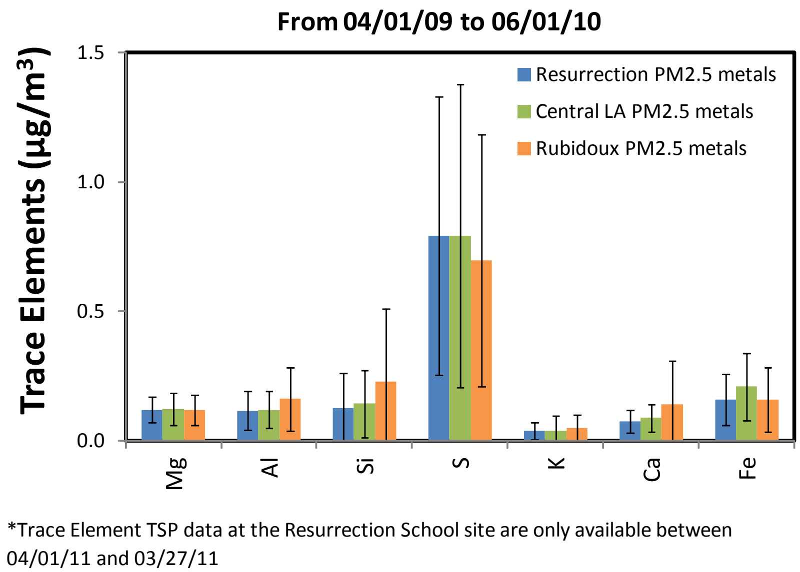
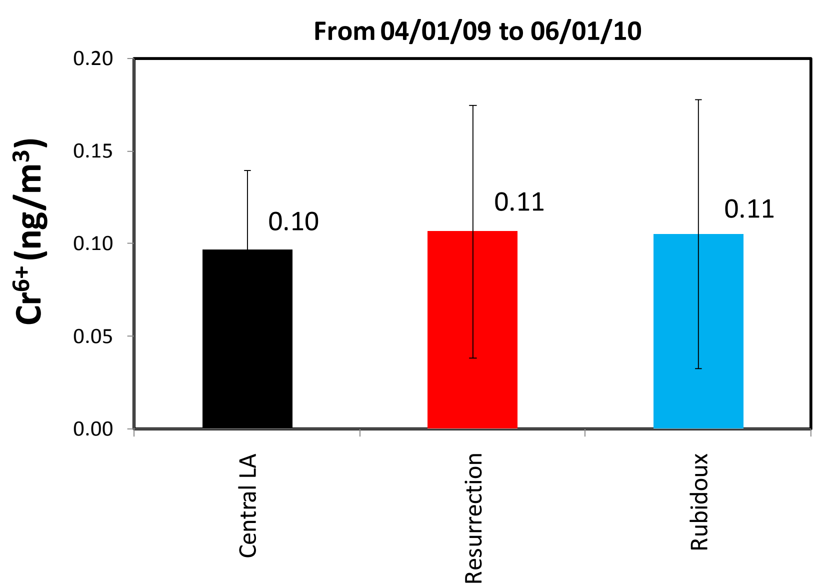


Figure 6 Study average hexavalent chromium (Cr^{6+}) concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations

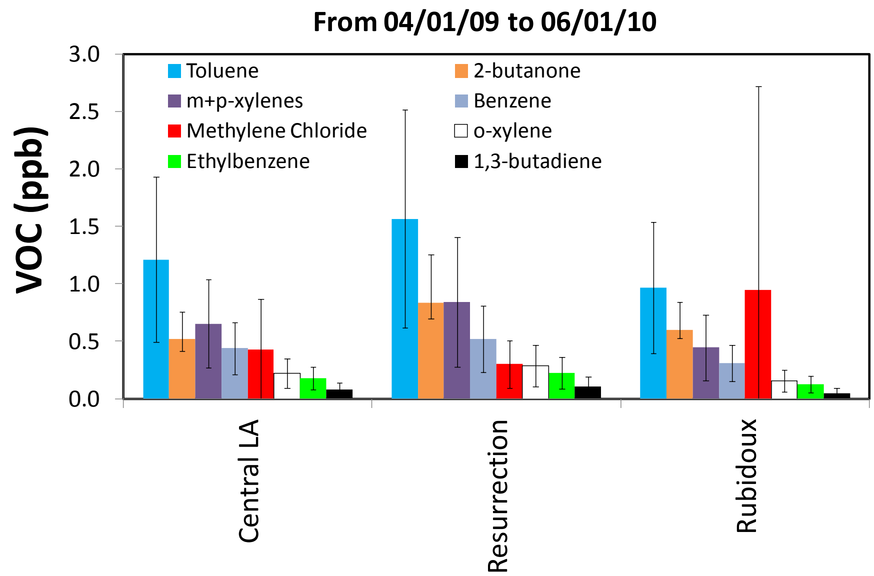


Volatile organic compounds and carbonyls are organic gases, some of which are considered air toxics. They are emitted from a variety of sources, including motor vehicles and industrial facilities. With the exception of methylene chloride, the concentrations of the most abundant VOCs and carbonyls measured at the Resurrection School site were comparable to those observed at the other two monitoring stations in Central Los Angeles and Rubidoux

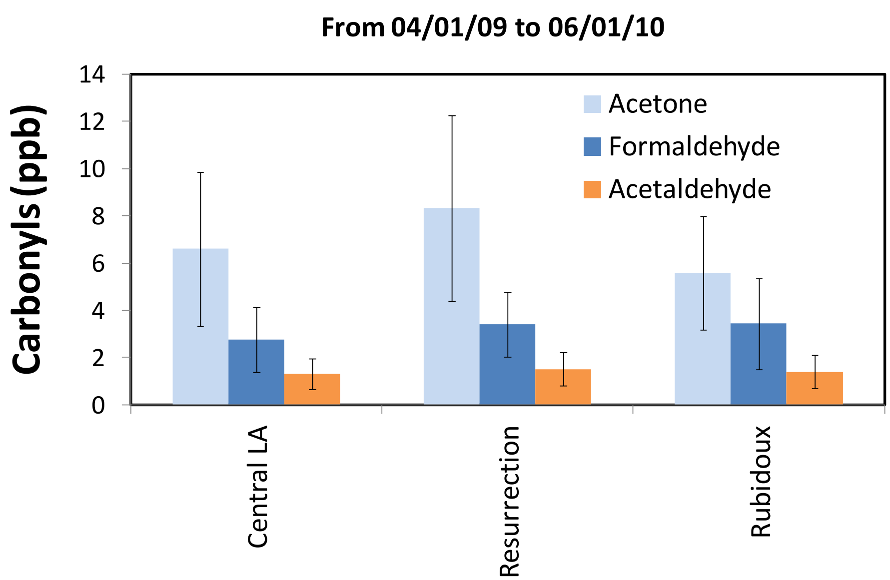
(Figure 7). This is probably because gaseous emissions from motor vehicles are likely to be the predominant source of these volatile species at all three monitored locations and throughout the entire South Coast Air Basin. The slightly higher atmospheric levels of toluene, 2-butanone, m+p-xylenes and other VOCs measured at Resurrection School might be explained by the close proximity of this site to the I-5 and/or to nearby surface streets. The potential contribution of emissions from nearby industrial facilities cannot be excluded, but this pattern of VOC levels is consistent with mobile source emissions.

Figure 7 Study average concentrations of a) selected volatile organic compounds (VOCs) and b) carbonyl compounds at the Resurrection School site and at the Central Los Angeles and Rubidoux stations

a)



b)



CONCLUSIONS

Overall, the concentrations of all air pollutants measured at the Resurrection School site are similar to those found in other dense urban areas of Los Angeles dominated by motor vehicle emissions. The atmospheric levels of diesel PM and VOCs were higher than those observed in Central Los Angeles and Rubidoux, likely due to the very close proximity of the Resurrection School site to the I-5 and busy surface streets.

Lead concentrations were higher at Resurrection School than in Central Los Angeles and Rubidoux, but almost nine times below (on average) the Federal Standard set by the U.S. EPA for this air toxic (0.15 $\mu g/m^3$). Emissions from Exide Technologies or transport of re-suspended particles containing lead from the Exide facility cannot be ruled out. However, other historical sources such as re-suspension of dust accumulated on nearby roadways may be responsible for the slightly elevated lead levels at Resurrection School.

APPENDIX A: TECHNICAL ANALYSIS

INTRODUCTION

Boyle Heights is a neighborhood located on the eastern bank of the Los Angeles River, east of downtown Los Angeles. The extensive East Los Angeles Interchange (the busiest freeway interchange in the world) passes through Boyle Heights, allowing access to the Golden State (I-5), Hollywood (U.S. Route 101), Pomona (SR 60), San Bernardino (I-10), Santa Ana (I-5), and Santa Monica (I-10) freeways. The area in and around Boyle Heights is also a major goods movement hub, with goods moving through warehouses and rail-yards on their way to and from the busy ports of Long Beach and Los Angeles. Boyle Heights is also bordered by heavy industrial areas such as the city of Vernon, home to facilities such as Exide Technologies (a lead-acid battery recycling facility) and rendering plants such as Baker Commodities, D&D Disposal Inc, West Coast Rendering, and Darling International. Local residents and community groups have expressed concern about increased levels of air toxics emitted from on-road and off-road vehicles (heavy duty diesel trucks and train traffic in particular, and industrial facilities), and the potential health consequences related to exposure to such pollutants, especially among children.

In the fall of 2007, the South Coast Air Quality Management District began a focused investigation of lead emissions at Exide Technologies following public complaints alleging particulate and dust fallout from the plant. AQMD placed several new particulate sample collection plates around the facility and, based on detection of lead in the collected samples, installed additional air monitors near the plant and began collecting ambient air data continuously from November 2007. Air monitoring results found that the facility violated National Ambient Air Quality Standards (NAAQS) for lead during the five month period of December 2007 through April 2008. Since then, AQMD has held several town hall meetings in the communities surrounding this plant to discuss the air pollution control measures it has imposed on Exide Technologies and to share monitoring data collected near the facility. Lead samples are still being collected in and around Exide, and actions have been taken by AQMD to reduce the atmospheric concentrations of this air toxic below the federal standard, including adoption of a new rule (AQMD Rule 1420.1) focused specifically on lead acid battery recycling facilities. It should be noted that since the majority of lead is found in particles that are relative large in size, the atmospheric concentration of this species decreases steeply away from the Exide facility because of particle deposition, and levels measured in the surrounding residential neighborhoods continue to be very low. Also, despite the presence of these and other industrial air pollution sources, emissions from cars and trucks from major freeways and minor roads surrounding the Boyle Heights community continue to be the main air-quality concern in this area and throughout the entire South Coast Air Basin.

Following numerous requests from concerned residents and community groups, AQMD began a comprehensive year-long monitoring study in April of 2009 of air toxic levels at the Resurrection Catholic School (3324 East Opal Street) in Boyle Heights, in an area impacted by both local and regional pollution sources. The approximately year-long field study was completed on 06/01/10. A wide array of particle and gaseous pollutants were monitored at this location including:

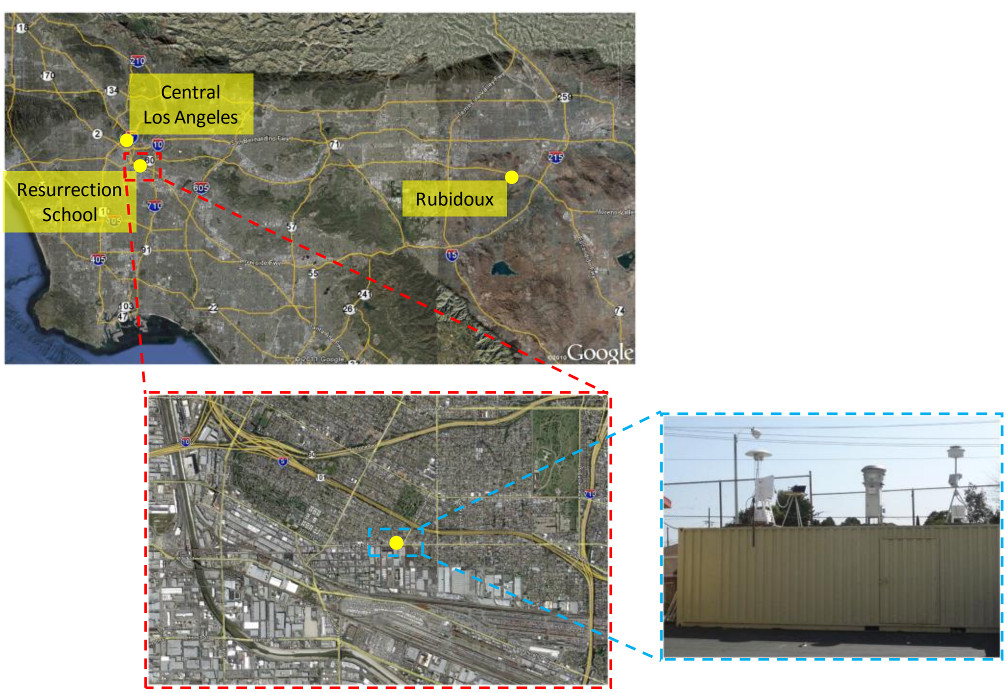
- Fine Particulate Matter ($PM_{2.5}$; particles with an aerodynamic diameter less than 2.5 μm): sources of $PM_{2.5}$ include emissions from motor vehicles, power plants, residential wood burning, and other combustion activities. Fine particles have well established health effects, including multiple adverse respiratory and cardiovascular outcomes. $PM_{2.5}$ is a U.S. Environmental Protection Agency (U.S. EPA) criteria pollutant for which there exist NAAQS.
- PM_{10} (particles with an aerodynamic diameter less than 10 μm): PM_{10} includes all $PM_{2.5}$ particles, but also larger "coarse" particles between 2.5 and 10 μm in diameter. Sources of these coarse particles include crushing or grinding operations, re-suspension of dust from vehicles traveling on roads, and other mechanical processes. PM_{10} is also a U.S. EPA criteria pollutant and has associated NAAQS.
- Elemental Carbon (EC; sometimes referred to as soot; related closely to black carbon or BC): EC is a component of PM and is formed through the incomplete combustion of fossil fuels and biomass. It is emitted from both natural and anthropogenic sources. The majority of EC and BC in Southern California comes from diesel particulate matter (DPM) emissions. DPM is considered an air toxic by the State of California, and the SCAQMD has recently estimated that DPM accounts for more than 80% of the total cancer risk from air toxics in the South Coast Air Basin (MATES III; South Coast AQMD, 2008).
- Hexavalent Chromium (Cr^{6+}): chromium is a natural constituent of the earth's crust and is present in several oxidation states. While trivalent chromium (Cr^{3+}) is naturally occurring and poses no risk to human health, Cr^{6+} is emitted from a number of commercial and industrial sources (e.g. chrome plating operations, cement manufacturing) and it has been associated with lung cancer and other respiratory problems. Hexavalent chromium (Cr^{6+}) is one of the top four pollutants of concern in the U.S. EPA National Air Toxics Trends Stations (NATTS) Program.
- Total Suspended Particulate Lead (Pb): in the past, motor vehicles were the major contributor of lead emissions to the air. Because of regulatory efforts to remove lead from on-road motor vehicle gasoline, lead emissions from the transportation sector have greatly declined over the past two decades. Today the major sources of lead emissions are metal processing facilities (e.g. incinerators and lead-acid battery manufacturers) and piston-engine aircraft operating on leaded aviation gasoline. Lead exposure can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system. Lead is also a U.S. EPA criteria pollutant and has associated NAAQS.
- Volatile Organic Compounds (VOCs) and carbonyls: these gases are emitted by a variety of evaporative processes and combustion sources, including paints, cleaning supplies, pesticides, building materials, household products, refineries, and mobile sources. Given some of the indoor sources, concentrations of many VOCs may be much higher indoors than outdoors (Jia et al., 2007; Bruno et al., 2008). Gasoline and diesel fuels are also important sources of VOCs. Exposure to many of these organic contaminants has also been associated with a wide array of toxic health effects.

METHODS

Study Design

Sampling was conducted at a monitoring station located in the parking lot of the Resurrection Catholic School (3324 East Opal Street, Los Angeles, CA 90023), about 320 m South of the intersection between the Interstate 5 (I-5) and South Lorena Street (Figure 1). Measurements were conducted from 04/01/09 to 06/01/10 to capture seasonal variations of the targeted air pollutants. Data collected at the Resurrection School site were then compared to those obtained at the Central Los Angeles and Rubidoux monitoring stations during the same time period to study the spatial variability of the targeted pollutants. The Central Los Angeles and Rubidoux sites are the two permanent AQMD's network stations used to monitor air quality and where air toxics are measured year-round. The Central Los Angeles station (1630 North Main Street, Los Angeles, CA 90012) is about 5.3 km north of the Resurrection School site in a highly urban area with similar emission sources as the Resurrection site (Figure 1). However, the monitors at Resurrection were located immediately above and only a few meters from East 8th St. Thus, the measured levels may reflect this very local traffic influence that does not exist to the same extent at the Central Los Angeles station. Since many residents in Boyle Heights, including the children at Resurrection School, live, work or play in similar proximity to traffic sources, the Resurrection site can be considered representative of typical exposures in the area. The Rubidoux station (5888 Mission Blvd, Riverside, CA 92509) is located 73 km east of the Resurrection School in an area that is mostly impacted by air pollutants emitted from the greater Los Angeles region (including the Los Angeles-Long Beach port complex and numerous roadways and industrial sources) and transported inland by the prevailing winds.

Figure 1 Map showing the location of the Resurrection School site. A picture of the monitoring station used to measure the targeted pollutants is also included



Measured Pollutants

Table 1 shows a list of all particle and gaseous pollutants measured during this study. These species are among the most significant contributors to health risks related to exposure to air toxics in the South Coast Air Basin (MATES III; South Coast AQMD, 2008). Both continuous and integrated measurement techniques were used to collect/monitor these air pollutants. All integrated samples were collected on a 1-in-6 day schedule.

