Attachment D:
Air Quality and Greenhouse Gases

D.1 - Air Quality and Greenhouse Gas Report

REVISED AIR QUALITY AND GREENHOUSE GAS ASSESSMENT

Las Terrazas Apartments and Services Center
Cypress Avenue and Valley Boulevard
Colton, California

Prepared For

AMCAL Multi-Housing, Inc.
Attention: Jay Ross
30141 Agoura Road, Suite 100
Agoura Hills, California 91301
Phone: 818-706-0694 ext. 128
Fax: 818-889-9158

Prepared By

Dr. Valorie L. Thompson
Scientific Resources Associated

On the behalf of
Eilar Associates, Inc.
Acoustical & Environmental Consulting
210 South Juniper Street, Suite 100
Escondido, California 92025
www.eilarassociates.com
Phone: 760-738-5570
Fax: 760-738-5227

Job #B30107A4

October 8, 2015

Air Quality and Greenhouse Gas Assessment

for the

Las Terrazas Apartments and Services Center

Submitted To:

AMCAL Multi-Housing, Inc.
Attention: Jay Ross
30141 Agoura Road, Suite 100
Agoura Hills, California 91301
Phone: 818-706-0694 ext. 128
Fax: 818-889-9158

Prepared By:

sra
Scientific Resources Associated
1328 Kaimalino Lane
San Diego, CA   92109
(858) 488-2987

October 8, 2015

Table of Contents

1.0 INTRODUCTION

This report presents an assessment of potential air quality and greenhouse gas (GHG) impacts associated with the proposed Las Terrazas Apartments and Services Center, a new apartment development at on a 6.14-acre lot located at 275-291 N. Cypress Avenue in unincorporated San Bernardino County. The proposed project involves the construction of 112 multi-family apartment units, including parking, at the site. The project will also include a 2,000-square foot community building and development of a 3,000 square foot child care center/neighborhood services building. The three parcels are currently vacant as the house that was located on the third parcel has been demolished.

Air quality and GHG impacts will be attributable to emissions associated with construction and operational emissions associated with traffic and energy use. This report presents an evaluation of existing conditions at the site, thresholds of significance, and potential air quality and GHG impacts associated with construction and operation of the project.

2.0 EXISTING CONDITIONS

2.1 Current Development

The project site is currently vacant and undeveloped.

2.2 Regulatory Setting

Air quality is defined by ambient air concentrations of specific pollutants identified by the United States Environmental Protection Agency (EPA) to be of concern with respect to health and welfare of the general public. The EPA is responsible for enforcing the Federal Clean Air Act (CAA) of 1970 and its 1977 and 1990 Amendments. The CAA required the EPA to establish National Ambient Air Quality Standards (NAAQS), which identify concentrations of pollutants in the ambient air below which no adverse effects on the public health and welfare are anticipated. In response, the EPA established both primary and secondary standards for several pollutants (called "criteria" pollutants). Primary standards are designed to protect human health with an adequate margin of safety. Secondary standards are designed to protect property and the public welfare from air pollutants in the atmosphere.

The CAA allows states to adopt ambient air quality standards and other regulations provided they are at least as stringent as federal standards. The California Air Resources Board (ARB) has established the more stringent California Ambient Air Quality Standards (CAAQS) for the six criteria pollutants through the California Clean Air Act of 1988, and also has established CAAQS for additional pollutants, including sulfates, hydrogen sulfide, vinyl chloride and visibility-reducing particles.

Areas that do not meet the NAAQS or the CAAQS for a particular pollutant are considered to be "nonattainment areas" for that pollutant. In September 1997, the EPA promulgated 8-hour O_3 and 24-hour and annual $PM_{2.5}$ national standards. As a result, this action has initiated a new planning process to monitor and evaluate emission control measures for these pollutants. The South Coast Air Basin (SCAB) is classified as an extreme nonattainment area for the 8-hour NAAQS for O_3, and a nonattainment area for the NAAQS for $PM_{2.5}$. The SCAB is also designated as a maintenance area for the NAAQS for CO and PM_{10}. The Los Angeles County portion of the SCAB has recently been classified as a nonattainment area for the NAAQS for NO_2 and lead. The SCAB is also considered a nonattainment area for the CAAQS for O_3, $PM_{2.5}$, and PM_{10}. The area is considered unclassified or attainment for all other NAAQS and CAAQS for the other criteria pollutants.

The ARB is the state regulatory agency with authority to enforce regulations to both achieve and maintain the NAAQS and CAAQS. The ARB is responsible for the development, adoption, and enforcement of the state's motor vehicle emissions program, as well as the adoption of the CAAQS. The ARB also reviews operations and programs of the local air districts, and requires each air district with jurisdiction over a nonattainment area to develop its own strategy for achieving the NAAQS and CAAQS. The local air district has the primary responsibility for the development and implementation of rules and regulations designed to attain the NAAQS and CAAQS, as well as the permitting of new or modified sources, development of air quality management plans, and adoption and enforcement of air pollution regulations. The South Coast Air Quality Management District (SCAQMD) is the local agency responsible for the administration and enforcement of air quality regulations for the SCAB.