Table 1 List of the particle and gaseous species monitored during this study. Both continuous and integrated measurement techniques were used to collect/monitor all targeted pollutants

Targeted Pollutants			
Integrated Measurements		*Continuous Measurements*	
PM_{10} mass	$PM_{2.5}$ (non-FRM) mass	Black Carbon (BC)	Wind Speed (WS) Wind Direction (WD)
Organic Carbon (OC)	Volatile Organic Compounds (VOC)		
Elemental Carbon (EC)	Carbonyls		
Hexavalent Chromium (Cr^{6+})	TSP Trace Metals (e.g. Lead)		

Measurement Techniques

Integrated (24-hr) PM_{10} samples were collected on Quartz fiber filters by mean of a hi-volume FRM sampler (Tisch Environmental, Inc.) and then analyzed for gravimetric mass using an analytical micro-balance (Sartorus, Inc.). Integrated 24-hr $PM_{2.5}$ samples were collected on Quartz and Teflon filters using a SASS $PM_{2.5}$ speciation sampler (Met One, Inc.), and analyzed for: gravimetric mass (using an analytical micro-balance; Sartorus, Inc.), organic and elemental carbon (OC and EC, respectively), and trace metals. Carbon analysis for the determination of OC and EC was performed on small circular disks taken from the loaded $PM_{2.5}$ quartz fiber filter samples. These disks were placed inside a heated furnace of a Thermal/Optical Carbon Analyzer (Desert Research Institute, Model 2001) one at the time and subjected to a programmed, step-wise temperature increase while helium gas (He) with varying amounts of oxygen was passed over the sample. This method (based on the IMPROVE protocol) uses a laser beam to monitor and correct, when necessary, the degree of oxidation or carbonization (pyrolysis) that occurs during the analysis. Because OC results may be affected by potential biases caused by sampling-related artifacts (i.e. excessive absorption of semi-volatile organic compounds on the sampling filter), they are not presented in this report. Metal analysis of $PM_{2.5}$ samples was performed using a methodology based on IO-3 (Compendium of Methods for Inorganic Air Pollutants) implementing a combination of energy dispersive X-ray fluorescence (PANalytical Epsilon 5

Energy Dispersive X-Ray Fluorescence Spectrometer), and inductively coupled plasma mass spectrometry (Leco ICP-MS).

Twenty four hour Total Suspended Particulate (TSP) samples were collected on glass fiber filters by mean of high volume samplers (Tisch Environmental, Inc.). Loaded TSP filters from all sampling locations were then extracted with acid and analyzed for Lead using an Inductively Coupled Plasma Mass Spectrometer (ICP-MS; Leco Renaissance Time of Flight). In addition, integrated 24-hr VOC samples were collected using silica-lined 6-liter canisters connected to Xontec 910/912 multi-canister samplers. Targeted VOCs were identified and measured using Gas Chromatograph-Mass Spectrometer (GC/MS) method TO-15. Carbonyl compounds were sampled by drawing air through a DNPH (2, 4-Dinitrophenylhedrazine) cartridge attached to Xontec 924 samplers; carbonyls undergo derivatization upon contact with DNPH. The derivatives were extracted using acetonitrile and analyzed using Waters High Pressure Liquid Chromatography (HPLC) in accordance with U.S. EPA method TO-11. The HPLC system employed for the analysis of these samples consists of a Waters 2690 separation module and a Waters 996 Photodiode Array Detector. Samples for Cr^{6+} analysis were collected by drawing ambient air through cellulose filters impregnated with sodium bicarbonate using a Xontech 920 toxic air sampler. These filters were then extracted in de-ionized water via sonication and then filtered. The extract was analyzed by ion chromatography using a system that includes a UV-Vis detector. This method is based on a modification of the California Air Resources Board Hexavalent Chromium in Ambient Air Method CARB MLD-039.

Black carbon (BC; closely related to EC and also considered an indicator of diesel PM) measurements were taken at five minute intervals using portable Aethalometers (Magee Scientific Model AE42), which are based on light absorption of aerosol particles collected on a Quartz fiber filter tape mounted inside the instrument. The sample inlet probe was preceded by a $PM_{2.5}$ sharp cut cyclone. One minute wind speed and wind direction data were obtained from a meteorological tower installed at the Resurrection School site. One and five minute data from the continuous instruments (Aethalometer and meteorological station) were recorded on a data logger and averaged to hourly values to allow for a easier interpretation of the results. All data files were periodically downloaded to a laptop computer and transferred to the AQMD's central database. A summary of the analytical methods that were used to measure the concentrations of all targeted chemical compounds is shown in Table 2.

Table 2 Sampling and analysis methods employed during this study. All integrated samples were collected on a 1-in-6 day schedule

Ambient Species	Sampling Method	Analysis Method
Integrated Measurements		
PM_{10} Mass	Hi-volume sampler	Analytical microbalance
$PM_{2.5}$ Mass	SASS sampler	Analytical microbalance
Organic and Elemental Carbon (OC and EC)	SASS sampler	Thermal-optical carbon analyzer (IMPROVE method)
Trace Metals	SASS sampler	X-ray Fluorescence and Inductively Coupled Plasma Mass Spectrometry (ICP-MS).
TSP Lead	TSP Sampler	Inductively Coupled Plasma Mass Spectrometry (ICP-MS)
Volatile Organic Compounds (VOC)	Silica-Lined Canisters	Gas Chromatography-Mass Spectrometry (GC-MS) with automated pre-concentration (TO-15)
Carbonyl Compounds	DNPH Cartridge	High Pressure Liquid Chromatography (HPLC)
Hexavalent Chromium (Cr^{6+})	Sodium Bicarbonate impregnated cellulose filters	Ion Chromatography (modified CARB MLD-039)
Continuous Measurements		
Black Carbon (BC)	Aethalometer (5 minute data)	Optical analysis method

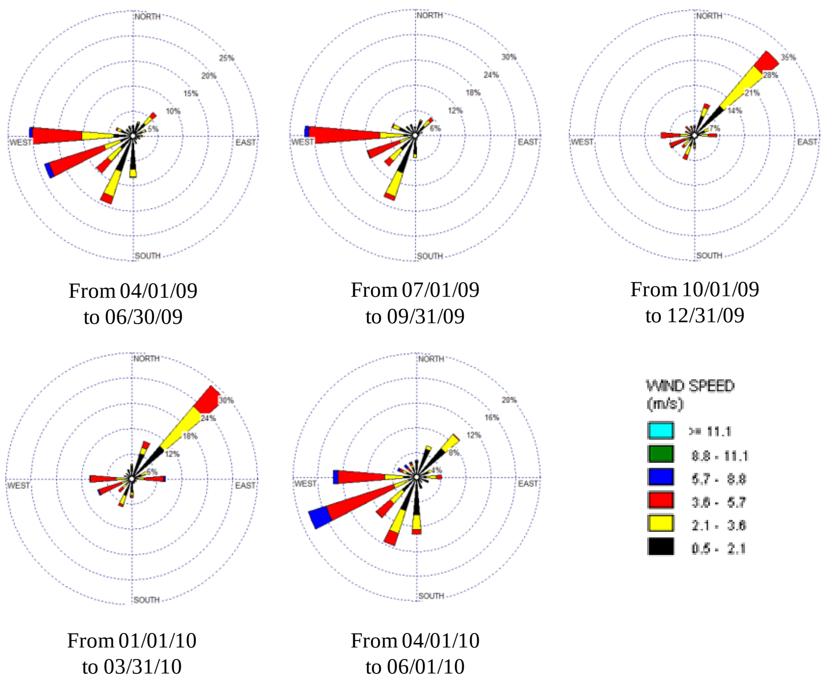
RESULTS AND DISCUSSION

The data collected at the Resurrection School site were examined for temporal patterns and compared to the corresponding values obtained at the Central Los Angeles and Rubidoux stations to better identify the influence of potential sources of air pollution near the Resurrection School. Also, the collected wind data were analyzed to better understand how local meteorology influences the atmospheric concentration of the measured air contaminants.

Meteorology

The wind roses shown in Figure 2 summarize the frequency distribution of wind speed and direction data over three-month periods. The spring (April through June) and summer (July through September) months (i.e., April through September) were characterized by predominantly westerly and west-southwesterly winds, typical of the daytime onshore sea-breezes in this part of the South Coast Air Basin. Conversely, the wind roses representative of colder fall and winter conditions show the predominance of offshore flow from the northeast. This is characteristic of cold air drainage from the mountains to the ocean and it is typically observed this time of year. The stronger northeasterly winds indicate “Santa Ana” winds where high pressure over the deserts of the Great Basin cause cold air to cross the mountains, gaining momentum and warming as it moves down-slope. Santa Ana events bring low humidity and can be warmer or cooler depending on the temperature of the air-mass over the Great Basin deserts.

Figure 2 Wind roses showing three-month average wind speed and direction data from 04/01/09 to 06/01/10



Coarse Particulate Matter

The study average PM_{10} mass levels at the Resurrection School site and in Central Los Angeles (33.0 and 31.3 µg/m^3, respectively) were lower than the corresponding value measured in Rubidoux (40.7 µg/m^3; Table 3 and Figure 3), probably because of increased re-suspension of dust particles at the latter location and secondary aerosol formation in the downwind area. Because of its larger size, the coarse portion (2.5 to 10 µm) of PM_{10} particles is generally not transported far away from its source, except under high wind conditions.

The slightly higher PM_{10} levels observed at all three locations during the warmer months (Figure 4) are probably related to seasonal changes in meteorological conditions. Generally, during the summertime, consistent onshore sea-breeze winds can increase particle re-suspension, while strong temperature inversions limit mixing and solar insulation. High PM_{10} in the fall is typically related to Santa Ana winds. All daily average PM_{10} levels measured at the Resurrection School site and at the other two stations were well below the U.S. EPA NAAQS for PM_{10} (150 µg/m^3, not to be exceeded more than once per year on average over three years). On 10/28/09 the 24-hour average PM_{10} concentration measured at the Central Los Angeles (62 µg/m^3) and

Resurrection School (60 μg/m^3) sites exceeded the corresponding California Ambient Air Quality Standard (CAAQS; 50 μg/m^3). Between 08/29/09 and 11/03/09 the daily average PM_{10} levels at the Rubidoux station were between 60 and 77 μg/m^3 on five different occasions. The study average PM_{10} concentrations at all three sites were above the corresponding annual average CAAQS (20 μg/m^3; annual arithmetic mean). PM_{10} levels higher than the CAAQS are common throughout the South Coast Air Basin. There is no longer an annual average NAAQS for PM_{10}.

Table 3 Average and median PM_{10} concentrations measured at the Resurrection School site and at the Central Los Angeles ad Rubidoux stations from 04/01/09 to 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), and the total number of valid samples (Valid N) are also included

	PM_{10} (μg/m^3)		
	Central LA	**Resurrection**	**Rubidoux**
Average	31.3	33.0	40.7
Median	31.6	32.0	41.0
SD	9.39	10.3	15.1
Min	10.0	12.0	12.0
Max	62.0	60.0	77.2
Valid N	69	69	71

Figure 3 Study average PM_{10} concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Vertical lines represent standard deviations for each bar

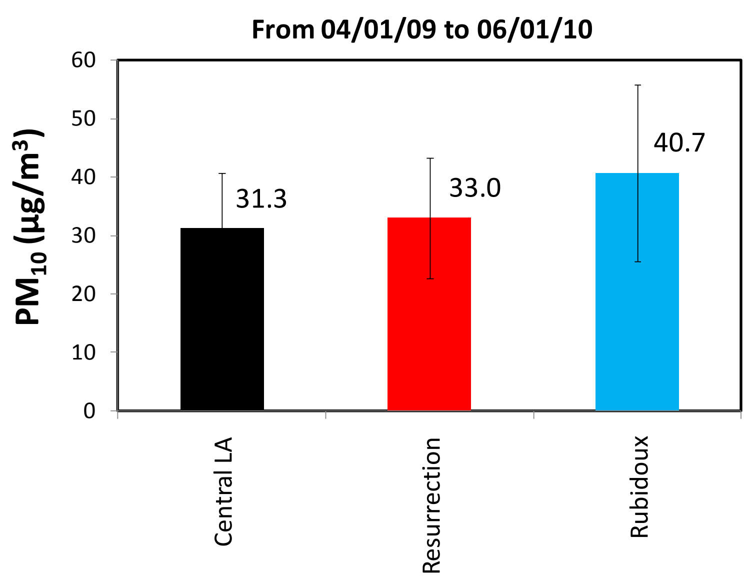
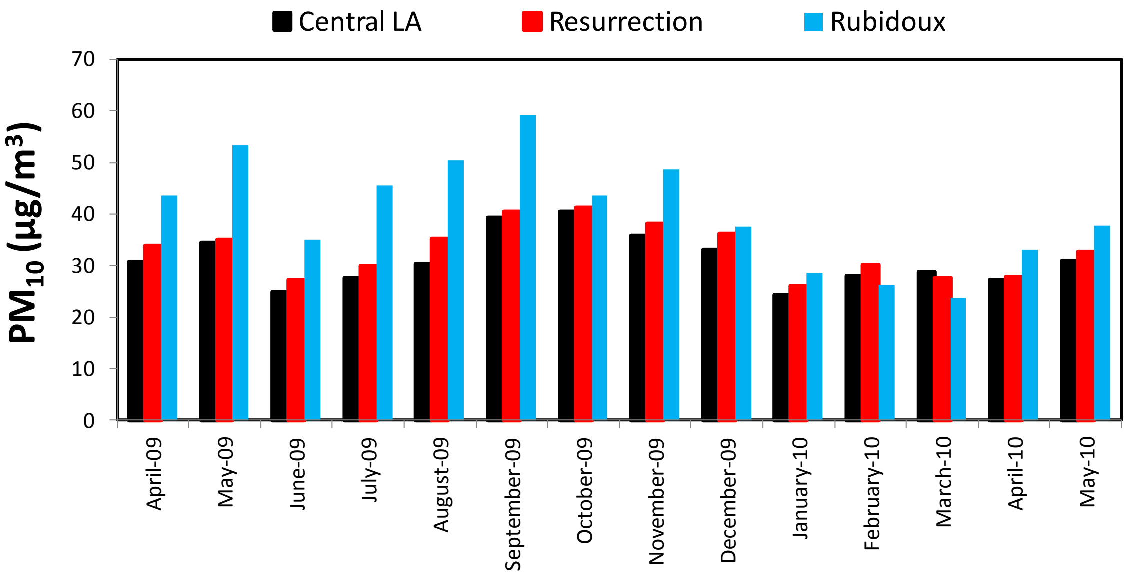


Figure 4 Monthly average PM_{10} concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



Fine Particulate Matter, Elemental Carbon Content and Diesel Emissions

The study average $PM_{2.5}$ mass level at the Resurrection School site (16.3 µg/m^3) was slightly higher than that observed in Central Los Angeles (14.7 µg/m^3) but comparable to that measured in Rubidoux (16.7 µg/m^3) (Table 4; Figure 5). Note that the sampling method used to measure $PM_{2.5}$ mass at Resurrection School, the SASS speciation sampler, utilizes a different flow rate than the Federal Reference Method (FRM) samplers at Central Los Angeles and Rubidoux. This difference can lead to higher measured concentrations relative to the FRM as was observed in previous studies such as MATES III (South Coast AQMD, 2008). The observed difference is on the order of 10% and could explain the variation between Resurrection School and Central Los Angeles. The small difference may also be due to the fact that while the atmospheric concentration of $PM_{2.5}$ is primarily influenced by regional sources, emissions from motor vehicles, industrial facilities and other local PM contributions can also be important. The Resurrection Church site is located less than 350 m south of the I-5 (a highly trafficked highway), north of a large industrial area in the city of Vernon, and very near a city street. The presence of multiple air pollution sources near the Resurrection School site and the Boyle Heights neighborhood may contribute to increased atmospheric $PM_{2.5}$ levels slightly above those observed in downtown Los Angeles. Emissions from the most highly trafficked parts of Los Angeles (such as the Los Angeles-Long Beach port area and the transportation corridors), contribute to the increased $PM_{2.5}$ concentrations seen inland at sites such as Rubidoux. As they are transported inland by the prevailing winds, secondary particles are formed from gaseous PM precursors emitted from the upwind areas of the western South Coast Air Basin.

The monthly average $PM_{2.5}$ levels measured at all three stations (Figure 6) reveals that the temporal variation of this air pollutant was highly variable and did not consistently follow any specific seasonal pattern. The study average $PM_{2.5}$ concentration measured during this study was below the annual average NAAQS for $PM_{2.5}$ set by the U.S. EPA (15 µg/m^3) in Central Los Angeles, but exceeded the NAAQS concentration level at both the Resurrection School and

Rubidoux stations. The daily average $PM_{2.5}$ levels at the Resurrection School site and in Rubidoux exceeded the corresponding 24-hr average NAAQS (35 μg/m^3) on more than one occasion (Table 4). Note again that the NAAQS is based on FRM samplers, and the Resurrection Church site used a non-FRM method to measure $PM_{2.5}$ mass.

Table 4 Average and median $PM_{2.5}$ concentrations measured at the Resurrection School site and at the Central Los Angeles ad Rubidoux stations from 04/01/09 to 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), the total number of valid samples (Valid N), and the number of day above the 24-hour average NAAQS for $PM_{2.5}$ are also included

	$PM_{2.5}$ (μg/m^3)		
	Central LA	**Resurrection**	**Rubidoux**
Average	14.7	16.3	16.7
Median	14.2	15.4	15.9
SD	5.94	7.08	8.65
Min	3.91	5.16	4.13
Max	35.0	37.5	40.9
Valid N	68	64	69
N > NAAQS	0	2*	3**

*Resurrection: the $PM_{2.5}$ concentrations measured on 09/28/09 and on 11/08/09 were 37.5 and 36.6 μg/m^3, respectively
**Rubidoux: the $PM_{2.5}$ concentrations measured on 05/13/09, 11/21/09 and on 12/03/09 were 40.9, 39.4 and 35.7 μg/m^3, respectively

Figure 5 Study average $PM_{2.5}$ concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Vertical lines represent standard deviations for each bar

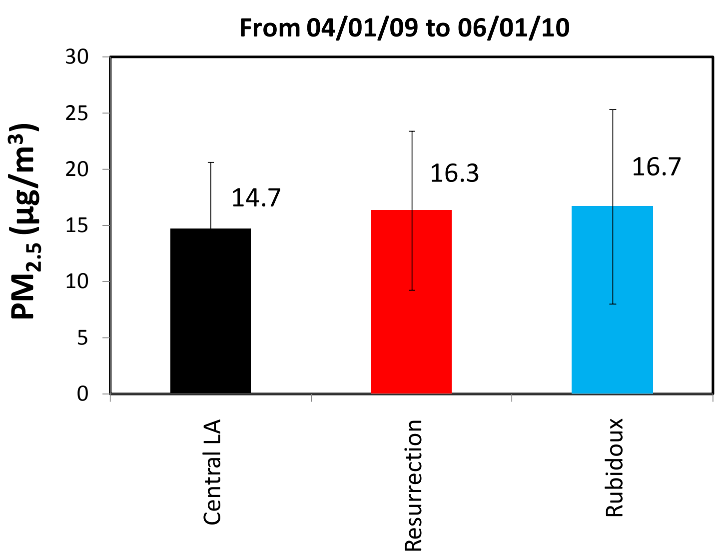
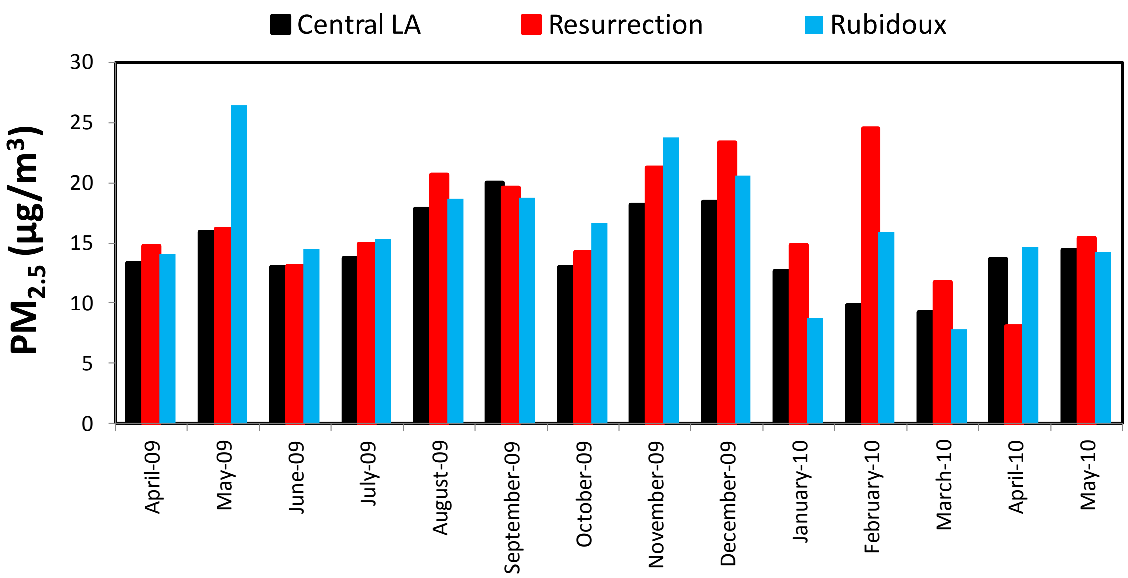


Figure 6 Monthly average $PM_{2.5}$ concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



The atmospheric concentration of EC (an indicator of diesel PM) was characterized by a different spatial variability, with a study average value that was higher at the Resurrection School site (2.04 µg/m^3) than at the Central Los Angeles and Rubidoux stations (1.72 and 1.63 µg/m^3, respectively) (Table 5; Figure 7). Although, the magnitude of these average EC levels is not particularly elevated relative to the ambient EC concentrations observed in other urban areas, these results may reflect the relatively close proximity of the Resurrection School site to the I-5 where heavy duty diesel truck comprise about 6% of the total traffic volume (http://pems.dot.ca.gov/).

Elemental carbon followed a well-defined temporal pattern, with higher atmospheric levels in the late fall and early winter and lower values in the warmer months (Figure 8). These variations are likely related to seasonal changes in meteorological conditions. Generally, in the late fall and winter light winds result in reduced ventilation, and late night/early morning inversions contribute to increasing the surface-level concentrations of those pollutants that are emitted from nearby ground-level sources. Although EC is currently not regulated by the U.S. EPA, a previous study conducted by AQMD suggested that exposure to diesel particles is the major contributor to the air toxics cancer risk in the South Coast Air Basin, accounting on average for about 80% of the total carcinogenic risk (MATES III; South Coast AQMD, 2008).

Table 5 Average and median EC concentrations measured at the Resurrection School site and at the Central Los Angeles ad Rubidoux stations from 04/01/09 to 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), and the total number of valid samples (Valid N) also included

	$PM_{2.5}$ EC (μg/m^3)		
	Central LA	**Resurrection**	**Rubidoux**
Average	1.72	2.04	1.63
Median	1.66	1.90	1.62
SD	0.98	1.09	1.04
Min	0.09	0.38	0.06
Max	4.50	5.34	4.57
Valid N	66	61	69

Figure 7 Study average $PM_{2.5}$ EC concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Vertical lines represent standard deviations for each bar

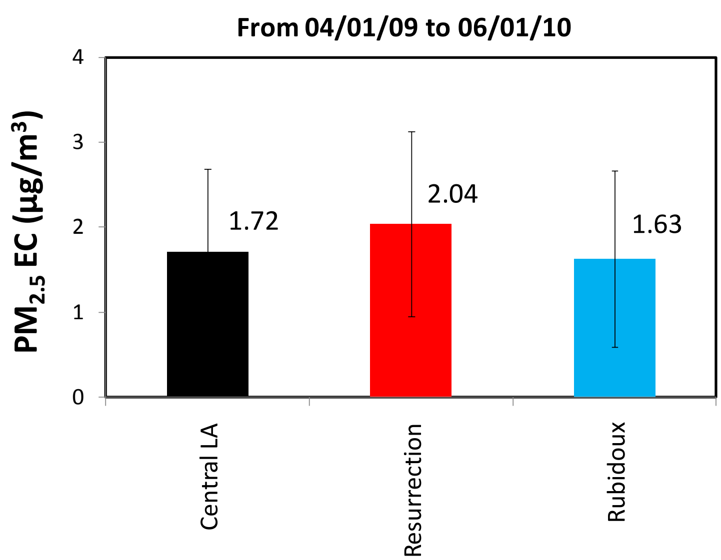
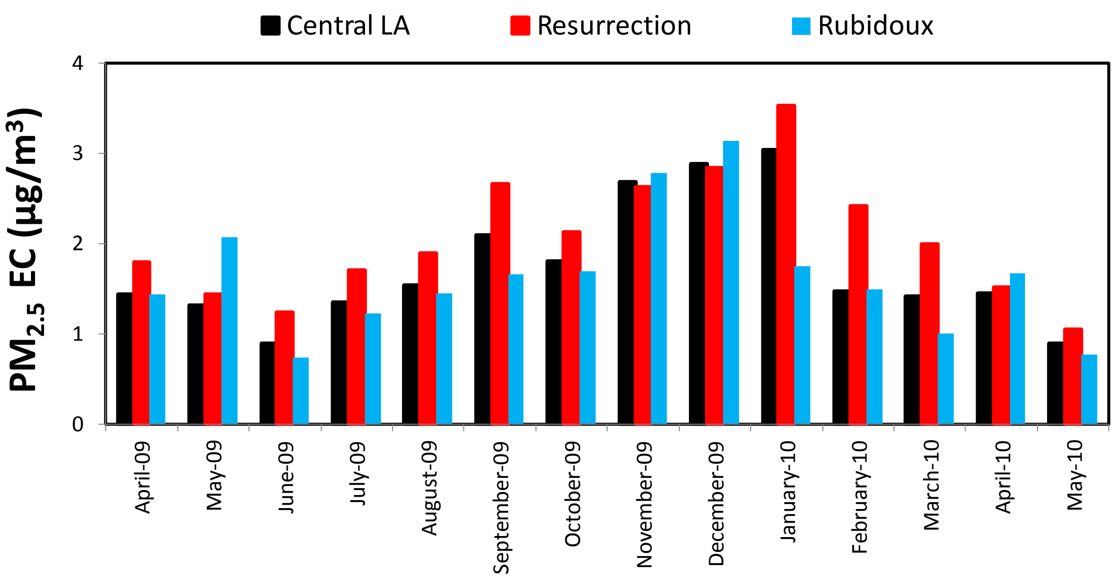


Figure 8 Monthly average $PM_{2.5}$ EC concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



To better understand the short-term impact of diesel PM in the area near the Resurrection School site, 1-hr BC data were taken at this location and analyzed in more detail. Elemental carbon and BC are both indicators of diesel PM emissions and are typically well correlated at any given monitoring location. However, recent data collected by AQMD have shown that the extent of this correlation can be different at coastal and inland sites and may vary throughout the year. As shown in the Figure 9 example, BC typically increased in the early morning because of rush hour traffic and decreased later in the afternoon. A slight increase in the atmospheric BC levels was also observed between 22:00 and 03:00 because of nighttime and early morning inversions. One hour values higher than 15 $\mu g/m^3$ were recorded on a few other occasions, mostly in the morning when traffic activity near this site was the highest.

The impact of diesel emissions from the I-5 on the BC concentrations measured at the Resurrection School site is illustrated in Figure 10, which shows the study average diurnal variation in BC along with the correspondent average truck traffic flow data collected on the I-5 north during the same time period. The peak in truck traffic volume typically occurred at around 08:00, about two hours after the maximum increase in BC was measured. This discrepancy may reflect the combined effect that meteorology (i.e. early morning inversion) and increasing truck traffic emissions have on the observed BC levels. The traffic information shown in Figure 10 was retrieved from the CalTrans/PeMS website (http://pems.dot.ca.gov/) and refers to the average diurnal truck traffic flow (#/hr) as recorded by a traffic sensor located about 330m north of the Resurrection School site.

Figure 9 Time series showing the typical daily variations of BC at the Resurrection School site. Black carbon data (reported as 1-hr average concentrations) were collected for the entire duration of the study

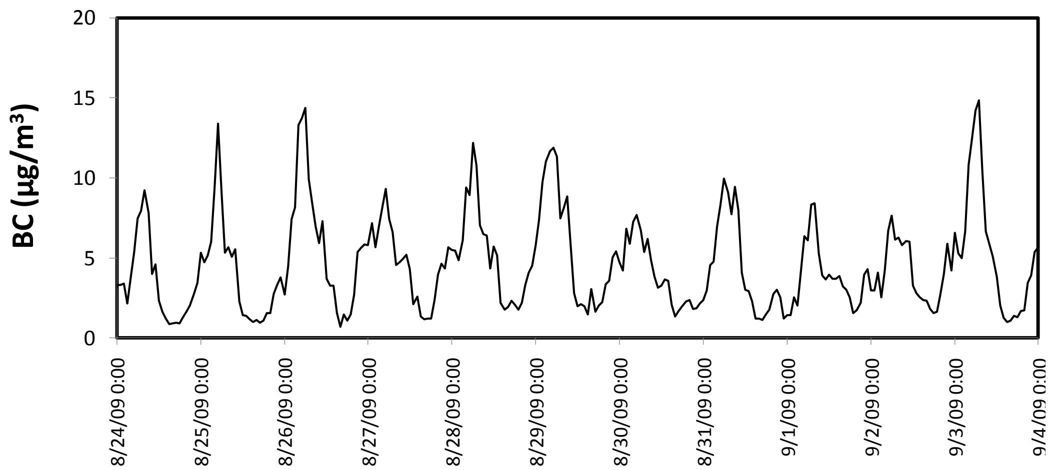
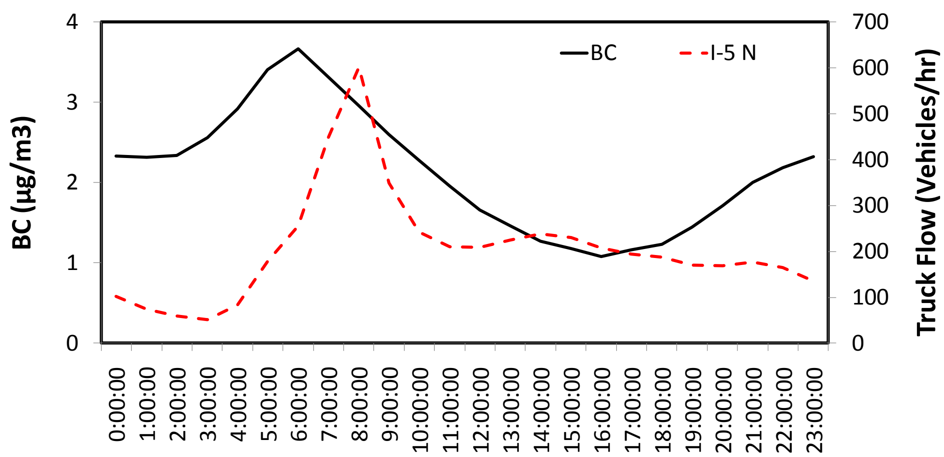


Figure 10 Study average diurnal profiles for BC and truck traffic volume at the Resurrection School site. Traffic information was taken from the CalTrans/PeMS website (http://pems.dot.ca.gov/)



Total Suspended Particulate Lead

As was the case for $PM_{2.5}$ and EC, the highest study average TSP lead concentration (16.8 ng/m^3) was measured at the Resurrection School site (Table 6; Figure 11). The average lead levels observed at the Central Los Angeles and Rubidoux stations during the same time period were 9.57 and 7.33 ng/m^3, respectively, or 43 and 56% less than the corresponding value at the Resurrection School. A slight increase in the atmospheric lead concentration near this monitoring site may be associated with re-suspension of historically deposited dust accumulated on roads within the community or near the I-5, and not with fresh emissions. The school is relatively far from the Exide plant (about 2.2 Km north-west) and the winds rarely blow towards the school from the Exide facility. In addition, the lead data collected at the Resurrection School site are not well correlated to those measured right next to the Exide plant during the same time period (R^2<0.001). However, we cannot exclude the possibility that direct lead emissions from Exide Technologies and/or transport of re-suspended particles containing lead from the Exide facility might have contributed to increase the atmospheric concentration of lead at the Resurrection School.

As shown in Figure 12, the lead concentration at all three sampling stations followed a similar temporal pattern as that observed for PM_{10}, probably because lead is mostly associated with larger particles. In October 2008 the U.S. Environmental Protection Agency strengthened the NAAQS for lead, lowering it from 1500 ng/m^3 (quarterly average) to a more stringent 150 ng/m^3 (rolling 3-month average). The concentrations measured at the three monitoring sites during this study were well below the current NAAQS for lead (Table 6).

Table 6 Average and median Total Suspended Particulate (TSP) lead concentrations measured at the Resurrection School site and at the Central Los Angeles ad Rubidoux stations from 04/01/09 to 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), and the total number of valid samples (Valid N) also included

	TSP Lead (ng/m^3)		
	Central LA	**Resurrection**	**Rubidoux**
Average	9.57	16.8	7.33
Median	10.0	16.1	8.83
SD	5.83	6.32	4.37
Min	0.00	4.87	0.00
Max	25.3	39.9	20.0
Valid N	69	68	69

Figure 11 Study average TSP lead concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Vertical lines represent standard deviations for each bar

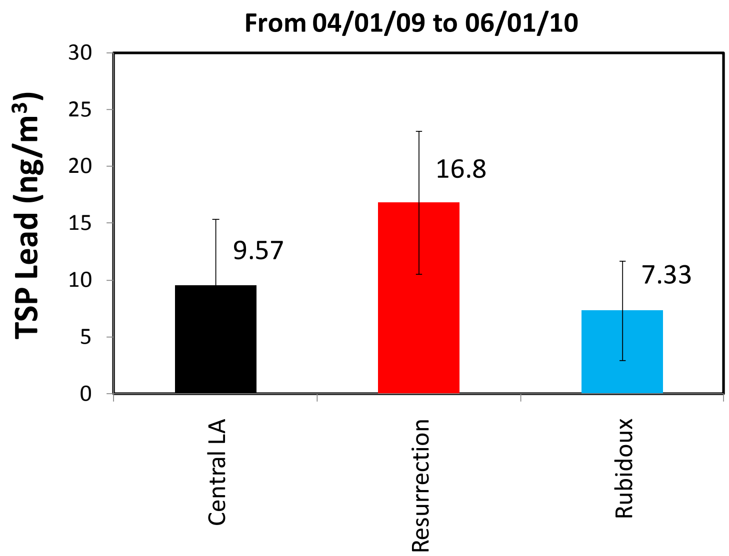
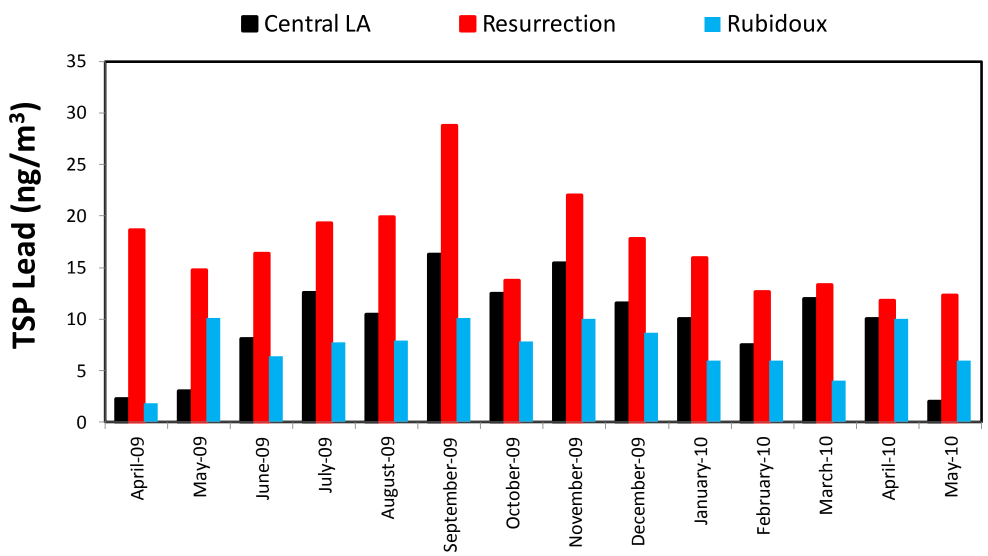


Figure 12 Monthly average Total Suspended Particulate (TSP) lead concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



Trace Elements

The elemental composition of the collected aerosol samples can be used to provide an important fingerprint to help distinguish particulate emissions from different sources. Some specific elements are also considered air toxics. Although more than 40 trace elements were analyzed on the TSP and $PM_{2.5}$ samples collected at the Resurrection School site and on the $PM_{2.5}$ samples taken at the Central Los Angeles and Rubidoux stations, only the concentrations of those species that were present in significant amounts [i.e. Magnesium (Mg), Aluminum (Al), Silicon (Si), Sulfur (S), Potassium (K), Calcium (Ca), and Iron (Fe)] will be discussed in the following paragraphs. Arsenic (As), Chromium (Cr) and other toxic trace elements were either non detected or present in concentrations close to urban background levels. The temporal and spatial distribution of lead has already been discussed in a previous section.