The SCAQMD and the Southern California Association of Governments (SCAG) are responsible for developing and implementing the clean air plan for attainment and maintenance of the ambient air quality standards in the SCAB. The most recently adopted air quality plan in the SCAB is the 2012 Air Quality Management Plan (AQMP), which was adopted by the Board on December 7, 2012.

Table 1 presents a summary of the ambient air quality standards adopted by the federal and California Clean Air Acts.

Table 1
Ambient Air Quality Standards

POLLUTANT	AVERAGE TIME	CALIFORNIA STANDARDS		NATIONAL STANDARDS		
		Concentration	Method	Primary	Secondary	Method
Ozone (O_3)	1 hour	0.09 ppm (176 µg/m^3)	Ultraviolet Photometry	--	--	Ethylene Chemiluminescence
	8 hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)	0.075 ppm (147 µg/m^3)	
Carbon Monoxide (CO)	8 hours	9.0 ppm (10 mg/m^3)	Non-Dispersive Infrared Spectroscopy (NDIR)	9 ppm (10 mg/m^3)	--	Non-Dispersive Infrared Spectroscopy (NDIR)
	1 hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
Nitrogen Dioxide (NO_2)	Annual Average	0.030 ppm (56 µg/m^3)	Gas Phase Chemiluminescence	0.053 ppm (100 µg/m^3)	--	Gas Phase Chemiluminescence
	1 hour	0.18 ppm (338 µg/m^3)		0.100 ppm (188 µg/m^3)	--	
Sulfur Dioxide (SO_2)	24 hours	0.04 ppm (105 µg/m^3)	Ultraviolet Fluorescence	--	--	Pararosaniline
	3 hours	--		--	0.5 ppm (1300 µg/m^3)	
	1 hour	0.25 ppm (655 µg/m^3)		0.075 ppm (196 µg/m^3)	--	
Respirable Particulate Matter (PM_{10})	24 hours	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	150 µg/m^3	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		--	--	
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12 µg/m^3	15 µg/m^3	Inertial Separation and Gravimetric Analysis
	24 hours	--		35 µg/m^3	35 µg/m^3	
Sulfates	24 hours	25 µg/m^3	Ion Chromatography	--	--	--
Lead	30-day Average	1.5 µg/m^3	Atomic Absorption	--	--	Atomic Absorption
	Calendar Quarter	--		1.5 µg/m^3	1.5 µg/m^3	
	3-Month Rolling Average	--		0.15 µg/m^3	0.15 µg/m^3	
Hydrogen Sulfide	1 hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence	--	--	--
Vinyl Chloride	24 hours	0.010 ppm (26 µg/m^3)	Gas Chromatography	--	--	--

ppm= parts per million; µg/m^3 = micrograms per cubic meter ; mg/m^3= milligrams per cubic meter
Source: California Air Resources Board, www.arb.ca.gov, 2013

2.3 Background Air Quality

The SCAQMD operates a network of ambient air monitoring stations throughout the SCAB. The purpose of the monitoring stations is to measure ambient concentrations of the pollutants and determine whether the ambient air quality meets the CAAQS and the NAAQS. The nearest ambient monitoring station to the project site is the San Bernardino monitoring station located at on 4th Street, which is located approximately one mile from the project site. The San Bernardino monitoring station measures O_3, PM_{10}, $PM_{2.5}$, CO, and NO_2. The nearest monitoring station that measures SO_2 is located in Fontana. Ambient concentrations of pollutants over the last three years are presented in Table 2.

Table 2
Ambient Background Concentrations
(ppm unless otherwise indicated)

Pollutant	Averaging Time	2011	2012	2013	CAAQS	NAAQS	Monitoring Station
Ozone	8 hour	0.121	0.109	0.112	0.070	0.075	San Bernardino
	1 hour	0.135	0.124	0.139	0.090	--	San Bernardino
PM_{10}	Annual	30.1	32.0	32.7	20 $\mu g/m^3$	--	San Bernardino
	24 hour	54	51	98	50 $\mu g/m^3$	150 $\mu g/m^3$	San Bernardino
$PM_{2.5}$	Annual	NA	11.7	11.4	12 $\mu g/m^3$	15 $\mu g/m^3$	San Bernardino
	24 hour	65.0	34.8	55.3	--	35 $\mu g/m^3$	San Bernardino
NO_2	Annual	0.017	0.019	0.018	0.030	0.053	San Bernardino
	1 hour	0.062	0.067	0.072	0.18	0.100	San Bernardino
CO	8 hour	1.74	1.64	NA	9	9	San Bernardino
SO_2	Annual	0.000	0.000	0.000	--	0.5[1]	Fontana
	24 hour	0.003	0.004	0.001	0.25	0.075	Fontana

[1]Secondary NAAQS
NA – Data not available

3.0 THRESHOLDS OF SIGNIFICANCE

The SCAQMD has adopted CEQA Guidelines (SCAQMD 1993), which provide guidance on the requirements for evaluating potential air quality impacts and on thresholds of significance under CEQA. The SCAQMD has identified numerical emission thresholds for significance for construction and operation for a project. The project-level numerical thresholds are summarized in Table 3.

Table 3
SCAQMD Significance Thresholds

Pollutant	Construction	Operation
Criteria Pollutants Mass Daily Thresholds		
NO_x	100 lbs/day	55 lbs/day
ROG	75 lbs/day	55 lbs/day
PM_{10}	150 lbs/day	150 lbs/day
$PM_{2.5}$	55 lbs/day	55 lbs/day
SO_x	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
TAC, AHM, and Odor Thresholds		
Toxic Air Contaminants (TACs)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Cancer Burden > 0.5 (in areas ≥ 1 in a million) Chronic and Acute Hazard Index ≥ 1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
GHG	10,000 MT/yr CO2eq for industrial facilities	
Ambient Air Quality for Criteria Pollutants		
NO2 1-hour average Annual arithmetic mean	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards 0.18 ppm (state) 0.03 ppm (state) and 0.0534 ppm (federal)	
PM10 24-hour average annual geometric mean	 10.4 µg/m^3 construction & 2.5 µg/m^3 operation 1.0 µg/m^3	
PM2.5 24-hour average	 10.4 µg/m^3 construction & 2.5 µg/m^3 operation	
SO2 1-hour average 24-hour average	 0.25 ppm (state) & 0.075 ppm (federal – 99th percentile) 0.04 ppm (state)	
Sulfate 24-hour average	 25 µg/m^3 (state)	
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards 20 ppm (state) and 35 ppm (federal) 9.0 ppm (state/federal)	

Table 3 SCAQMD Significance Thresholds		
Pollutant	**Construction**	**Operation**
Lead 30-day average Rolling 3-month average Quarterly average	 1.5 μg/m^3 (state) 0.15 μg/m^3 (federal) 1.5 μg/m^3 (federal)	

μg/m^3 = microgram per cubic meter; pphm = parts per hundred million; mg/m^3 = milligram per cubic meter; ppm = parts per million; TAC = toxic air contaminant; AHM = Acutely Hazardous Material

To further evaluate the potential for significant impacts associated with the project, the SCAQMD's *Final Localized Significance Threshold Methodology* (SCAQMD 2003) can be considered to evaluate whether a project's emissions could cause a localized exceedance of an ambient air quality standard. The Localized Significance Threshold (LST) Methodology provides a look-up table for construction and operational emissions based on the emission rate, location, and distance from receptors, and provides a methodology for air dispersion modeling to evaluate whether a construction or operation could cause an exceedance of an ambient air quality standard. The LST lookup tables are applicable only to sources that are five acres or less in size. A screening air dispersion modeling approach was therefore used to assess the significance of localized construction impacts on receptors in the project vicinity. The LST Methodology only applied to impacts to NO_2, CO, $PM_{2.5}$, and PM_{10} concentrations, and tables have been updated as of 2009 (SCAQMD 2009).

According to the LST Methodology, the project is located in Source Receptor Area 34, the Central San Bernardino area. LSTs for the Project are shown in Table 4, based on the size of the site and the distance to the nearest receptor.

The site is approximately 6.14 acres in size. Based on a review of the site location and aerial maps of the vicinity, the distance to the nearest receptor is estimated to be 50 meters. For conservative purposes, the LSTs for a 5-acre site and 50-meter distance were used to evaluate the potential significance of impacts.

Table 4 Localized Significance Thresholds, lbs/day						
	Pollutant					
Distance to Nearest Receptor, meters	**NOx**	**CO**	**PM_{10} - Construction**	**PM_{10} - Operation**	**$PM_{2.5}$ - Construction**	**$PM_{2.5}$ - Operation**
5 acres						
50	302	2,396	44	11	10	3

The impacts associated with construction and operation of the project were evaluated for significance based on these significance criteria.

4.0 IMPACTS

The proposed Project includes both construction and operational impacts. Construction impacts include emissions associated with site grading/preparation, utilities installation, construction of buildings, and paving. Operational impacts include emissions associated with the project, including traffic, at full buildout.

4.1 Construction

Emissions of pollutants such as fugitive dust that are generated during construction are generally highest near the construction site. Emissions from the construction phase of the project were estimated through the use of the CalEEMod Model (ENVIRON 2013). Construction is anticipated to be carried out in three main phases. The first phase of construction involves site preparation and utilities installation. The second phase of construction involves laying the slab and associated paving activities at the site. The third phase of construction involves construction of the building, along with architectural coatings application. It was assumed that the entire construction project would be completed within 12 months. It was assumed that architectural coatings application would occur during the last three months of building construction. It was assumed that heavy construction equipment would be operating at the site for eight hours per day, five days per week during project construction. It was assumed that, in accordance with the requirements of the SCAQMD Rule 403, fugitive dust controls would be utilized during construction, including watering of active sites three times daily.

For the purpose of estimating emissions from the application of architectural coatings, it was assumed that water-based coatings that would be compliant with SCAQMD Regulations would be used for both exterior and interior surfaces. Within the CalEEMod Model, this assumption was included by assuming that the architectural coating emissions would have a VOC content of 150 grams per liter for nonresidential coatings and 100 grams per liter for residential coatings.