The spatial distribution of each trace element was quite uniform across all sampling stations and, typically, sulfur was the most abundant trace element in the collected $PM_{2.5}$ samples (Table 7; Figure 13). Sulfur (emitted as sulfate or SO_2) is typically generated from combustion of sulfur-containing fuel. Previous studies (Ntziacristos et al., 2007; Arhami et al., 2009) have indicated that sulfur is mostly found in ultra-fine and accumulation mode particles, which explains why this trace element was found in similar concentrations in the TSP and $PM_{2.5}$ samples collected at the Resurrection School site. The remaining trace elements mainly originate from mechanical processes such as vehicle brake abrasion (Fe) or from re-suspension of crustal materials (i.e. Mg, Ca, K, Fe, Si, and Al), and their concentrations are well within those reported in previous road-side, tunnel, and port studies conducted in the Los Angeles Basin (Singh et al., 2002; Ntziachristos et al., 2007; Arhami et al., 2009) and other urban areas (Birmili et al., 2006). Calcium (used as anti-wear, detergent, and stabilizing additive in oils) has also been proposed as marker for lube-oil combustion. Because these elements naturally occur in soil particles, their concentration in the TSP samples collected at the Resurrection Church site was higher than the corresponding levels present in the $PM_{2.5}$ samples collected at the same site during the same time period (Figure 13). While $PM_{2.5}$ is primarily emitted from combustion activities, TSP also includes larger particles from the Earth's crust. Overall, the temporal profile of the trace elements measured during this study is variable, with higher sulfur levels in the warmer months probably because of production of secondary sulfate in late spring and early summer (not shown). A summary of all trace element data collected during this study can be found in Appendix B.

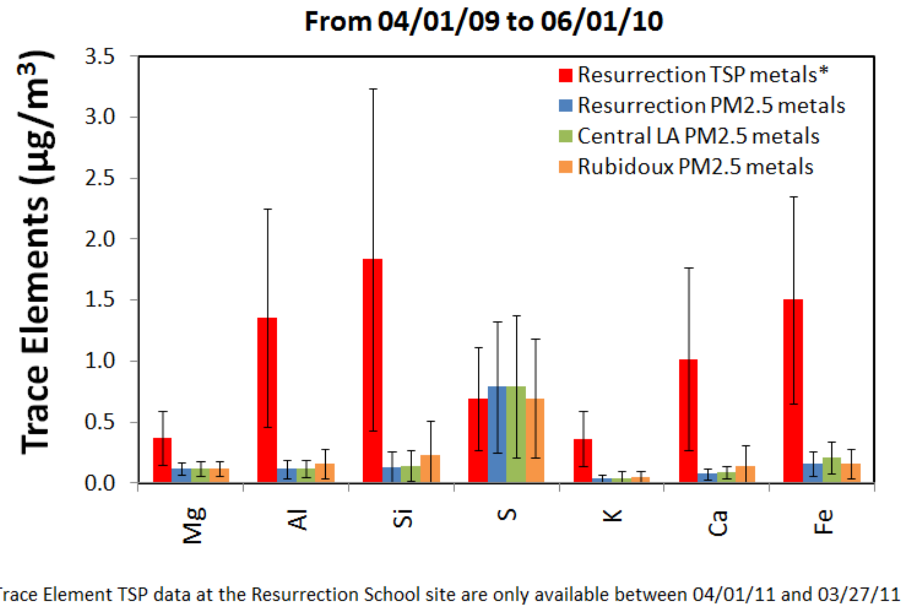
Table 7 Average and median trace element concentrations measured in $PM_{2.5}$ samples collected at the Resurrection School site and at the Central Los Angeles and Rubidoux stations between 04/01/09 and 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), and the total number of valid samples (Valid N) are also included. Total Suspended Particulate (TSP) samples were also taken and analyzed for trace elements, but only at the Resurrection School

TRACE ELEMENTS IN TSP (μg/m^3)							
	Resurrection						
	Mg	Al	Si	S	K	Ca	Fe
Average	0.37	1.36	1.84	0.69	0.36	1.02	1.50
Median	0.32	1.20	1.43	0.63	0.37	0.89	1.43
SD	0.22	0.89	1.40	0.43	0.22	0.75	0.85
Min	0.05	0.09	0.15	0.18	0.06	0.17	0.21
Max	1.28	4.14	5.87	1.78	1.13	4.58	4.36
Valid N	52	57	57	57	57	57	57

TRACE ELEMENTS IN $PM_{2.5}$ (μg/m^3)							
	Resurrection						
	Mg	Al	Si	S	K	Ca	Fe
Average	0.12	0.11	0.13	0.79	0.04	0.07	0.16
Median	0.12	0.11	0.10	0.78	0.03	0.07	0.13
SD	0.05	0.07	0.14	0.54	0.03	0.04	0.10
Min	0.03	0.01	0.01	0.08	0.00	0.01	0.00
Max	0.24	0.40	0.91	2.32	0.18	0.29	0.44
Valid N	67	67	66	66	61	67	67
	Central Los Angeles						
Average	0.12	0.12	0.14	0.79	0.04	0.09	0.21
Median	0.13	0.12	0.11	0.67	0.02	0.08	0.18
SD	0.06	0.07	0.13	0.59	0.06	0.05	0.13
Min	0.01	0.01	0.01	0.06	0.00	0.01	0.04
Max	0.45	0.35	0.80	2.66	0.55	0.29	0.66
Valid N	112	112	112	112	112	112	112
	Rubidoux						
Average	0.12	0.16	0.23	0.70	0.05	0.14	0.16
Median	0.13	0.14	0.15	0.58	0.03	0.09	0.14
SD	0.06	0.12	0.28	0.49	0.05	0.17	0.12
Min	0.01	0.01	0.02	0.07	0.00	0.01	0.03
Max	0.31	0.84	2.01	2.16	0.26	1.32	0.96
Valid N	113	113	113	113	113	113	113

*Trace Element TSP data at the Resurrection School site are only available between 04/01/11 and 03/27/11

Figure 13 Study average concentrations of selected trace elements in $PM_{2.5}$ samples collected at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Total Suspended Particulate (TSP) samples were also taken and analyzed for trace elements, but only at the Resurrection School. Vertical lines represent standard deviations for each bar



Hexavalent Chromium

The study average concentration of Cr^{6+} at the Resurrection School site (0.11 ng/m^3) was virtually identical to that measured in Central Los Angeles and in Rubidoux (0.10 and 0.11 ng/m^3, respectively) (Table 8; Figure 14). The monthly average Cr^{6+} levels at all three locations reveals that the temporal variation of this air toxic was highly variable and did not follow any specific seasonal pattern (Figure 15) other than a general tendency to be slightly higher in the fall and winter seasons. These levels are consistent with what is considered the urban background in Southern California, and thus do not indicate the presence of any local sources.

Hexavalent chromium is a toxic form of the element chromium and it is used in many industrial applications (e.g. chromate pigment production and chromium plating). Exposure to Cr^{6+} in the workplace has been related to a number of harmful health effects including respiratory irritation and lung cancer. Hexavalent chromium and Cr^{6+} containing compounds are listed as Toxic Air Contaminants by the California Air Resource Board (CARB). All Cr^{6+} concentrations measured during this study are similar to or below those observed by AQMD during other measurement studies conducted in the South Coast Air Basin (MATES III; South Coast AQMD, 2008).

Table 8 Average and median Hexavalent Chromium (Cr^{6+}) concentrations measured at the Resurrection School site and at the Central Los Angeles ad Rubidoux stations from 04/01/09 to 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), and the total number of valid samples (Valid N) also included

	Cr^{6+} (ng/m^3)		
	Central LA	**Resurrection**	**Rubidoux**
Average	0.10	0.11	0.11
Median	0.09	0.09	0.09
SD	0.04	0.07	0.07
Min	0.02	0.03	0.03
Max	0.22	0.40	0.39
Valid N	73	66	70

Figure 14 Study average Cr^{6+} concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Vertical lines represent standard deviations for each bar

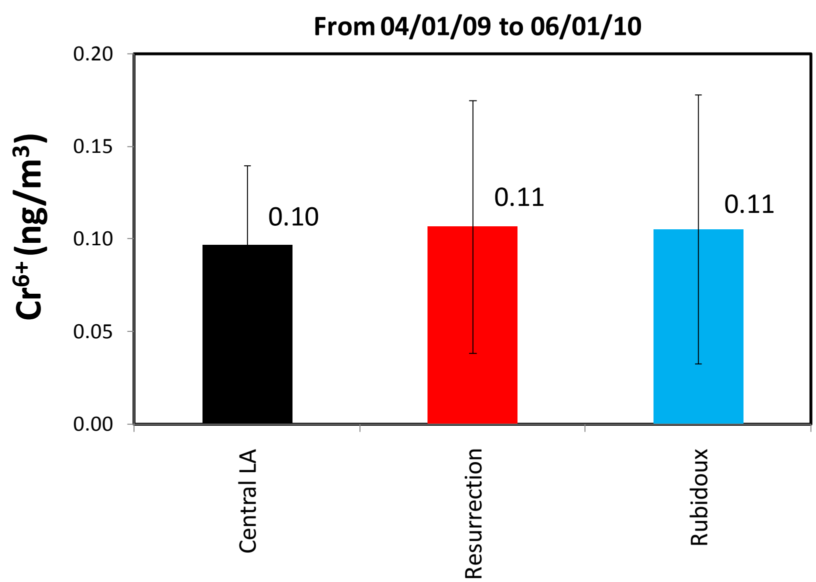
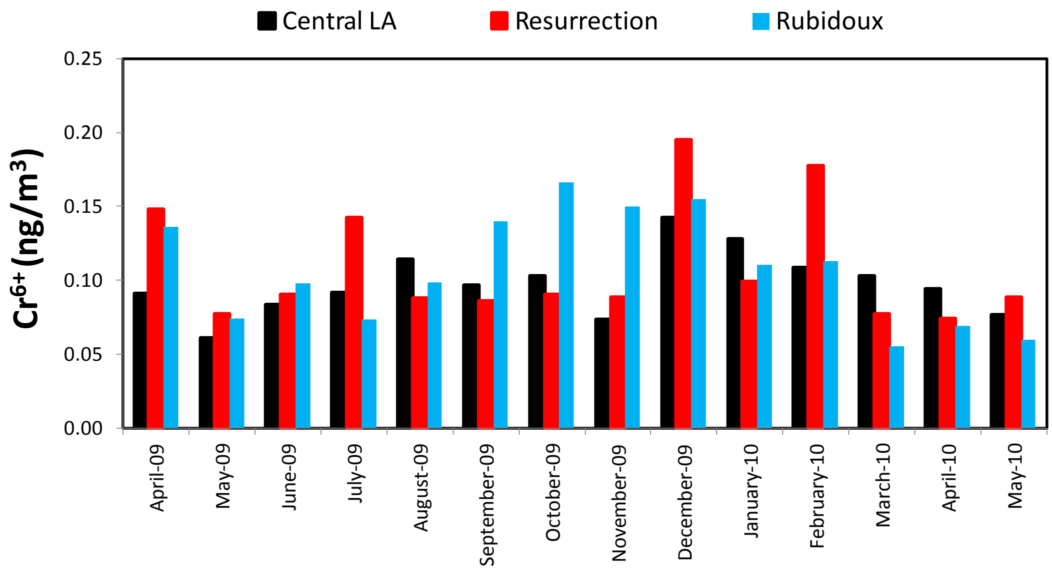


Figure 15 Monthly average Cr^{6+} concentrations at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



Volatile Organic Compounds and Carbonyls

The following VOCs were analyzed in all samples collected at the Resurrection School site and at the Central Los Angeles and Rubidoux stations because of their potential importance relative to toxic cancer risk in the South Coast Air Basin: Vinylchloride, 1,3-butadiene, 2-propenal, Acetone, Methylenechloride, Methyltertbutylether, 2-butanone, chloroform, 1,2-Dichloroethane, Benzene, Carbontetrachloride, 1,2-Dichloropropane, Trichloroethylene, Toluene, 1,2-dibromoethane, Tetrachloroethene, Ethylbenzene, m,p-Xylenes, Styrene, o-Xylene, 1,4-DiChlorobenzene, and 1,2-DiChlorobenzene. Only those VOCs that were detected in significant amounts in all collected samples were selected for the purpose of this analysis and will be discussed here. The complete VOC dataset can be found in Appendix C.

With the exception of methylene chloride, the concentrations of all selected VOCs (namely, m+p-xylenes, o-xylenes, benzene, ethylbenzene, 1,3-butadiene, toluene, methylene chloride, and 2-butanone) at the Resurrection School site were comparable to those measured at the other two monitoring stations in Central Los Angeles and Rubidoux (Table 9; Figure 16). This is probably because gaseous emissions from motor-vehicles are likely to be the predominant source of these volatile species at all three monitored locations and throughout the entire South Coast Air Basin. The slightly higher atmospheric levels of toluene, 2-butanone, m+p-xylenes and other VOCs measured at the Resurrection School might be explained by the close proximity of this site to the I-5 or the very close proximity to the surface street. The potential contribution of evaporative emissions from nearby industrial facilities cannot be excluded, but this pattern of VOC levels is consistent with mobile source emissions.

The VOC concentration was generally higher during the colder months (November through February) than during the remaining part of the year. This is consistent with typical seasonal changes in local meteorological conditions, as described in previous sections. Monthly average variations for benzene and 1,3-butadiene (considered to be good tracers of gasoline vehicle emissions) are shown in Figure 17 as an example.

Table 9 Average and median concentrations of selected VOCs measured at the Resurrection School site and at the Central Los Angeles ad Rubidoux stations from 04/01/09 to 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), and the total number of valid samples (Valid N) also included

		VOCs (ppb)			
		Toluene	*m+p-xylenes*	*Benzene*	*Methylene Chloride*
CELA	**Average**	1.21	0.65	0.44	0.43
	Median	1.06	0.58	0.37	0.33
	SD	0.72	0.38	0.23	0.44
	Min	0.18	0.08	0.10	0.08
	Max	3.14	1.62	1.06	2.57
	Valid N	66	66	66	66
Resurrection	**Average**	1.56	0.84	0.52	0.30
	Median	1.28	0.68	0.42	0.26
	SD	0.95	0.56	0.29	0.21
	Min	0.31	0.02	0.13	0.05
	Max	4.13	2.37	1.22	1.24
	Valid N	62	62	62	62
Rubidoux	**Average**	0.96	0.44	0.31	0.94
	Median	0.93	0.42	0.29	0.28
	SD	0.57	0.28	0.16	1.77
	Min	0.12	0.08	0.08	0.04
	Max	2.67	1.25	0.74	8.27
	Valid N	68	68	68	68
		2-butanone	*o-xylene*	*Ethylbenzene*	*1,3-butadiene*
CELA	**Average**	0.52	0.22	0.18	0.08
	Median	0.47	0.19	0.15	0.06
	SD	0.24	0.13	0.10	0.06
	Min	0.15	0.03	0.02	0.01
	Max	1.26	0.58	0.42	0.24
	Valid N	66	66	66	66
Resurrection	**Average**	0.84	0.29	0.22	0.11
	Median	0.78	0.22	0.18	0.07
	SD	0.42	0.18	0.14	0.08
	Min	0.19	0.06	0.05	0.02
	Max	2.07	0.76	0.59	0.34
	Valid N	62	62	62	62
Rubidoux	**Average**	0.60	0.16	0.13	0.05
	Median	0.61	0.14	0.12	0.03
	SD	0.24	0.09	0.07	0.04
	Min	0.11	0.03	0.02	0.00
	Max	1.21	0.43	0.34	0.19
	Valid N	68	68	68	68

Figure 16 Study average concentrations of selected VOCs at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Vertical lines represent standard deviations for each bar

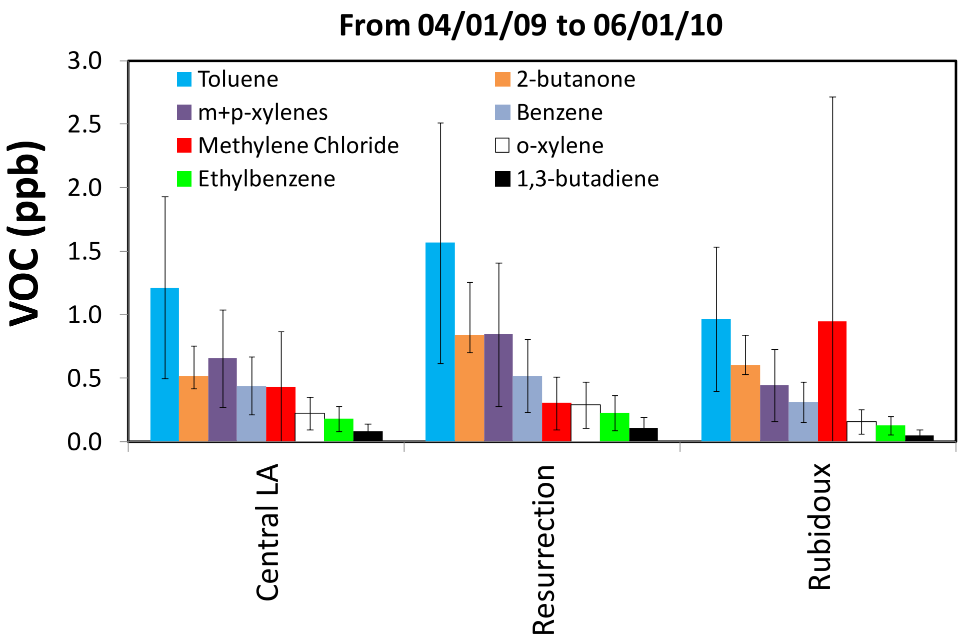
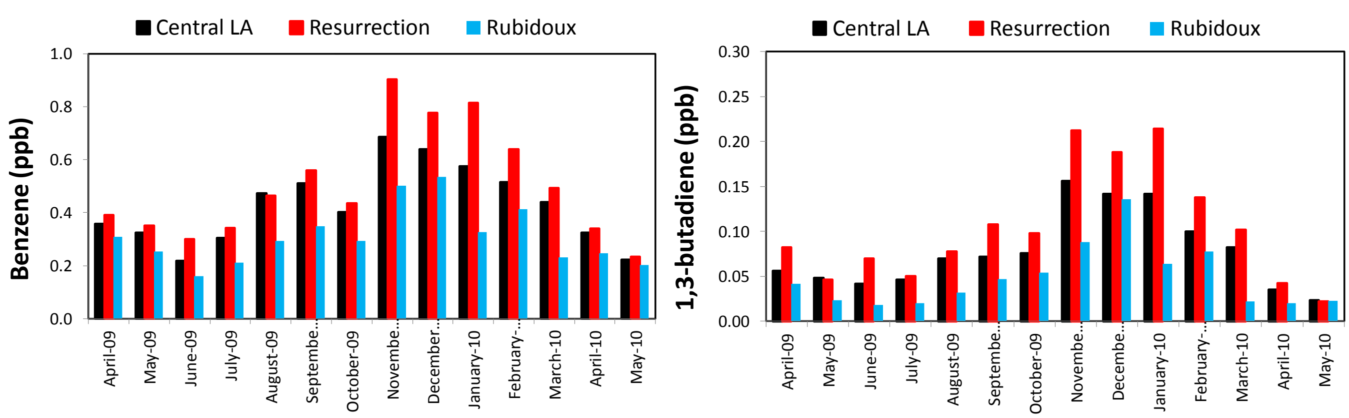


Figure 17 Monthly average concentrations of selected VOCs at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



The average concentrations of the most abundant carbonyl compounds (i.e. formaldehyde, acetaldehyde, and acetone) measured at the Resurrection School site were also comparable to those recorded at the Central Los Angeles and Rubidoux stations (Table 10; Figure 18) and followed a similar seasonal pattern at all three locations (an example for formaldehyde is shown in Figure 19). In addition to direct emissions, formaldehyde and acetaldehyde are also formed in the air via photochemical reactions. The higher levels in summer and at inland Rubidoux point to regional formaldehyde formed by atmospheric chemistry, enhanced with more sunlight in summer and elevated at inland sites due to atmospheric aging and transport. In winter, with less sunlight and less inland transport, lower values inland suggest that the atmospheric concentration of these carbonyl compounds is mostly affected by primary motor-vehicle emissions and proximity to local traffic. Contributions from local evaporative sources may have contributed to increase the acetone levels at the Resurrection School site, but the extent of this contribution cannot be assessed from the available data. A summary of all carbonyl compound data collected throughout this study can be found in Appendix C.

Table 10 Average and median concentrations of the carbonyl compounds measured at the Resurrection School site and at the Central Los Angeles ad Rubidoux stations from 04/01/09 to 06/01/10. Minimum (Min) and maximum (Max) values, standard deviations (SD), and the total number of valid samples (Valid N) also included

	CARBONYLS (ppb)		
	Acetone		
	Central LA	**Resurrection**	**Rubidoux**
Average	6.60	8.33	5.58
Median	5.68	7.58	5.28
SD	3.27	3.93	2.41
Min	2.14	2.28	1.49
Max	16.4	21.1	13.9
Valid N	66	62	68
	Formaldehyde		
	Central LA	**Resurrection**	**Rubidoux**
Average	2.77	3.41	3.43
Median	2.80	3.40	3.10
SD	1.38	1.36	1.94
Min	0.50	0.69	0.80
Max	6.00	8.75	9.50
Valid N	68	62	70
	Acetaldehyde		
	Central LA	**Resurrection**	**Rubidoux**
Average	1.30	1.51	1.39
Median	1.20	1.44	1.40
SD	0.64	0.70	0.70
Min	0.30	0.40	0.30
Max	3.70	3.78	3.70
Valid N	67	62	70

Figure 18 Study average concentrations of the carbonyl compounds measured at the Resurrection School site and at the Central Los Angeles and Rubidoux stations. Vertical lines represent standard deviations for each bar

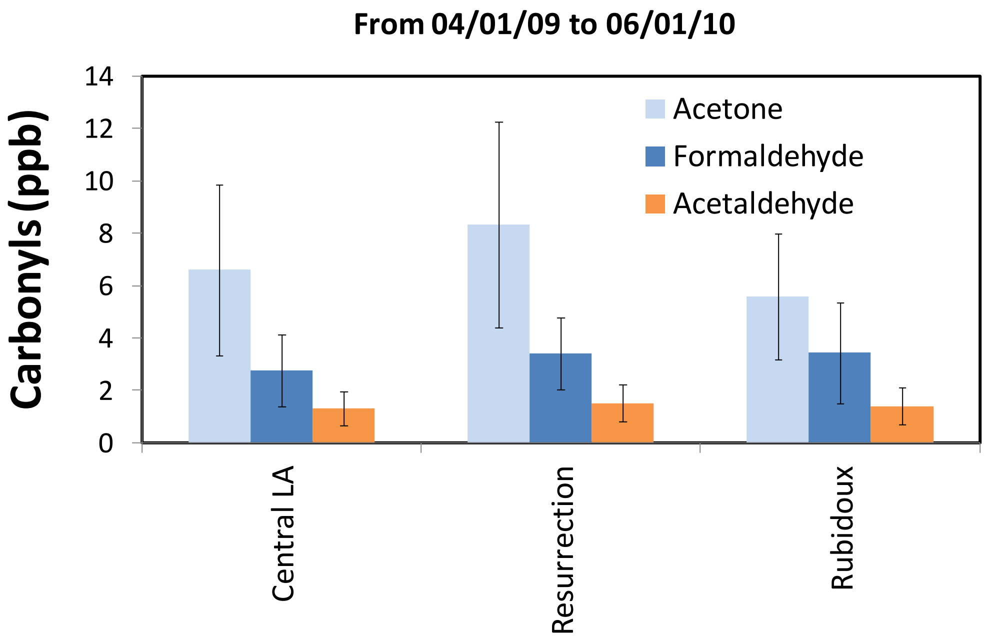
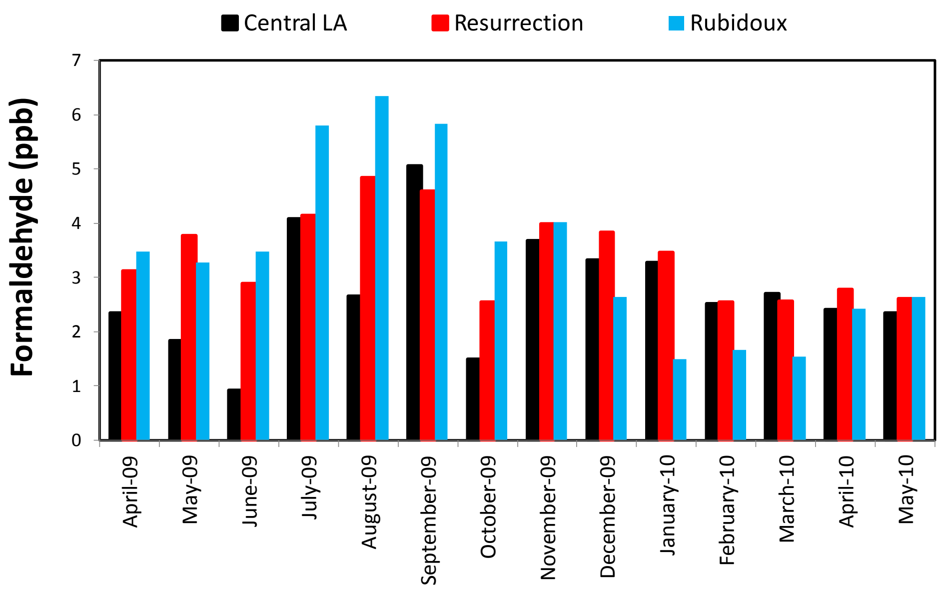


Figure 19 Monthly average concentrations of the carbonyl compounds measured at the Resurrection School site and at the Central Los Angeles and Rubidoux stations



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APPENDIX B: TRACE ELEMENT DATA

Central Los Angeles ($PM_{2.5}$)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
04/01/09	158.02	190.12	290.12	874.07	51.85	112.35	180.25	0.72
04/04/09	141.92	229.54	351.71	667.63	67.87	129.58	202.39	0.72
04/07/09	114.76	229.51	240.62	736.66	22.21	93.78	186.32	0.72
04/10/09								
04/13/09	66.67	202.47	222.22	737.04	22.22	76.54	264.20	0.72
04/16/09	161.75	156.81	176.56	277.81	29.63	90.13	174.09	0.72
04/19/09	39.51	204.94	327.16	446.91	24.69	127.16	260.49	0.72
04/22/09	115.99	167.81	188.79	1485.66	35.78	81.44	144.37	0.72
04/25/09	149.31	207.30	160.41	572.54	34.55	80.21	164.11	0.72
04/28/09	165.40	176.51	137.01	1310.84	27.15	81.46	120.96	0.72
05/01/09	86.38	233.24	233.24	1161.25	22.21	97.49	264.09	0.72
05/04/09	95.03	124.65	123.42	698.55	0.63	49.37	96.27	0.72
05/07/09	144.46	208.66	302.50	525.98	207.43	130.88	214.84	0.72
05/10/09	118.47	208.56	209.79	2204.03	45.66	80.21	155.49	0.72
05/13/09	152.96	213.40	260.28	1775.08	55.51	102.38	154.19	0.62
05/16/09	117.22	215.32	193.73	2660.36	37.02	75.27	132.03	0.72
05/19/09	70.35	204.26	201.79	1192.22	1.85	49.98	147.49	0.62
05/22/09	153.01	208.53	254.19	1874.34	44.42	114.76	154.24	0.62
05/25/09	88.86	162.91	119.72	1620.49	4.94	48.13	61.71	0.62
05/28/09	59.26	148.15	145.68	1954.32	6.17	45.68	132.10	0.62
05/31/09	28.36	168.93	78.91	1538.84	0.51	8.63	50.55	0.62
06/03/09	16.03	159.11	115.94	1465.31	0.51	86.34	144.31	0.62
06/06/09	20.98	133.26	66.63	330.69	16.04	19.74	64.16	0.62
06/09/09	23.44	178.92	91.31	969.87	0.51	38.25	93.78	0.62
06/12/09	48.08	155.33	125.74	1020.75	0.51	36.98	124.51	0.62
06/15/09	44.42	148.07	70.33	531.83	0.51	29.61	82.67	0.62
06/18/09	48.13	170.32	16.46	1877.20	20.98	75.29	192.53	1.23
06/21/09	152.98	160.38	90.06	947.47	11.10	48.11	50.58	0.62
06/24/09	449.24	128.36	16.46	1334.16	17.28	95.03	129.59	62.94
06/27/09	160.61	219.91	16.47	2010.09	65.48	102.54	179.14	56.83
06/30/09	148.18	170.41	16.46	1641.08	35.81	92.61	274.13	40.75
07/03/09	153.07	187.64	16.46	1629.46	46.91	92.58	80.24	92.58
07/06/09	83.89	189.99	16.45	1033.82	80.19	87.59	148.04	107.33
07/09/09	101.19	187.58	16.45	1598.11	28.38	88.85	148.09	55.53
07/12/09	99.99	154.31	22.32	749.31	61.72	66.66	138.26	34.56
07/15/09	174.06	148.13	22.32	1207.90	37.03	102.46	154.31	74.68
07/18/09	60.48	138.24	22.32	892.41	11.11	51.84	140.71	62.95
07/21/09								
07/24/09	92.51	187.48	22.30	1254.39	43.17	98.67	213.38	99.91
07/27/09	17.27	143.12	22.31	920.42	0.51	59.84	132.63	28.99
07/30/09	14.39	152.99	64.16	1005.55	13.57	80.20	220.85	37.01
08/02/09	14.41	187.71	22.33	1249.77	6.17	35.81	90.15	14.82
08/05/09	76.53	183.91	22.32	260.44	8.64	98.75	207.36	54.31
08/08/09	55.57	181.54	22.33	571.78	18.52	96.33	116.09	38.28
08/11/09	17.28	93.81	143.18	1271.34	0.63	55.54	111.09	0.72
08/14/09	56.69	115.85	119.54	1636.64	55.46	41.90	99.83	0.72
08/17/09	38.20	122.01	141.73	2012.53	83.80	59.16	98.59	0.72
08/20/09	17.28	91.32	70.34	979.84	7.40	59.23	153.02	18.51
08/23/09	29.63	71.61	77.79	1732.28	34.57	39.51	67.91	0.72
08/26/09	60.52	10.29	33.35	344.62	554.61	124.76	272.98	6.18
08/29/09	46.89	10.28	51.83	545.40	171.52	115.99	250.49	23.44
09/01/09	44.42	10.28	32.08	645.28	50.59	114.74	191.24	0.62
09/04/09	80.28	27.17	156.85	763.28	63.61	147.59	232.19	0.62
09/07/09	82.71	10.29	143.20	643.14	25.92	138.26	138.26	0.62
09/10/09	171.45	262.72	527.91	852.30	76.47	273.82	429.23	77.71
09/13/09	61.64	145.47	261.35	1236.49	0.63	51.78	54.24	140.54
09/16/09	183.93	77.77	130.85	564.14	13.58	79.00	223.43	97.52
09/19/09	129.48	98.65	66.59	1447.74	0.63	41.93	94.95	54.26
09/22/09	132.13	128.42	210.23	753.24	19.76	143.24	321.05	0.72

Central Los Angeles ($PM_{2.5}$)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
09/25/09	90.07	209.13	343.31	595.93	96.24	196.18	629.86	29.46
09/28/09	185.07	135.72	244.29	1944.48	64.16	46.88	120.91	128.32
10/01/09	134.55	217.26	554.26	238.25	44.44	280.22	465.38	112.33
10/04/09	265.46	130.88	248.17	317.32	20.99	93.84	48.15	70.38
10/07/09	195.74	154.37	347.64	489.04	14.20	69.77	226.61	121.03
10/10/09	119.70	99.96	273.96	1051.42	14.81	44.43	119.70	78.98
10/13/09	93.76	74.02	188.75	189.99	0.51	48.11	44.41	55.52
10/16/09	124.67	97.51	293.77	286.36	9.87	90.10	466.57	120.96
10/19/09	166.56	96.24	208.51	908.08	0.63	41.95	60.46	146.82
10/22/09	113.46	69.06	159.10	361.36	17.27	109.76	377.39	127.03
10/25/09	124.73	71.63	60.51	1467.12	39.52	56.81	258.10	154.37
10/28/09	213.12	351.09	799.51	110.87	50.51	234.06	296.89	108.41
10/31/09	139.43	80.21	206.07	185.09	49.36	134.50	430.64	153.01
11/03/09	138.33	62.99	87.69	702.76	11.12	95.10	393.99	80.28
11/06/09	153.04	61.71	39.49	672.63	0.63	39.49	196.24	76.52
11/09/09	116.04	64.19	109.87	690.05	33.33	102.46	417.24	98.76
11/12/09	155.44	175.18	349.13	726.64	81.42	259.07	489.77	125.84
11/15/09	135.68	78.94	127.04	255.32	60.44	67.84	275.05	114.71
11/18/09	141.87	56.75	132.00	379.97	62.92	93.76	359.00	101.16
11/21/09	119.61	41.92	43.16	414.30	27.13	49.32	194.82	62.89
11/24/09	162.86	202.34	414.56	204.81	65.39	294.88	662.55	98.70
11/27/09	165.28	61.67	104.84	173.91	43.17	80.17	202.28	98.67
11/30/09	133.26	109.82	250.49	155.48	29.61	153.01	491.11	128.33
12/03/09	171.32	53.00	76.42	666.80	43.14	61.63	266.23	86.28
12/06/09	182.68	25.92	22.32	356.72	14.81	64.18	72.82	65.42
12/09/09	128.30	37.01	30.84	194.92	28.37	33.31	197.39	139.41
12/12/09	135.72	10.28	22.31	164.10	0.51	29.61	45.65	98.70
12/15/09	122.12	66.61	55.51	119.65	25.90	78.95	293.59	82.65
12/18/09	111.02	80.18	159.13	136.92	27.14	115.95	581.00	80.18
12/21/09	118.46	75.27	150.54	206.07	55.53	102.42	404.73	108.59
12/24/09	136.88	82.62	175.11	160.31	123.32	114.69	358.85	118.38
12/27/09	144.31	45.64	30.84	262.72	96.21	33.30	202.28	133.21
12/30/09	120.85	34.53	40.69	199.77	23.43	50.56	162.78	80.16
01/02/10	151.81	50.60	60.48	55.54	7.41	40.73	161.68	99.97
01/08/10	117.21	62.92	169.03	177.67	50.59	106.11	444.17	124.61
01/14/10	149.31	74.04	127.10	225.81	13.57	124.63	370.18	70.33
01/20/10								
01/26/10	138.20	40.72	51.83	128.33	4.94	45.66	207.30	104.88
02/01/10								
02/07/10	149.28	25.91	22.31	104.86	1.23	22.21	85.12	225.76
02/13/10	120.91	43.18	66.63	262.80	32.08	40.72	301.05	129.55
02/19/10								
02/25/10	100.02	20.15	27.02	222.45	9.37	35.61	184.97	125.07
03/03/10	136.25	26.00	12.02	193.41	0.00	30.80	114.66	96.27
03/09/10	146.07	24.19	30.88	201.16	0.00	24.04	54.41	33.45
03/15/10	160.18	91.43	158.71	169.60	13.11	91.95	325.67	91.44
03/21/10	144.76	127.90	247.29	523.79	55.93	111.50	262.40	103.61
03/27/10	157.94	176.48	386.45	206.11	35.97	170.51	288.87	92.78
04/02/10	132.48	51.63	83.69	294.92	9.62	94.51	248.54	100.20
04/08/10	139.98	90.96	217.22	198.53	21.43	97.65	247.51	139.75
04/14/10	138.93	44.91	105.97	470.62	17.62	61.88	176.19	90.42
04/20/10	151.84	38.89	80.97	397.32	1.92	62.98	87.29	71.67
04/26/10	116.93	49.17	78.65	1344.91	6.37	56.99	197.63	77.19
05/02/10	207.88	10.86	5.75	580.02	28.56	80.12	51.62	58.25
05/08/10	203.94	54.81	105.98	422.23	31.53	99.16	142.33	102.54
05/14/10	202.63	43.43	58.98	1316.21	22.58	82.95	109.02	84.62
05/20/10	172.13	24.88	64.50	712.64	24.86	91.04	123.87	52.69
05/26/10								
06/01/10	199.11	48.29	65.80	1106.87	24.01	77.81	92.23	80.23