Table 5 provides a summary of the emission estimates for construction of the proposed project, assuming standard measures are implemented to reduce emissions, as calculated with the

CalEEMod Model. Refer to Appendix A for detailed model output files. As shown in the tables, emissions associated with construction are below the significance thresholds for all construction phases and pollutants. Construction of the project would be short-term and temporary. Thus the emissions associated with construction would not result in a significant impact on the ambient air quality. Because emissions are less than the significance levels, they would not conflict or obstruct the implementation of the AQMP or applicable portions of the SIP.

Project construction would also not result in emission of any odor compounds that would cause a nuisance or significant impact to nearby receptors. The impacts associated with Project construction are therefore not considered significant.

Table 5
Estimated Construction Emissions

Emission Source	ROG	NOx	CO	SO_x	PM_{10}	$PM_{2.5}$
lbs/day						
Site Preparation/Utilities						
Fugitive Dust	-	-	-	-	2.41	1.30
Offroad Diesel	3.83	40.42	26.67	0.03	2.33	2.14
Worker Travel	0.07	0.09	1.07	0.002	0.17	0.05
TOTAL	**3.90**	**40.51**	**27.74**	**0.03**	**4.91**	**3.49**
Significance Criteria	75	100	550	150	150	55
Localized Significance Criteria	N/A	302	2,396	N/A	44	10
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
Paving						
Asphalt Offgassing	0.00	-	-	-	-	-
Offroad Diesel	2.32	25.18	14.98	0.02	1.41	1.30
Onroad Diesel	0.09	0.98	1.08	0.002	0.09	0.03
Worker Travel	0.07	0.09	1.07	0.002	0.17	0.05
TOTAL	**2.48**	**26.25**	**17.13**	**0.02**	**1.67**	**1.38**
Significance Criteria	75	100	550	150	150	55
Localized Significance Criteria	N/A	302	2,396	N/A	44	10
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
Building Construction						
Building Offroad Diesel	3.66	30.03	18.74	0.03	2.12	1.99
Building Vendor Trips	0.12	1.28	1.41	0.003	0.16	0.06
Building Worker Travel	0.38	0.47	5.87	0.01	0.97	0.04
TOTAL	**4.16**	**31.78**	**26.02**	**0.04**	**3.25**	**2.09**
Significance Criteria	75	100	550	150	150	55
Localized Significance Criteria	N/A	302	2,396	N/A	44	10
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
Architectural Coatings Application						
Architectural Coatings Offgassing	14.97	-	-	-	-	-
Architectural Coatings Offroad	0.41	2.57	1.90	0.003	0.22	0.22

Table 5 **Estimated Construction Emissions**						
Emission Source	**ROG**	**NOx**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
lbs/day						
Diesel						
Architectural Coatings Worker Travel	0.07	0.09	1.15	0.002	0.18	0.05
TOTAL	**15.45**	**2.66**	**3.05**	**0.005**	**0.40**	**0.27**
Significance Criteria	75	100	550	150	150	55
Localized Significance Criteria	N/A	302	2,396	N/A	44	10
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
MAXIMUM SIMULTANEOUS CONSTRUCTION EMISSIONS	**19.61**	**40.50**	**29.08**	**0.05**	**4.91**	**3.49**
Significance Criteria	75	100	550	150	150	55
Localized Significance Criteria	N/A	302	2,396	N/A	44	10
Significant?	*No*	*No*	*No*	*No*	*No*	*No*

4.2 Operational Impacts

The main operational impacts associated with the Project would be impacts associated with traffic. Minor impacts would be associated with energy use and landscaping. To address whether the Project would result in emissions that would violate any air quality standard or contribute substantially to an existing or proposed air quality violation, the emissions associated with Project-generated traffic and area sources were compared with the SCAQMD's quantitative significance criteria. The trip generation rates were based on the Traffic Impact Analysis (Linscott, Law & Greenspan 2015). The CalEEMod Model contains emission factors from the EMFAC2011 model, which is the latest version of the Caltrans emission factor model for on-road traffic. Project-related traffic was assumed to be comprised of a mixture of vehicles in accordance with the CalEEMod Model default outputs for traffic. This assumption includes light duty autos and light duty trucks (i.e., small trucks, SUVs, and vans) as well as medium- and heavy-duty vehicles that may be traveling to the facility to make deliveries. For conservative purposes, emission factors representing the vehicle mix for 2016 were used to estimate emissions as 2016 was assumed to be the first year of full operation; based on the results of the EMFAC2011 model for subsequent years, emissions would decrease on an annual basis from 2016 onward due to phase-out of higher polluting vehicles and implementation of more stringent emission standards that are taken into account in the EMFAC2011 model. Emissions associated with area sources (energy use and landscaping activities) were also estimated using the default assumptions in the CalEEMod Model.

Table 6 presents the results of the emission calculations in lbs/day, considering the project's design features listed above, along with a comparison with the significance criteria. It should be noted that according to the SCAQMD's LST Methodology, only on-site emissions should be evaluated versus the significance thresholds. No mitigation measures were assumed in the analysis.