Rubidoux ($PM_{2.5}$)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
04/01/09	101.59	193.27	344.41	646.71	38.41	131.32	152.38	0.72
04/04/09	131.31	298.54	554.97	718.49	83.00	169.71	195.73	0.72
04/07/09	50.73	268.48	379.83	549.33	30.93	169.50	188.06	0.72
04/10/09	29.73	159.80	122.64	874.57	3.72	35.92	60.70	0.72
04/13/09	90.27	218.88	270.82	677.66	23.50	143.45	202.80	19.79
04/16/09	128.85	214.33	194.51	317.16	23.54	94.16	109.02	0.72
04/19/09	60.69	213.03	330.68	526.37	29.72	117.66	182.06	0.72
04/22/09	72.95	220.09	270.79	1041.11	29.68	118.70	138.49	0.72
04/25/09	120.07	168.35	84.18	497.63	13.62	39.61	48.28	0.72
04/28/09	152.42	146.22	178.44	1327.14	28.50	71.87	64.44	0.72
05/01/09	91.57	257.40	309.37	1158.30	39.60	99.00	158.40	0.72
05/04/09								
05/07/09	100.08	307.04	457.17	615.32	244.65	177.92	244.65	0.72
05/10/09	150.80	237.33	270.70	1582.20	90.23	85.29	110.01	0.72
05/13/09	80.45	200.52	325.53	1821.97	35.89	95.31	148.53	0.62
05/16/09	125.03	216.63	311.95	1577.06	61.89	132.45	167.11	0.62
05/19/09								
05/22/09	146.05	269.83	367.61	1385.04	47.03	153.48	147.29	0.62
05/25/09	81.80	200.78	214.42	1342.28	18.59	64.45	76.84	0.62
05/28/09	61.81	216.34	210.16	2157.21	2.47	58.10	108.79	0.62
05/31/09	16.09	193.09	105.21	1278.60	0.52	17.33	87.88	0.62
06/03/09	36.04	196.33	144.14	996.58	0.52	64.62	121.78	0.62
06/06/09	19.83	173.52	63.21	401.57	0.52	6.20	37.18	0.62
06/09/09	25.96	180.51	92.73	935.92	0.52	29.67	59.34	0.62
06/12/09	33.39	150.87	107.58	863.15	0.52	32.15	160.76	0.62
06/15/09	37.08	190.34	123.60	868.88	14.83	49.44	63.03	0.62
06/18/09	37.14	153.51	17.33	1316.00	30.95	92.85	108.94	34.66
06/21/09	76.68	133.57	16.49	816.24	9.89	61.84	39.58	44.52
06/24/09	107.64	145.99	16.50	1276.83	45.78	97.74	92.79	12.37
06/27/09	163.23	347.49	273.29	1613.77	89.04	213.93	236.19	48.23
06/30/09	143.45	260.92	145.92	1346.66	50.70	169.41	199.09	29.68
07/03/09	163.20	270.76	34.62	1269.73	259.63	96.44	95.20	116.22
07/06/09	89.22	232.96	16.52	1083.02	162.33	97.89	127.63	87.98
07/09/09	80.51	199.42	76.80	795.21	34.68	125.10	137.49	71.84
07/12/09	95.25	202.87	132.36	535.61	56.90	145.96	168.23	89.06
07/15/09	132.54	196.94	26.01	1076.38	45.83	144.92	174.65	75.56
07/18/09	66.82	226.44	101.46	1097.55	47.02	103.94	147.25	103.94
07/21/09	56.95	212.96	139.91	881.55	40.86	160.96	157.24	136.19
07/24/09	75.51	222.82	22.38	1400.04	37.14	85.41	123.79	48.28
07/27/09	44.57	177.05	22.39	1041.27	64.38	90.38	115.15	28.48
07/30/09	14.43	179.38	22.37	993.40	0.52	47.01	111.34	79.18
08/02/09	29.73	141.23	22.40	1005.99	21.06	45.84	91.68	39.64
08/05/09	44.58	231.58	152.32	183.28	28.48	206.81	196.90	82.97
08/08/09	38.31	127.28	22.35	556.07	17.30	1005.87	87.74	50.66
08/11/09	28.47	110.16	178.24	1147.40	48.27	66.84	99.02	0.72
08/14/09	32.15	139.71	194.11	1352.57	39.56	77.89	79.13	0.72
08/17/09	69.29	123.74	197.98	1593.73	163.33	75.48	136.11	0.72
08/20/09	47.00	138.53	253.56	1453.31	63.08	102.66	139.15	0.72
08/23/09	37.07	130.97	156.92	1654.45	56.84	79.08	77.84	45.72
08/26/09	174.47	233.86	381.11	368.74	76.72	264.80	259.85	51.97
08/29/09	51.95	10.31	174.42	493.56	115.04	207.81	189.26	0.62
09/01/09	110.16	92.83	267.35	769.88	188.14	198.04	174.52	27.23
09/04/09	45.84	58.23	216.83	639.34	85.49	231.70	201.96	0.62
09/07/09	48.21	124.86	165.65	624.29	18.54	76.65	45.74	60.57
09/10/09	69.29	136.11	369.97	862.45	54.44	193.03	178.18	43.31
09/13/09	61.97	66.93	95.43	1453.83	24.79	43.38	40.90	35.94
09/16/09	127.28	114.92	129.75	483.16	8.65	101.33	123.57	82.79
09/19/09	122.27	130.92	154.38	1158.50	23.47	96.34	117.33	140.80
09/22/09	105.05	289.19	603.40	672.30	42.02	266.94	310.20	15.29

Rubidoux ($PM_{2.5}$)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
09/25/09	179.44	236.98	553.16	470.25	69.30	315.56	356.40	112.61
09/28/09	148.36	136.00	150.83	1545.44	17.31	102.62	112.51	80.36
10/01/09	174.59	251.37	595.60	142.40	24.77	231.56	188.22	79.25
10/04/09	263.72	122.58	236.48	423.44	26.00	82.96	38.38	94.10
10/07/09	169.57	128.73	290.87	563.18	14.85	54.46	68.08	84.17
10/10/09	106.48	130.00	294.68	1245.56	34.67	64.38	128.77	164.67
10/13/09	116.22	82.84	202.76	166.91	0.52	50.69	27.20	126.11
10/16/09	187.94	327.67	798.76	225.04	77.90	453.79	466.15	89.03
10/19/09	105.13	10.31	21.03	462.59	0.63	24.74	37.11	117.50
10/22/09	170.77	253.69	597.71	162.11	71.77	399.71	330.41	60.64
10/25/09								
10/28/09	246.31	500.05	1193.19	91.59	107.68	398.56	401.03	101.50
10/31/09	237.62	481.44	1163.37	159.65	157.18	629.95	599.01	138.61
11/03/09	310.39	835.94	2011.95	285.66	254.74	1316.98	964.55	155.81
11/06/09	118.67	30.90	46.97	896.17	4.94	53.15	98.89	40.79
11/09/09	148.45	115.05	247.42	603.71	39.59	183.09	306.80	94.02
11/12/09	143.45	104.49	215.79	439.61	34.62	185.49	244.85	85.94
11/15/09	121.36	113.93	157.28	245.20	44.58	82.97	137.46	64.40
11/18/09								
11/21/09	128.79	64.40	73.07	558.51	66.87	49.54	235.29	76.78
11/24/09	194.15	148.39	304.20	86.56	7.42	150.87	143.45	60.59
11/27/09	174.61	82.97	141.18	251.39	78.02	107.74	158.51	37.15
11/30/09	132.48	68.10	125.05	115.15	6.19	66.86	87.91	42.10
12/03/09	146.13	49.54	91.64	724.46	47.06	81.73	189.47	65.63
12/06/09	164.74	22.30	22.40	453.34	58.22	47.07	48.31	44.59
12/09/09	111.48	35.92	85.47	284.89	84.23	73.08	178.36	126.34
12/12/09	138.67	10.32	22.39	120.10	35.91	26.00	64.38	48.29
12/15/09	129.99	40.85	97.80	96.56	18.57	89.14	164.65	68.09
12/18/09	114.96	69.22	121.14	67.99	2.47	87.76	126.08	92.71
12/21/09	141.06	97.75	205.40	153.43	55.68	152.20	300.68	86.62
12/24/09	127.69	50.83	76.86	90.50	106.61	58.26	154.96	171.07
12/27/09	118.91	38.40	60.69	115.19	106.52	39.64	121.39	84.23
12/30/09	133.83	59.48	76.83	234.20	69.39	75.59	200.74	55.76
01/02/10	208.88	454.84	1003.60	102.59	101.35	355.96	451.13	61.80
01/08/10	152.20	121.26	248.71	75.48	24.75	210.35	217.78	129.92
01/14/10	126.33	63.16	94.13	121.37	12.39	54.49	71.83	87.93
01/20/10								
01/26/10	131.43	43.40	68.20	192.19	19.84	80.60	215.75	94.23
02/01/10	110.25	60.70	66.89	447.20	34.69	80.52	199.44	146.18
02/07/10	146.21	42.13	22.41	174.70	0.52	18.59	34.69	83.01
02/13/10	176.32	558.05	757.02	218.38	65.97	253.55	416.99	64.90
02/19/10	131.28	10.32	71.83	805.66	3.72	33.44	60.69	71.83
02/25/10	123.77	18.07	37.45	239.93	5.12	84.94	109.83	55.40
03/03/10	151.31	51.24	31.67	230.61	0.00	54.29	62.76	44.63
03/09/10	144.48	27.80	39.93	240.33	0.00	34.42	46.85	53.40
03/15/10	127.36	62.98	118.48	182.51	0.00	55.82	89.18	103.40
03/21/10	140.11	154.29	352.44	343.57	64.30	144.34	196.42	114.85
03/27/10	172.92	244.19	647.78	221.17	51.37	285.57	197.91	126.48
04/02/10	113.75	34.25	74.31	238.05	17.76	73.26	96.10	37.10
04/08/10	165.08	135.11	265.41	149.32	20.60	133.48	175.50	76.61
04/14/10	140.85	68.58	102.45	436.73	10.34	67.00	123.72	51.01
04/20/10	153.25	84.45	157.23	483.11	25.95	100.23	112.93	69.96
04/26/10	148.34	83.63	159.36	1238.95	25.69	80.85	136.49	82.12
05/02/10	195.80	36.62	37.93	471.54	19.53	73.37	40.98	37.70
05/08/10	150.26	76.64	179.66	577.54	47.80	120.02	136.72	53.44
05/14/10	245.83	94.00	126.15	915.20	45.94	106.57	120.53	67.69
05/20/10	130.10	58.68	91.35	655.21	8.21	79.01	101.29	70.37
05/26/10	137.48	61.20	97.57	332.92	1.18	72.87	69.67	70.53
06/01/10	171.54	40.61	76.94	849.32	43.10	87.03	64.86	66.77

Resurrection School ($PM_{2.5}$)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
04/01/09	168.35	243.86	306.99	927.17	33.42	107.70	184.44	0.62
04/07/09	90.44	231.67	284.95	867.23	32.21	80.53	142.47	0.62
04/13/09	65.60	183.19	177.00	862.71	27.23	65.60	219.08	0.62
04/19/09	54.43	175.65	267.19	599.94	33.40	85.35	215.24	0.62
04/25/09	138.71	188.25	153.58	635.36	23.53	75.55	66.88	0.62
05/01/09	87.86	168.30	210.37	1165.72	38.36	102.71	190.57	0.62
05/07/09	129.94	217.80	258.64	613.80	176.96	102.71	200.47	0.62
05/13/09	162.01	281.97	238.69	1628.77	40.81	103.89	138.51	0.62
05/19/09	37.16	177.13	214.29	1295.62	7.43	70.60	133.77	0.62
05/25/09	85.40	184.42	142.34	1432.08	6.19	51.99	51.99	0.62
05/31/09	42.07	165.82	81.67	1591.42	0.52	7.42	44.55	0.62
06/06/09	28.49	137.52	96.63	317.16	0.52	18.58	69.38	0.62
06/12/09	43.89	117.45	103.85	922.93	9.27	35.24	87.78	0.62
06/18/09	39.58	137.31	22.37	1609.32	6.18	53.19	91.54	105.14
06/24/09	141.06	138.59	22.38	1491.03	25.98	86.62	75.48	79.19
06/30/09	168.39	217.91	22.39	1607.10	17.33	89.15	107.72	28.48
07/06/09	71.72	150.87	32.15	1141.38	137.26	75.43	129.84	110.06
07/12/09	132.30	144.67	22.36	829.68	53.17	89.03	124.88	0.62
07/18/09	49.44	150.80	22.35	940.67	13.60	61.80	95.18	17.31
07/24/09	87.90	158.46	22.39	1428.66	2.48	71.80	107.71	64.38
07/30/09	25.98	137.31	22.37	1009.38	0.52	45.77	66.80	71.75
08/05/09	65.40	118.46	22.31	276.40	23.44	111.05	191.26	39.49
08/11/09	47.02	214.04	22.37	1577.48	1.24	48.25	86.61	40.83
08/17/09	63.08	140.38	162.03	2322.82	83.49	54.42	92.15	0.62
08/23/09	45.87	99.17	107.85	1658.68	30.99	45.87	57.02	0.62
08/29/09	76.72	142.31	210.37	839.02	123.75	141.07	268.54	24.75
09/04/09	85.38	10.31	22.38	809.24	69.29	92.80	126.21	0.62
09/10/09	105.17	87.84	163.32	812.87	48.25	106.40	142.28	27.22
09/16/09	117.36	95.12	98.83	532.43	0.51	74.12	169.24	138.36
09/22/09	148.55	123.79	139.88	851.66	32.18	132.45	263.67	85.41
09/28/09	179.68	157.37	251.55	1930.61	63.20	47.09	107.81	89.22
09/28/09	179.68	157.37	251.55	1930.61	63.20	47.09	107.81	89.22
10/04/09								
10/10/09	137.36	117.56	266.06	1079.10	17.32	35.89	65.59	115.09
10/16/09								
10/22/09	115.08	58.16	108.89	350.18	24.75	86.62	277.17	126.21
10/28/09	186.75	395.75	910.23	131.09	58.13	290.63	361.13	101.41
11/03/09	116.41	92.88	148.61	596.90	27.24	126.32	402.48	128.79
11/09/09	175.72	183.15	146.02	912.03	40.84	106.42	373.72	149.74
11/15/09	110.21	86.68	117.63	299.66	64.39	73.06	203.08	94.11
11/21/09	97.78	34.66	38.37	439.40	33.42	44.56	181.95	85.40
11/27/09	143.61	49.52	69.95	196.84	30.95	68.09	154.13	88.52
12/03/09	116.54	42.15	63.23	752.56	30.99	75.63	204.57	52.07
12/09/09	145.10	62.01	32.24	229.43	17.36	47.13	152.54	102.94
12/15/09								
12/21/09	146.21	118.95	162.31	199.48	43.37	106.56	372.95	45.84
12/27/09	112.65	27.85	43.33	289.04	108.93	64.99	197.44	114.50
01/02/10	146.25	54.53	68.17	80.56	42.14	45.86	184.67	95.43
01/08/10	123.81	78.62	145.48	193.15	56.95	110.81	437.06	114.53
01/14/10	131.50	80.64	100.49	253.08	27.29	88.08	339.92	70.71
01/20/10	158.51	45.82	22.39	75.54	8.67	42.11	80.50	74.30
01/26/10	110.29	54.52	50.81	185.87	12.39	50.81	192.07	80.55
02/01/10	149.80	66.85	54.47	544.72	32.19	49.52	247.60	125.04
02/07/10								
02/13/10	130.02	39.62	71.82	236.51	42.10	50.77	289.75	61.91
02/19/10	123.94	74.36	112.79	949.39	9.92	58.25	109.07	137.57
02/25/10								
03/03/10	115.19	23.53	22.40	200.66	1.24	34.68	79.27	96.61
03/09/10	131.95	8.95	15.7	231.44		33.34	63.7	64.88

Resurrection School (PM$_{2.5}$)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
03/15/10								
03/21/10	135.62	110.39	241.13	1045.31	65.01	91.27	205.13	65.59
03/27/10	219.33	202.95	473.86	290.14	61.61	213.03	308.56	119.43
04/02/10	164.97	67.83	54.24	317.98	7.77	46.6	115.26	44.9
04/08/10	148.76	89.1	185.61	249.47	15.43	90.54	203.5	119.05
04/14/10	144.26	49.01	22.9	340.57		24.25	78.52	74.41
04/20/10	109.73	17.69	12.5	311.88		28.46	51.04	89.01
04/26/10	103.93	59.54	40.3	963.35		27.13	58.59	66.02
05/02/10	198.35	36.91	33.13	424.79	14.63	52.88	50.94	139.77
05/08/10	236.35	55.21	109.12	523.52	31.59	95.73	115.86	102.73
05/14/10	199.76	45.69	64.47	1243.44	27.94	81.63	102.02	34.15
05/20/10	122.14	21.72				10.55	3.68	167.35
05/26/10	120.79	50.39	62.37	636.52		40.42	61.27	84.54
06/01/10	170.51	35.73	45.71	1005.54	23.79	69.81	113.38	43.15

Resurrection School (TSP)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
4/1/2009	0.68	2.05	1.04	1.47	0.45	1.03	1.23	0.04
4/7/2009	0.41	0.86	0.46	0.36	0.18	0.50	0.64	ND
4/13/2009	0.79	1.74	0.91	0.82	0.41	1.20	1.74	0.09
4/19/2009	0.85	1.81	0.68	0.50	0.39	1.12	1.63	0.07
4/25/2009	0.56	1.61	0.83	0.74	0.37	0.75	0.86	0.03
5/1/2009	0.32	2.21	1.13	1.14	0.49	1.29	1.82	0.10
5/7/2009	1.28	2.50	1.36	0.68	0.70	1.46	1.97	0.11
5/13/2009	0.24	2.13	0.95	1.59	0.51	1.19	1.57	0.05
5/19/2009	0.36	0.87	0.38	0.74	0.18	0.56	0.66	0.03
5/25/2009	0.24	0.50	0.23	0.74	0.12	0.23	0.27	0.03
5/31/2009	0.41	0.93	0.51	1.67	0.17	0.42	0.60	0.04
6/6/2009	ND	0.28	0.15	0.18	0.07	0.17	0.25	ND
6/10/2009	0.17	0.28	0.15	0.20	0.06	0.18	0.21	ND
6/12/2009	0.31	0.48	0.19	0.33	0.11	0.28	0.37	ND
6/18/2009	ND	0.64	0.40	0.82	0.14	0.36	0.48	ND
6/24/2009	0.35	0.53	0.23	0.60	0.13	0.31	0.36	ND
6/30/2009	0.79	0.52	0.72	1.75	0.11	0.28	1.04	0.04
7/6/2009	0.68	0.57	0.85	1.10	0.16	0.34	2.12	0.04
7/12/2009	0.65	0.57	0.93	0.72	0.15	0.31	1.55	ND
7/18/2009	0.44	0.55	0.82	0.80	0.12	0.31	0.99	0.03
7/24/2009	0.30	1.64	2.30	1.32	0.39	1.05	1.29	0.06
7/30/2009	ND	0.47	0.69	0.83	0.09	0.26	1.62	0.03
8/5/2009	ND	0.45	0.71	0.35	0.09	0.27	1.01	0.03
8/11/2009	ND	0.51	0.77	1.01	0.09	0.30	1.32	0.03
8/17/2009	0.24	1.35	1.86	1.78	0.39	0.89	1.03	0.06
8/23/2009	0.24	0.99	1.43	1.16	0.26	0.56	0.72	0.03
8/29/2009	0.34	2.81	4.26	0.68	0.78	2.30	3.00	0.14

Resurrection School (TSP)								
Date	Mg (ng/m^3)	Al (ng/m^3)	Si (ng/m^3)	S (ng/m^3)	K (ng/m^3)	Ca (ng/m^3)	Fe (ng/m^3)	Ba (ng/m^3)
9/4/2009	0.35	2.39	3.56	0.78	0.64	1.89	2.17	0.11
9/10/2009	0.32	2.20	3.25	0.95	0.56	1.87	2.13	0.11
9/16/2009	0.31	1.83	2.77	0.63	0.47	1.51	1.80	0.09
9/22/2009	0.35	4.14	5.87	0.85	1.13	4.58	4.36	0.19
9/28/2009	0.25	1.76	2.52	1.41	0.47	1.30	1.58	0.07
10/4/2009	0.45	2.37	3.21	0.82	0.57	1.30	1.43	0.04
10/10/2009	0.30	1.73	2.45	1.05	0.40	0.97	1.27	0.04
10/16/2009								
10/22/2009	0.27	2.14	3.26	0.45	0.52	1.56	2.41	0.15
10/28/2009	0.44	3.82	5.51	0.21	0.74	1.59	2.05	0.06
11/3/2009								
11/9/2009	0.27	2.43	3.68	0.67	0.58	1.86	3.06	0.15
11/15/2009	0.29	2.27	3.30	0.42	0.58	1.45	2.18	0.12
11/21/2009	0.23	1.13	1.68	0.43	0.30	0.76	1.28	0.07
11/27/2009	0.33	2.01	2.83	0.40	0.49	1.28	1.72	0.09
12/3/2009	0.24	1.75	2.65	0.62	0.44	1.34	1.98	0.09
12/9/2009	0.22	0.79	1.71	0.32	0.31	0.89	1.40	0.08
12/15/2009								
12/21/2009	0.40	1.35	2.99	0.33	0.48	1.46	2.50	0.17
12/27/2009	0.21	0.79	1.65	0.32	0.35	0.77	1.38	0.09
1/2/2010								
1/8/2010	0.44	1.50	3.27	0.32	0.56	1.77	2.92	0.17
1/14/2010	0.60	2.29	4.23	0.33	0.67	1.99	3.44	0.18
1/20/2010	0.05	0.09	0.23	0.20	0.12	0.22	0.36	0.02
1/26/2010	0.17	0.64	1.39	0.21	0.24	0.69	1.24	0.08
2/1/2010	0.23	0.85	1.92	0.54	0.34	0.99	1.64	0.10
2/7/2010								
2/13/2010	0.19	0.72	1.63	0.33	0.33	0.84	1.65	0.11
2/19/2010	0.20	0.66	1.52	0.58	0.26	0.77	0.90	0.08
2/25/2010	0.19	0.61	1.35	0.25	0.26	0.69	1.18	0.06
3/3/2010	0.09	0.27	0.65	0.26	0.13	0.40	0.58	0.03
3/9/2010	0.14	0.45	1.04	0.32	0.18	0.46	0.61	0.03
3/15/2010	0.34	1.22	2.54	0.26	0.39	1.34	1.76	0.11
3/21/2010	0.32	1.20	2.75	0.76	0.45	1.38	1.79	0.10
3/27/2010	0.57	2.10	4.33	0.42	0.69	2.07	2.49	0.11

APPENDIX C: VOC AND CARBONYL DATA

	Central Los Angeles								
Date	Methylene Chloride (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	m+p-xylenes (ppb)	o-xylene (ppb)	1,3-butadiene (ppb)	2-propenal (ppb)	2-butanone (ppb)
4/1/2009	0.41	0.32	0.85	0.12	0.46	0.16	0.05	0.13	0.45
4/7/2009	0.21	0.31	0.84	0.13	0.5	0.17	0.06	0.1	0.28
4/13/2009	0.24	0.54	1.47	0.2	0.73	0.26	0.07	0.17	0.54
4/19/2009	0.22	0.44	1.38	0.22	0.82	0.26	0.08	0.18	0.45
4/25/2009	0.16	0.18	0.38	0.06	0.22	0.08	0.02	0.07	0.19
5/1/2009	0.3	0.48	1.36	0.22	0.74	0.26	0.07	0.27	0.54
5/7/2009	0.59	0.53	1.3	0.2	0.73	0.25	0.08	0.23	0.55
5/13/2009	0.35	0.31	0.84	0.14	0.47	0.17	0.04	0.12	0.41
5/19/2009	0.15	0.29	0.78	0.13	0.47	0.16	0.06	0.13	0.28
5/25/2009	0.08	0.13	0.27	0.05	0.16	0.06	0.02	0.07	0.2
5/31/2009	0.13	0.2	0.45	0.06	0.2	0.07	0.02	0.12	0.37
6/6/2009	0.11	0.16	0.56	0.1	0.34	0.11	0.03	0.12	0.31
6/12/2009	0.33	0.2	0.61	0.1	0.37	0.12	0.04	0.1	0.33
6/18/2009	0.38	0.28	0.9	0.14	0.5	0.16	0.04	0.13	0.43
6/24/2009	0.74	0.18	0.57	0.11	0.4	0.12	0.04	0.1	0.39
6/30/2009	0.17	0.27	0.86	0.14	0.6	0.18	0.06	0.12	0.15
7/6/2009	0.2	0.32	0.95	0.15	0.57	0.17	0.07	0.17	0.39
7/12/2009	0.17	0.38	1.1	0.17	0.64	0.19	0.06	0.18	0.46
7/18/2009	0.16	0.32	0.94	0.14	0.48	0.16	0.04	0.17	0.43
7/24/2009	0.36	0.3	0.86	0.13	0.48	0.17	0.04	0.16	0.73
7/30/2009	2.46	0.2	0.54	0.08	0.28	0.1	0.02	0.13	0.48
8/5/2009	0.52	0.42	1.36	0.19	0.71	0.26	0.06	0.35	0.82
8/11/2009	0.34	0.29	0.72	0.11	0.39	0.14	0.04	0.14	0.51
8/17/2009	0.15	0.32	0.77	0.11	0.38	0.13	0.04	0.15	0.55
8/23/2009	0.12	0.27	0.51	0.09	0.26	0.08	0.02	0.27	0.52
8/29/2009	0.76	1.06	2.82	0.4	1.59	0.58	0.19	0.65	1.26
9/4/2009	0.29	0.46	1.39	0.2	0.71	0.23	0.07	0.27	0.84
9/10/2009	0.35	0.53	1.39	0.2	0.71	0.24	0.06	0.23	0.65
9/16/2009	0.27	0.46	1.26	0.18	0.57	0.22	0.04	0.22	0.77
9/16/2009	0.33	0.5	1.43	0.22	0.69	0.25	0.05	0.29	0.75
9/22/2009	0.52	0.75	2.24	0.32	1.18	0.42	0.15	0.36	0.72
9/28/2009	0.25	0.36	1.03	0.14	0.51	0.16	0.06	0.18	0.74
10/4/2009	0.09	0.11	0.27	0.04	0.13	0.04	0.02	0.15	0.19

Date	Central Los Angeles Methylene Chloride (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	m+p-xylenes (ppb)	o-xylene (ppb)	1,3-butadiene (ppb)	2-propenal (ppb)	2-butanone (ppb)
10/10/2009	0.14	0.25	0.67	0.1	0.33	0.12	0.03	0.14	0.43
10/16/2009	0.43	0.8	2.63	0.36	1.37	0.47	0.16	0.34	0.72
10/22/2009	0.76	0.75	2.56	0.35	1.29	0.44	0.16	0.33	0.84
10/28/2009	0.4	0.1	0.18	0.02	0.08	0.03	0.01	0.04	0.2
11/3/2009	0.61	0.93	3.14	0.41	1.5	0.52	0.18	0.37	1.22
11/9/2009	0.39	0.85	2.43	0.34	1.27	0.42	0.19	0.4	0.79
11/15/2009	0.23	0.57	1.37	0.2	0.76	0.25	0.12	0.24	0.47
11/21/2009	0.68	0.6	1.69	0.23	0.94	0.31	0.16	0.23	0.46
11/27/2009	0.25	0.48	1.4	0.21	0.82	0.26	0.13	0.21	0.42
12/3/2009	0.34	0.6	1.64	0.23	0.79	0.27	0.1	0.23	0.61
12/9/2009	0.29	0.5	1.25	0.18	0.63	0.21	0.08	0.18	0.44
12/15/2009	0.33	0.6	1.72	0.26	1.06	0.42	0.15	0.18	0.47
12/21/2009	1.34	0.82	2.52	0.36	1.3	0.43	0.2	0.34	0.72
12/27/2009	0.23	0.68	1.57	0.23	0.88	0.3	0.18	0.25	0.45
1/2/2010	0.17	0.41	1.08	0.15	0.59	0.19	0.1	0.14	0.3
1/8/2010	0.62	0.91	3.02	0.42	1.62	0.51	0.24	0.31	0.78
1/14/2010	0.35	0.68	2.06	0.28	1.2	0.35	0.17	0.2	0.51
1/20/2010	0.34	0.33	0.65	0.1	0.38	0.12	0.07	0.07	0.23
1/26/2010	0.45	0.54	1.6	0.22	0.83	0.26	0.13	0.16	0.41
2/1/2010	0.44	0.74	1.76	0.26	0.88	0.29	0.11	0.2	0.66
2/7/2010	0.13	0.31	0.66	0.1	0.38	0.12	0.06	0.11	0.2
2/13/2010	2.57	0.77	2.08	0.29	1.13	0.36	0.2	0.18	0.47
2/19/2010	0.51	0.21	0.5	0.06	0.25	0.08	0.03	0.09	0.32
2/25/2010	0.41	0.54	1.26	0.19	0.65	0.21	0.1	0.3	0.51
3/3/2010	0.18	0.29	0.62	0.1	0.38	0.12	0.09	0.17	0.22
3/9/2010	0.14	0.18	0.28	0.03	0.13	0.04	0.02	0.07	0.18
3/15/2010	0.58	0.59	1.65	0.33	1.2	0.32	0.13	0.21	0.77
3/21/2010	0.56	0.7	1.79	0.26	0.94	0.32	0.09	0.3	1.07
4/14/2010	0.28	0.34	0.91	0.12	0.46	0.16	0.05	0.17	0.47
4/26/2010	0.17	0.31	0.65	0.09	0.26	0.1	0.02	0.13	0.64
5/2/2010	0.17	0.14	0.29	0.05	0.17	0.06	0.02	0.11	0.31
5/8/2010	0.53	0.28	0.71	0.09	0.27	0.1	0.02	0.11	0.58
5/14/2010	1.22	0.25	0.65	0.09	0.29	0.12	0.03	0.11	0.54

Date	Rubidoux Methylene Chloride (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	m+p-xylenes (ppb)	o-xylene (ppb)	1,3-butadiene (ppb)	2-propenal (ppb)	2-butanone (ppb)
4/1/2009	0.24	0.38	1.14	0.14	0.51	0.19	0.04	0.13	0.63
4/7/2009	0.15	0.31	1.01	0.12	0.5	0.18	0.06	0.11	0.36
4/13/2009	0.6	0.37	1.29	0.15	0.54	0.21	0.04	0.14	0.64
4/19/2009	0.14	0.33	1.15	0.14	0.56	0.21	0.05	0.14	0.49
4/25/2009	0.49	0.15	0.38	0.05	0.18	0.07	0.02	0.05	0.32
5/1/2009	0.83	0.34	1.13	0.15	0.49	0.19	0.03	0.21	0.72
5/7/2009	0.61	0.36	1.29	0.15	0.55	0.2	0.04	0.19	0.82
5/13/2009	0.2	0.21	0.59	0.07	0.2	0.08	0.01	0.14	0.57
5/19/2009	0.2	0.31	1.12	0.14	0.48	0.18	0.04	0.18	0.58
5/25/2009	0.12	0.11	0.25	0.04	0.12	0.05	0.01	0.06	0.24
5/31/2009	0.17	0.19	0.44	0.06	0.15	0.07	0.01	0.1	0.47
6/6/2009	0.11	0.1	0.27	0.04	0.13	0.05	0.01	0.13	0.29
6/12/2009	0.95	0.08	0.24	0.03	0.09	0.04	0	0.07	0.2
6/18/2009	0.18	0.18	0.6	0.08	0.24	0.09	0.02	0.1	0.43
6/24/2009	0.24	0.14	0.44	0.06	0.19	0.07	0.02	0.08	0.35
6/30/2009	1.19	0.3	1.09	0.12	0.46	0.17	0.04	0.13	0.98
7/6/2009	0.22	0.24	0.85	0.1	0.35	0.12	0.02	0.11	0.62
7/12/2009	0.12	0.25	0.94	0.12	0.44	0.14	0.03	0.1	0.53
7/18/2009	0.37	0.28	1	0.14	0.44	0.15	0.02	0.13	0.63
7/24/2009	0.75	0.16	0.49	0.06	0.19	0.08	0.02	0.16	0.68
7/30/2009	1.76	0.13	0.41	0.05	0.17	0.07	0.01	0.11	0.58
8/5/2009	2.15	0.29	1.22	0.15	0.5	0.19	0.03	0.21	0.83
8/11/2009	0.21	0.24	0.69	0.08	0.26	0.1	0.02	0.19	0.97
8/17/2009	0.76	0.27	0.68	0.08	0.25	0.09	0.02	0.13	0.73
8/23/2009	0.63	0.18	0.54	0.07	0.23	0.09	0.02	0.12	0.61
8/29/2009	0.15	0.49	1.89	0.24	0.9	0.34	0.07	0.25	1.21
9/4/2009	0.3	0.43	1.91	0.21	0.84	0.29	0.07	0.19	0.88
9/10/2009	0.23	0.41	1.45	0.17	0.59	0.22	0.04	0.24	0.95
9/16/2009	0.2	0.3	1.11	0.13	0.41	0.14	0.02	0.19	0.84
9/16/2009	0.28	0.32	1.15	0.14	0.47	0.17	0.04	0.26	0.8
9/22/2009	0.15	0.36	1.41	0.18	0.69	0.24	0.07	0.18	0.82
9/28/2009	0.14	0.27	0.85	0.1	0.36	0.12	0.04	0.13	0.71
10/4/2009	0.05	0.08	0.2	0.03	0.09	0.03	0.01	0.06	0.2
10/10/2009	0.22	0.29	0.91	0.11	0.4	0.14	0.04	0.18	0.65

Date	Rubidoux Methylene Chloride (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	m+p-xylenes (ppb)	o-xylene (ppb)	1,3-butadiene (ppb)	2-propenal (ppb)	2-butanone (ppb)
10/16/2009	0.19	0.51	1.87	0.24	0.87	0.3	0.08	0.29	0.98
10/22/2009	0.26	0.51	2	0.25	1	0.33	0.13	0.24	0.79
10/28/2009	0.04	0.08	0.12	0.02	0.08	0.03	0.01	0	0.11
11/3/2009	0.34	0.74	2.67	0.34	1.25	0.43	0.15	0.35	1.21
11/9/2009	0.26	0.65	2.18	0.27	0.97	0.35	0.12	0.27	1.04
11/15/2009	0.2	0.32	0.75	0.1	0.3	0.11	0.02	0.12	0.46
11/21/2009	0.48	0.44	1.21	0.15	0.54	0.21	0.08	0.23	0.74
11/27/2009	0.56	0.36	1	0.13	0.5	0.17	0.07	0.18	0.52
12/3/2009	0.28	0.46	1.16	0.15	0.54	0.18	0.08	0.22	0.74
12/9/2009	0.31	0.53	1.46	0.19	0.73	0.24	0.13	0.21	0.56
12/15/2009	0.54	0.4	1.21	0.15	0.6	0.2	0.1	0.15	0.62
12/21/2009	0.23	0.68	2.24	0.3	1.21	0.4	0.19	0.26	0.75
12/27/2009	0.1	0.61	1.56	0.22	0.86	0.29	0.18	0.24	0.47
1/2/2010	0.06	0.17	0.34	0.05	0.19	0.06	0.02	0.06	0.22
1/8/2010	0.17	0.42	1.36	0.18	0.72	0.22	0.11	0.14	0.55
1/14/2010	0.08	0.23	0.68	0.08	0.25	0.09	0.02	0.04	0.39
1/20/2010	0.06	0.2	0.35	0.04	0.16	0.05	0.03	0.03	0.24
1/26/2010	0.36	0.61	1.88	0.25	0.92	0.3	0.14	0.14	0.6
2/1/2010	0.54	0.58	1.63	0.22	0.74	0.25	0.08	0.15	0.78
2/13/2010	0.35	0.45	1.28	0.2	0.74	0.24	0.11	0.1	0.42
2/13/2010	0.78	0.44	1.31	0.22	0.77	0.24	0.11	0.1	0.44
2/19/2010	0.59	0.18	0.34	0.05	0.15	0.06	0.01	0.1	0.37
3/3/2010	1.44	0.22	0.51	0.07	0.26	0.09	0.02	0.14	0.43
3/9/2010	1.28	0.19	0.37	0.05	0.17	0.06	0.02	0.06	0.23
3/15/2010	0.27	0.16	0.38	0.05	0.21	0.07	0.02	0.06	0.41
3/21/2010	0.43	0.41	1.08	0.15	0.5	0.19	0.04	0.22	0.85
3/27/2010	0.08	0.18	0.3	0.05	0.13	0.05	0.01	0	0.32
4/2/2010	7.71	0.29	0.64	0.12	0.27	0.11	0.02	0.15	0.72
4/8/2010	4.94	0.12	0.21	0.04	0.09	0.04	0	0.09	0.43
4/14/2010	1.08	0.33	0.83	0.13	0.42	0.15	0.04	0.2	0.58
5/2/2010	8.27	0.13	0.32	0.06	0.16	0.07	0.02	0.08	0.42
5/8/2010	6.2	0.26	0.8	0.12	0.34	0.14	0.02	0.16	0.74
5/14/2010	6.45	0.2	0.62	0.1	0.27	0.1	0.02	0.13	0.61
5/20/2010	4.11	0.22	0.79	0.12	0.36	0.13	0.03	0.13	0.62