Table 6
Estimated Operational Emissions

Emission Source	ROG	NOx	CO	SO_x	PM_{10}	$PM_{2.5}$
Summer, lbs/day						
Area Sources	2.88	0.11	9.37	0.00	0.05	0.05
Energy Use	0.05	0.42	0.18	0.003	0.03	0.03
Vehicular Emissions	3.51	9.41	39.24	0.09	6.21	1.75
TOTAL	**6.44**	**9.94**	**48.79**	**0.09**	**6.29**	**1.83**
Significance Criteria	55	55	550	150	150	55
TOTAL ONSITE EMISSIONS	**2.93**	**0.53**	**9.56**	**0.00**	**0.08**	**0.08**
Localized Significance Criteria	N/A	302	2,396	N/A	11	3
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
Winter, lbs/day						
Area Sources	2.88	0.11	9.37	0.00	0.05	0.05
Energy Use	0.05	0.42	0.18	0.003	0.03	0.03
Vehicular Emissions	3.64	9.90	38.75	0.09	6.21	1.75
TOTAL	**6.57**	**10.43**	**48.31**	**0.09**	**6.29**	**1.83**
Significance Criteria	55	55	550	150	150	55
TOTAL ONSITE EMISSIONS	**2.93**	**0.53**	**9.56**	**0.00**	**0.08**	**0.08**
Localized Significance Criteria	N/A	302	2,396	N/A	11	3
Significant?	*No*	*No*	*No*	*No*	*No*	*No*

Based on the estimates of the emissions associated with project operations, the emissions are below the significance criteria for all pollutants. Because emissions are less than the significance levels, they would not conflict or obstruct the implementation of the AQMP or applicable portions of the SIP. It should be noted that the emissions from vehicles are projected to decrease with time due to phase-out of older, more polluting vehicles and increasingly stringent emissions standards.

Projects involving traffic impacts may result in the formation of locally high concentrations of CO, known as CO "hot spots." The Traffic Impact Analysis did not predict any significant impacts to study intersections in the project vicinity due to project-related traffic. The intersections in the projct area would therefore operate at an acceptable LOS and would not experience CO "hot spots" because traffic congestion would not result.

4.3 Toxic Air Contaminant Impacts

As discussed in Section 3.0, air quality regulators typically define sensitive receptors as schools (Preschool-12th Grade), hospitals, resident care facilities, or day-care centers, or other facilities that may house individuals with health conditions that would be adversely impacted by changes in air quality. Residential land uses may also be considered sensitive receptors.

The residential use proposed for the project would not be sources of TACs. However, the project is located north of the Interstate 10 Freeway, and adjacent to a Union Pacific rail line. South of the freeway is the CalPortland Quarry and cement facility. Both trucks traveling on the freeway and locomotives traveling on the Union Pacific rail line are a source of diesel particulate matter emissions, which is categorized as a toxic air contaminant by the state of California. In addition, the CalPortland operation is a source of toxic air contaminants, including organic compounds and metals.

The rail line is used exclusively for freight. It was assumed that freight traffic would result in two daily trips on the line. Train locomotive diesel particulate matter emissions were calculated based on U.S. EPA's locomotive emission factors (USEPA 2009). For the purpose of representing a scenario based on residential exposure, it was assumed, as a worst case, that residents at the Las Terrazas Apartments and Services Center project could be exposed to rail emissions for a period of 70 years. To evaluate an average exposure, the 9-year exposure scenario for both children and adults was used.

To evaluate emissions from trucks, diesel particulate matter (DPM) emitted from trucks traveling along the segment of Interstate 10 nearest to the project were evaluated. DPM is the risk-driving substance emitted from vehicles, and has been identified by the state of California as a carcinogenic compound.

The first step in the analysis was to evaluate emissions associated with traffic on the Interstate 10 segment near the project. Estimated annual daily trips (ADT) on the segment adjacent to the project site were obtained from the Caltrans website (Caltrans 2013) for the segment of Interstate 10 between Pepper Avenue and Mount Vernon Avenue in Colton. The estimated number of truck trips on the segment of Interstate 10 is 19,400 average daily trips (ADT). Of the 19,400 trips, Caltrans data indicates that 4,753 ADT would be 2-axle trucks, 1,746 ADT would be 3-axle trucks, and 12,895 ADT would be 4+-axle trucks.

Table 7 presents a summary of the ADT for the segment of Interstate 10 adjacent to the project site.

Table 7
I-10 Traffic Projections
Average Daily Trips

Total Traffic, ADT	Total Truck Traffic, ADT	2-Axle Trucks, ADT	3-Axle Trucks, ADT	4+-Axle Trucks, ADT
194,000	19,400	4,753	1,746	12,895

Mobile source emission factors were modeled using the Emission Factors (EMFAC2014) Model (ARB 2014). The analysis utilized emissions for the South Coast Air Basin, for medium duty trucks to represent 2-axle trucks (MDV), medium-heavy trucks for 3-axle trucks (T6), and heavy-heavy trucks for 4-axle trucks (T7).

The U.S. EPA's approved air dispersion model, AERMOD (U.S. EPA 2009), was used to estimate the downwind impacts at the closest receptors to the construction site. The model was run using preprocessed meteorological data from the Fontana surface meteorological monitoring station provided by the South Coast Air Quality Management District. Risks were estimated using the Office of Environmental Health Hazard Assessment (OEHHA)'s guidance, which takes into account the sensitivity of children during developmental years (OEHHA 2015).

Exposure through inhalation is a function of the respiration rate and the concentration of a substance in the air and is calculated by using the following formulas (OEHHA 2015):

Risk = Dose Inhalation x CPF x ASF

where:

Age Sensitivity Factor (ASF) = described below

Inhalation cancer potency factor (CPF) = 1.1 (milligram per kilogram per day)$^{-1}$ (for Diesel Particulate Matter [DPM])

Dose Inhalation = C_{air} * DBR * A * EF * ED * 10^{-6} / AT (Equation 2)

where:

C_{air} = concentration in microgram per cubic meter

DBR = breathing rate in liter per kilogram of body weight per day (Per OEHHA 2015)

A = inhalation absorption factor (1 for DPM)

EF = exposure frequency in days per year (250 days)

ED = exposure duration in years (30 years)

AT = averaging time period over which exposure is averaged in days (25,550 days for 70 years)

For modeling purposes, the values suggested by the OEHHA Guidance were used for the dose inhalation calculation. These values take into account the increased sensitivity of children during the third trimester, ages 0 to 2, and ages 2 to 16, by applying an age sensitivity factor for each period. Daily breathing rates for each of the time periods considered were used to calculate risk. A lifetime exposure period of 30 years was evaluated per OEHHA guidance. Average emissions associated with traffic on the I-10 segment were estimated by averaging the EMFAC2014 emission calculations over the 30-year period for which the HRA calculations were conducted.

To accurately represent the spatial distributions of emissions and capture high concentrations that often occur next to roadways, the analysis utilized link-based emissions as recommended by the U.S. Environmental Protection Agency (EPA 2002). Roadway segments were modeled as a series of volume sources as recommended in the South Coast Air Quality Management District's *Health Risk Assessment Guidance for Analyzing Cancer Risks from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis* (SCAQMD 2003), which recommends using multiple, adjacent volume sources to simulate a roadway. The analysis was conducted in accordance with the *Supplemental Guidelines for Submission of Air Toxics "Hot Spots" Program Health Risk Assessments (HRAs)* (SDAPCD 2006) and the OEHHA's *Guidance Manual for Preparation of Health Risk Assessments* (OEHHA 2015).

Because the emission factors provided are based on grams per vehicle mile traveled, emissions were allocated to the individual volume sources used to represent the I-10 freeway segment. The volume source dimensions were 25 meters by 25 meters; therefore, each volume represents 0.0155 mile of vehicle travel per volume source. Emission estimates on a per 25 meter by 25 meter source are summarized in Table 8. Detailed emission calculations are provided in Appendix A.

Table 8
Emission Estimates – Interstate 10 Segment Traffic

Scenario	2-Axle Truck Diesel Particulate Emissions, lbs/year per source	3-Axle Truck Diesel Particulate Emissions, lbs/year per source	4+-Axle Truck Diesel Particulate Emissions, lbs/year per source	Total Diesel Particulate Emissions, lbs/year per source
30-year exposure	0.155	0.049	0.644	0.848

In addition to the emissions from rail and trucks, emissions for the CalPortland quarry operation were obtained from the ARB's emissions inventory website. Emissions were based on an average of 2007 and 2008 data, and are shown in Table 9. These emissions were included in the AERMOD model as a volume source placed at the quarry.

Table 9 Toxic Air Contaminant Emissions - CalPortland			
POLLUTANT	**2007 EMISSIONS, LBS/YR**	**2008 EMISSIONS, LBS/YR**	**AVERAGE EMISSIONS, LBS/YR**
1,3-Butadiene	7.84	0.41305	4.126525
Acetaldehyde	2.56	2.56	2.56
Acrolein	0.346	0.346	0.346
Arsenic	0.154	0.30642	0.23021
Benzene	331.3	268.2542554	299.7771277
Beryllium	0	0.04098	0.02049
Cadmium	48.564	40.6972	44.6306
Copper	0.01	0.01	0.01
Cr(VI)	0.033	0.13668	0.08484
Ethyl Benzene	0.88	0.88	0.88
Formaldehyde	16730.75	11673.01848	14201.88424
HCl	0.52	0.52	0.52
Hexane	0.62	0.62	0.62
Lead	3.395	2.50789	2.951445
Manganese	0.009	0.009	0.009
Mercury	0.006	0.006	0.006
NH3	1962.87	1046.23	1504.55
Naphthalene	0.079	0.07454	0.07677
Nickel	17.034	14.22335122	15.62867561
PAHs-w/o	4.889	2.64868	3.76884
Selenium	0.006	0.006	0.006
Toluene	3.59	3.59	3.59
Xylenes	2.56	2.56	2.56

The AERMOD air dispersion model was used to calculate ground-level concentrations at the Las Terrazas Apartments and Service Center site associated with emissions of TACs from the freeway, rail line, and CalPortland operations. Surface and upper air profiler meteorological data from the Riverside meteorological monitoring station were used in the AERMOD model. The high-end excess cancer risk was calculated based on guidance from the Office of Environmental Health Hazard Assessment (OEHHA 2015). The risks were calculated using the HotSpots Assessment and Reporting Program 2 (HARP2) for excess cancer risks and chronic non-cancer hazards.