Date	Resurrection School								
	Methylene Chloride (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	m+p-xylenes (ppb)	o-xylene (ppb)	1,3-butadiene (ppb)	2-propenal (ppb)	2-butanone (ppb)
4/1/2009	0.17	0.35	1.01	0.14	0.57	0.21	0.07	0.15	0.48
4/7/2009	0.27	0.34	1.29	0.16	0.64	0.22	0.09	0.12	0.44
4/13/2009	0.33	0.65	2.19	0.28	1.12	0.40	0.13	0.21	0.96
4/25/2009	0.19	0.22	0.69	0.09	0.38	0.13	0.04	0.07	0.35
5/1/2009	0.31	0.55	1.70	0.21	0.83	0.30	0.10	0.19	0.68
5/7/2009	0.32	0.47	1.61	0.21	0.77	0.28	0.07	0.24	0.97
5/13/2009	0.16	0.32	0.84	0.11	0.37	0.14	0.02	0.15	0.60
5/19/2009	0.26	0.26	0.77	0.10	0.30	0.12	0.02	0.16	0.65
5/25/2009	0.08	0.16	0.44	0.07	0.24	0.09	0.02	0.09	0.35
6/30/2009	0.28	0.30	1.19	0.19	0.75	0.24	0.07	0.71	1.25
7/6/2009	0.26	0.32	1.10	0.16	0.57	0.18	0.06	0.62	1.14
7/12/2009	0.21	0.40	1.33	0.19	0.69	0.22	0.06	0.66	1.16
7/18/2009	0.24	0.35	1.16	0.16	0.56	0.18	0.05	0.57	1.21
7/24/2009	0.35	0.30	0.96	0.13	0.43	0.17	0.03	0.34	1.49
8/11/2009	0.30	0.31	0.97	0.13	0.51	0.21	0.04	0.25	1.25
8/17/2009	0.20	0.38	0.88	0.12	0.37	0.14	0.03	0.00	1.23
8/23/2009	0.15	0.24	0.62	0.09	0.31	0.13	0.04	0.19	0.82
8/29/2009	0.81	0.93	3.38	0.45	1.74	0.67	0.20	0.22	1.94
9/10/2009	0.54	0.58	1.87	0.25	0.92	0.33	0.09	0.40	1.52
9/16/2009	0.33	0.48	1.55	0.22	0.84	0.29	0.10	0.20	0.93
9/22/2009	1.24	0.76	2.53	0.35	1.33	0.46	0.17	0.35	1.16
9/28/2009	0.19	0.42	1.26	0.17	0.60	0.21	0.07	0.24	1.04
10/4/2009	0.07	0.17	0.43	0.06	0.24	0.08	0.04	0.14	0.41
10/10/2009	0.14	0.22	0.64	0.10	0.32	0.11	0.03	0.27	0.67
10/16/2009	0.49	0.77	2.57	0.33	1.40	0.47	0.17	0.49	1.16
10/22/2009	0.42	0.87	3.11	0.49	2.02	0.66	0.21	0.33	1.05
10/28/2009	0.05	0.15	0.31	0.06	0.25	0.08	0.04	0.04	0.19
11/3/2009	0.70	1.18	3.98	0.55	2.06	0.71	0.21	0.45	2.07
11/9/2009	0.71	1.21	3.58	0.52	2.03	0.69	0.32	0.44	1.09
11/15/2009	0.17	0.74	2.00	0.28	1.10	0.38	0.20	0.24	0.62
11/21/2009	0.24	0.74	2.00	0.30	1.11	0.38	0.16	0.29	0.64
11/27/2009	0.19	0.64	1.94	0.29	1.18	0.38	0.17	0.21	0.51
12/3/2009	0.33	0.73	2.05	0.33	1.19	0.38	0.15	0.35	0.68

Date	Resurrection School								
	Methylene Chloride (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	m+p-xylenes (ppb)	o-xylene (ppb)	1,3-butadiene (ppb)	2-propenal (ppb)	2-butanone (ppb)
12/9/2009	0.29	0.63	1.70	0.25	0.99	0.32	0.13	0.20	0.54
12/15/2009	0.31	0.64	1.87	0.28	1.13	0.37	0.16	0.18	0.47
12/21/2009	0.41	1.03	3.28	0.51	2.09	0.66	0.28	0.33	0.79
12/27/2009	0.18	0.85	2.00	0.30	1.16	0.39	0.22	0.31	0.55
1/2/2010	0.21	0.66	1.94	0.28	1.09	0.35	0.15	0.22	0.54
1/8/2010	0.54	1.22	4.13	0.59	2.37	0.76	0.34	0.39	0.91
1/14/2010	0.69	1.04	3.5	0.49	1.99	0.62	0.3	0.29	1.05
1/20/2010	0.16	0.45	1.16	0.17	0.67	0.21	0.12	0.12	0.23
1/26/2010	0.26	0.7	2	0.3	1.17	0.37	0.16	0.16	0.47
2/1/2010	0.28	0.84	2.21	0.34	1.23	0.4	0.16	0.24	0.76
2/7/2010	0.18	0.56	1.42	0.22	0.87	0.27	0.16	0	0.28
2/13/2010	0.46	0.94	2.71	0.39	1.43	0.47	0.19	0.26	1.77
2/19/2010	0.23	0.33	1.01	0.13	0.5	0.16	0.06	0.13	0.83
2/25/2010	0.51	0.53	1.54	0.24	0.86	0.27	0.12	0.26	0.89
3/3/2010	0.36	0.36	0.78	0.12	0.47	0.15	0.07	0.21	0.52
3/9/2010	0.1	0.21	0.33	0.05	0.19	0.06	0.02	0.06	0.23
3/15/2010	0.31	0.74	2.23	0.34	1.34	0.42	0.21	0.27	0.86
3/21/2010	0.51	0.77	2.36	0.34	1.17	0.4	0.14	0.31	1.7
3/27/2010	0.13	0.38	0.79	0.1	0.28	0.07	0.07	0.12	0.45
4/2/2010	0.22	0.38	0.9	0.13	0.44	0.16	0.05	0.22	0.59
4/8/2010	0.28	0.41	1.26	0.17	0.62	0.21	0.07	0.3	0.87
4/20/2010	0.26	0.25	0.71	0.1	0.02	0.11	0.02	0.21	0.7
4/26/2010	0.26	0.32	0.86	0.12	0.41	0.14	0.03	0.23	1.1
5/2/2010	0.1	0.22	0.49	0.08	0.26	0.1	0.02	0.12	0.51
5/8/2010	0.21	0.32	0.83	0.13	0.34	0.13	0.02	0.24	0.96
5/14/2010	0.24	0.26	0.72	0.1	0.35	0.12	0.03	0.14	0.51
5/20/2010	0.11	0.24	0.99	0.12	0.38	0.15	0.02	0.1	0.88
5/26/2010	0.09	0.13	0.53	0.08	0.27	0.09	0.02	0.04	0.57
6/1/2010	0.08	0.17	0.79	0.11	0.45	0.15	0.05	0.1	0.62

Central Los Angeles			
Date	Formaldehyde (ppb)	Acetaldehyde (ppb)	Acetone (ppb)
4/1/2009	2.80	1.00	4.03
4/7/2009	1.80	1.00	3.73
4/13/2009	2.70	1.70	4.84
4/19/2009	3.60	2.20	5.34
4/25/2009	0.80	0.40	2.69
5/1/2009	2.40	1.60	7.96
5/7/2009	3.80	2.00	7.42
5/10/2009	2.90	1.00	
5/13/2009	1.40	1.00	4.89
5/19/2009	1.10	1.00	5.33
5/25/2009	0.50	0.40	2.14
5/31/2009	0.70	0.60	4.44
6/6/2009	0.50	0.40	3.17
6/12/2009	1.00	0.50	3.58
6/18/2009	1.20	1.00	5.03
6/24/2009	0.70	0.50	3.85
6/30/2009	1.20	1.10	4.84
7/6/2009	3.90	1.50	4.04
7/12/2009	5.10	1.80	4.95
7/18/2009	4.50	1.50	5.22
7/24/2009	4.10	1.30	6.67
7/30/2009	2.80	0.80	5.18
8/5/2009	4.00	1.80	8.45
8/11/2009	1.80	1.20	6.37
8/17/2009	1.80	1.40	5.69
8/23/2009	1.00	1.00	5.28
8/29/2009	4.70	3.70	16.02
9/4/2009	6.00	1.70	11.21
9/10/2009	5.10	1.90	9.16
9/16/2009	4.30	1.60	9.44
9/16/2009			10.92
9/22/2009	5.70	2.20	13.55
9/28/2009	4.20	1.60	7.57
10/4/2009	1.50	0.40	2.79
10/10/2009			5.75
10/16/2009			13.57
10/22/2009			12.99
10/28/2009			4.51
11/3/2009			16.36
11/9/2009	5.30	2.50	11.34
11/15/2009	3.30	1.60	6.54

Central Los Angeles			
Date	Formaldehyde (ppb)	Acetaldehyde (ppb)	Acetone (ppb)
11/21/2009	2.80	1.30	5.75
11/27/2009	3.30	1.50	4.92
12/3/2009	3.30	1.50	9.42
12/9/2009	2.40	1.20	5.19
12/15/2009	2.80	1.20	8.62
12/21/2009	4.70	2.30	10.36
12/27/2009	3.40	1.80	4.98
1/2/2010	2.90	1.30	3.24
1/8/2010	4.60	2.50	11.72
1/14/2010	3.40	1.60	7.9
1/20/2010	2.10	0.60	2.97
1/26/2010	3.40	1.30	6.01
2/1/2010	3.50	1.80	6.76
2/7/2010	1.40	0.70	3.08
2/13/2010	3.30	1.60	6.65
2/19/2010	1.60	0.60	2.85
2/25/2010	2.80	1.20	5.67
3/3/2010	1.40	0.50	3.32
3/9/2010	0.80	0.30	3.87
3/15/2010	3.60	1.90	6.84
3/21/2010	4.70	2.60	9.98
3/27/2010	3.00	1.50	
4/2/2010	2.10	0.90	
4/8/2010	3.00	1.30	
4/14/2010	2.40	1.10	5.7
4/20/2010	1.60	0.60	
4/26/2010	2.90	1.20	7.52
5/2/2010	1.80	0.60	3.69
5/8/2010	2.90	1.20	6.44
5/14/2010	2.40	1.00	5.39
5/20/2010	2.90	1.00	
5/26/2010	1.70		
6/1/2010	1.00	0.80	

Rubidoux			
Date	Formaldehyde (ppb)	Acetaldehyde (ppb)	Acetone (ppb)
4/1/2009	3.30	1.40	4.89
4/7/2009	3.00	1.40	3.8
4/13/2009	4.30	1.90	5.25
4/19/2009	5.10	2.00	3.87
4/25/2009	1.70	0.50	3
5/1/2009	1.60	1.40	7.74
5/7/2009	2.30	2.30	7.04
5/13/2009	4.10	1.40	6.14
5/19/2009	5.20	2.10	6.8
5/25/2009	2.80	0.90	2.45
5/31/2009	3.70	1.30	3.58
6/6/2009	2.00	0.60	3.12
6/12/2009	2.20	0.50	2.8
6/18/2009	4.60	1.60	5.3
6/24/2009	3.50	1.10	3.98
6/30/2009	5.10	1.90	7.63
7/6/2009	5.20	1.90	5.23
7/12/2009	5.80	2.10	4.7
7/18/2009	8.30	2.00	5.97
7/24/2009	4.80	0.90	6.4
7/30/2009	4.90	1.30	6.75
8/5/2009	5.30	1.90	7.59
8/11/2009	6.40	2.00	8.52
8/17/2009	5.40	1.70	6.09
8/23/2009	5.10	1.40	4.62
8/29/2009	9.50	3.50	9.72
9/4/2009	7.20	2.20	9.1
9/10/2009	7.30	2.60	10.43
9/16/2009	5.80	2.00	8.68
9/16/2009			9.22
9/22/2009	3.20	1.90	6.86
9/28/2009	5.70	2.00	7.43
10/4/2009	1.90	0.50	2.19
10/10/2009	4.00	1.50	6.78
10/16/2009			8.67
10/22/2009	5.10	2.20	8.18
10/28/2009			1.49

Rubidoux			
Date	Formaldehyde (ppb)	Acetaldehyde (ppb)	Acetone (ppb)
11/3/2009	6.80	3.70	13.87
11/9/2009	5.20	2.70	9.01
11/15/2009	1.60	0.90	4.43
11/21/2009	3.60	1.60	5.93
11/27/2009	2.90	1.20	4.31
12/3/2009	3.40	1.60	7.37
12/9/2009	1.70	1.00	4.91
12/15/2009	1.80	0.80	4.59
12/21/2009	3.50	1.80	6.25
12/27/2009	2.80	1.50	2.98
1/2/2010	1.20	0.50	2.47
1/8/2010	2.30	1.00	4.17
1/14/2010	0.90	0.50	2.37
1/20/2010	0.80	0.30	1.82
1/26/2010	2.30	1.40	5.59
2/1/2010	2.60	1.40	4.89
2/7/2010	1.20	0.60	3.73
2/13/2010	2.00	1.00	4.69
2/19/2010	1.30	0.50	3.21
2/25/2010	1.20	1.00	
3/3/2010	1.20	0.60	3.66
3/9/2010	0.90	0.40	2.6
3/15/2010	1.30	0.60	3.72
3/21/2010	3.30	1.70	7.51
3/27/2010	1.00	0.50	2.77
4/2/2010	1.90	0.90	7.26
4/8/2010	2.40	1.40	3.47
4/14/2010	2.30	1.00	8.2
4/20/2010	1.70	0.70	
4/26/2010	3.80	1.90	
5/2/2010	1.90	0.70	3.32
5/8/2010	3.30	1.50	6.4
5/14/2010	2.70	1.20	5.57
5/20/2010	3.40	1.50	6.47
5/26/2010	1.90	0.80	
6/1/2010	2.70	1.10	

Date	Resurrection School Formaldehyde (ppb)	Acetaldehyde (ppb)	Acetone (ppb)
4/1/2009			4.95
4/7/2009			5.40
4/13/2009	4.24	2.61	7.56
4/25/2009	2.01	1.12	3.15
5/1/2009	4.10	2.33	6.50
5/7/2009	4.96	2.78	8.76
5/13/2009	3.38	1.75	6.35
5/19/2009	3.22	1.47	6.71
5/25/2009			3.46
5/27/2009	4.04	1.95	
5/31/2009	2.96	1.60	
6/12/2009	2.61	1.14	
6/18/2009	3.34	1.09	
6/24/2009	2.60	0.80	
6/30/2009	2.98	1.02	9.84
7/6/2009	3.82	1.50	7.52
7/12/2009	4.82	1.83	7.73
7/18/2009	4.06	1.40	9.49
7/24/2009	3.86	1.24	10.24
7/30/2009	NA	NA	
8/5/2009	4.65	1.72	
8/11/2009	3.48	1.17	10.82
8/17/2009	3.90	1.41	4.40
8/23/2009	3.41	1.10	6.72
8/29/2009	8.75	3.78	16.75
9/4/2009	5.36	2.22	
9/10/2009	4.59	1.94	12.04
9/16/2009	3.77	1.76	10.42
9/22/2009	5.28	2.44	14.01
9/28/2009	3.94	1.70	9.98
10/4/2009	1.35	0.59	4.22
10/10/2009	2.69	1.07	8.02
10/16/2009			13.57
10/22/2009	5.07	2.55	14.67
10/28/2009	1.10	0.66	2.91
11/3/2009			21.09

Date	Resurrection School Formaldehyde (ppb)	Acetaldehyde (ppb)	Acetone (ppb)
11/9/2009	5.66	2.81	12.98
11/15/2009	3.53	2.04	7.59
11/21/2009	3.16	1.60	7.09
11/27/2009	3.59	1.71	6.21
12/3/2009	3.33	1.63	11.00
12/9/2009	2.62	1.40	5.10
12/15/2009			7.01
12/21/2009	5.58	2.78	12.65
12/27/2009	3.83	1.95	5.33
1/2/2010			5.4
1/8/2010	5.40	2.87	19.52
1/14/2010	4.26	1.96	13.51
1/20/2010	1.34	0.63	4.18
1/26/2010	2.87	1.46	5.55
2/1/2010	3.83	1.82	8.4
2/7/2010			3.1
2/13/2010	2.72	1.65	9.95
2/19/2010	0.69	0.42	8.32
2/25/2010	2.94	1.31	9.57
3/3/2010	1.83	0.67	5.17
3/9/2010	1.06	0.40	2.28
3/15/2010	4.02	1.82	8.49
3/21/2010			14.43
3/27/2010	4.09	1.88	4.28
4/2/2010	2.24	0.95	7.04
4/8/2010	3.46	1.42	8.94
4/14/2010	3.03	1.22	
4/20/2010	1.93	0.66	6.76
4/26/2010	3.21	1.34	9.06
5/2/2010	2.00	0.70	5.16
5/8/2010	3.46	1.28	9.03
5/14/2010	2.53	0.91	6.96
5/20/2010	3.02	1.03	8.46
5/26/2010	2.00	0.64	5.26
6/1/2010	1.89	0.52	5.37