Cancer Risk

Table 10 presents a summary of the excess cancer risks calculated for the project based on the 30-year exposure scenario. The results of the health risk calculations indicate that the risks are driven by exposure to diesel particulate matter from the Interstate 10 freeway. According to the SCAQMD's MATES IV study, diesel particulate matter is the risk-driving chemical within the SCAB, with the average population-weighted risk within the air basin of 897 in a million using the OEHHA 2015 guidelines based on monitoring data (SCAQMD 2015). Given that the MATES IV study shows that excess cancer risks for the region are above the level predicted for the Las Terrazas Apartments and Services Center project, the results of the health risk calculations are consistent with the MATES IV study. Because the project does not have control over emissions from the Interstate 10 freeway, and because existing sensitive receptors are exposed to the same levels of DPM emissions from the freeway as the project would be, impacts are below with the background risk levels reported in the MATES IV study.

Table 10
Health Risk Assessment Results – Excess Cancer Risk

30-year exposure scenario	67.9 in a million

Non-Cancer Risk

The highest non-cancer chronic risk is predicted to be 0.11, indicating that no adverse non-cancer health effects are anticipated. The risks are below the SCAQMD's significance threshold of 1.0.

Mitigation Measures

As discussed above, the lifetime cancer risks are below the background cancer risks reported in the MATES IV study. However, the risks are above the SCAQMD's significance threshold of 10 in a million. It should be noted that this significance threshold is generally applied to impacts from projects that emit TACs, rather than to projects that would experience a cumulative risk from background sources such as the I-10 freeway and rail operations.

Mitigation Measure MM-AQ1 will be implemented to reduce risks to residents in the development to below the SCAQMD's threshold of 10 in a million. Based on the

- **Mitigation Measure MM-AQ1**: The buildings will be equipped with a central heating, ventilation, and air conditioning (HVAC) system that includes high efficiency filters for particulates (Minimum Efficiency Reporting Value [MERV] 13 or higher) or other similarly effective systems. Any windows within a 500' distance to I-10 and facing the freeway are required to be fixed. However, if there is a requirement for emergency egress for a particular space facing I-10, then it can be operable. The site will include tree plantings between residential dwellings and the freeway.

Based on information on the effectiveness of MERV 13 filters in removing particulates, it is estimated that the filters will remove from 70 to 90 percent of the particulates.[1] The project will also include a sound wall and vegetation along the wall. A study conducted by the USEPA[2] indicates that a wall of vegetation may reduce particulate concentrations behind the wall by 15 to 50 percent. Accordingly, the actual concentration of diesel particulate matter to which residents of the development would be exposed is lower than predicted by the models used in the screening analysis, and risks would be reduced.

With the implementation of these recommended measures, the design of the proposed multi-family project would help reduce the potential health risk impacts of future residences from the exposure to vehicle emissions from the I-10 freeway.

---

[1] ARB. 2012. *Status of Research on Potential Mitigation Concepts to Reduce Exposure to Nearby Traffic Pollution*. August 23.
[2] Baldauf, R., E. Thoma, A. Khlystov, V. Isakov, G. Bowker, T. Long, R. Snow. 2008. *Impacts of Noise Barriers on Near-Road Air Quality*. Atmospheric Environment 42, 7502-7507.

4.4 Odors

During construction, diesel equipment operating at the site may generate some nuisance odors; however, due to the distance of sensitive receptors to the project site and the temporary nature of construction, odors associated with project construction would not be significant.

Land uses associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting activities, refineries, landfills, dairies, and fiberglass molding operations. These land uses are not proposed for the Las Terrazas Apartments and Services Center. Odor impacts would not be significant.

5.0 GREENHOUSE GAS EVALUATION

According to the California Natural Resources Agency[3], "due to the global nature of GHG emissions and their potential effects, GHG emissions will typically be addressed in a cumulative impacts analysis." According to Appendix G of the CEQA Guidelines, the following criteria may be considered to establish the significance of GCC emissions:

Would the project:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

As discussed in Section 15064.4 of the CEQA Guidelines, the determination of the significance of greenhouse gas emissions calls for a careful judgment by the lead agency, consistent with the provisions in Section 15064. Section 15064.4 further provides that a lead agency should make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of GHG emissions resulting from a project. A lead agency shall have discretion to determine, in the context of a particular project, whether to:

(1) Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use. The lead agency has discretion to select the model or methodology it considers most appropriate provided it supports its decision with substantial evidence. The lead agency should explain the limitations of the particular model or methodology selected for use; and/or

(2) Rely on a qualitative analysis or performance based standards.

Section 15064.4 also advises a lead agency to consider the following factors, among others, when assessing the significance of impacts from greenhouse gas emissions on the environment:

[3] California Natural Resources Agency, Initial Statement of Reasons for Regulatory Action, Proposed Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gases Pursuant to SB 97. July 2009.

(1) The extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting;

(2) Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; and

(3) The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions.

According to the ARB's Scoping Plan, AB 32's goal of reducing GHGs to 1990 levels by 2020 would amount to an approximate 28.35% reduction in emissions below "business as usual" levels, accounting for growth in the state of California. "Business as usual" is defined as the emissions that would have occurred in the absence of reductions mandated under AB 32. Based on the latest guidelines and baseline emission calculations, for energy efficiency, "business as usual" is considered to be the equivalent of being as energy efficient as Title 24 requires as of 2005. The potential for significant impacts to global climate for the project were therefore evaluated on the basis of the project's consistency with the goals of AB 32 to reduce GHG emissions to 1990 levels by 2020, and to implement those programs that will be required under AB 32 that are applicable to the Las Terrazas Project.

In addition to the threshold listed above, to provide guidance to local lead agencies on determining significance for GHG emissions in their CEQA documents, the SCAQMD staff has established a GHG CEQA Significance Threshold Working Group. Members of the working group include government agencies implementing CEQA and representatives from various stakeholder groups that will provide input to the SCAQMD staff on developing GHG CEQA significance thresholds.

On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal for an interim GHG significance threshold for projects where the SCAQMD is lead agency. On September 28, 2010, the SCAQMD has recommended a threshold of 3,000 metric tons of CO_2e as a Tier 3 threshold for all residential and commercial land uses under CEQA. For the purpose of this evaluation, a threshold of 3,000 metric tons of CO_2e is used to assess significance of greenhouse gas emissions.

Based on the results of the CalEEMod Model, the project would generate a total of 423 metric tons of CO_2e emissions during construction. The SCAQMD recommends amortizing construction emissions over a period of 30 years to estimate the contribution of construction emissions to operational emissions over the project lifetime. Amortized over 30 years, the construction of the Project will generate 14 metric tons of CO_2e on an annualized basis.

Based on the results of the CalEEMod Model, the project would generate a total of 1,393 metric tons of CO_2e emissions for operations. Adding the amortized construction emissions results in an estimate of 1,407 metric tons of CO_2e emissions. This level is below the SCAQMD's Tier 3 threshold of 3,000 metric tons of CO_2e emissions for residential and commercial land uses. The project's GHG emissions would therefore be less than significant.

6.0 CONCLUSIONS

The air quality and GHG analysis for the Las Terrazas Apartments and Services Center proposed in unincorporated San Bernardino County evaluated emissions associated with both the construction and operation of the project. Emissions associated with construction and operation were compared with significance thresholds developed by the SCAQMD, which provide a conservative means of evaluating whether project emissions would cause a significant impact on the ambient air quality or whether further evaluation is warranted. Emissions associated with construction and operation are below the significance thresholds for all phases and pollutants. Thus the emissions associated with construction and operation of the project would not result in a significant impact on the ambient air quality.

Impacts to sensitive receptors were evaluated based on the project's potential to emit toxic air contaminants that would expose sensitive receptors to substantial pollutant concentrations, and on the potential for toxic air contaminants from nearby sources to affect the project. The project is not a source of toxic emissions and impacts from the project to sensitive receptors are therefore less than significant. Impacts associated with nearby sources on the project are consistent with the results of the SCAQMD's MATES III Study. The project would also not expose a substantial number of receptors to objectionable odors.

Emissions of GHGs are also below the SCAQMD's recommended significance threshold of 3,000 metric tons of CO_2e for residential and commercial projects. GHG emissions would be less than significant.

7.0 REFERENCES

Association of Environmental Professionals. 2007. *Recommendations by the Association of Environmental Professionals (AEP) on How to Analyze Greenhouse Gas Emissions and Global Climate Change in CEQA Documents*. June.

Bay Area Air Quality Management District. 2010. *California Environmental Quality Act Air Quality Guidelines*. June.

California Air Pollution Control Officers Association. 2008. *CEQA and Climate Change – Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act.* January.

California Office of Environmental Health Hazard Assessment. 2003. *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. August.

California Office of Environmental Health Hazard Assessment. 2005. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II: Technical Support Document for Describing Available Cancer Potency Factors. May

California Air Resources Board. 2007. EMFAC2007 Emissions Model.

California Air Resources Board. 2007b. *Staff Report, California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit*.

California Air Resources Board. 2007c. California's Greenhouse Gas Inventory, 1990 – 2004. November. http://www.arb.ca.gov/cc/inventory/archive/archive.htm

California Air Resources Board. 2008. *Climate Change Proposed Scoping Plan*. October.

California Office of Environmental Health Hazard Assessment. 2012. *Health Effects of Diesel Exhaust*. http://oehha.ca.gov/public_info/facts/dieselfacts.html.

California Office of Environmental Health Hazard Assessment. 2015. *Air Toxics Hot Spots Program, Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments.* February.

ENVIRON. 2013. CalEEMod Model, Version 2013.2.2.

Linscott, Law & Greenspan. 2015. *Traffic Impact Analysis – Las Terrazas Project*.

SCAQMD. 2008. *Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES III)*. September.

United Nations Framework Convention on Climate Change. 2006. *Greenhouse Gas Emissions Data, Predefined Queries, Annex I Parties – GHG total without LULUCF (land-use, land-use change and forestry).* http://unfccc.int/ghg_emissions_data/predefined_queries/items/3841.php.

U.S. EPA. 2006. *The U.S. Inventory of Greenhouse Gas Emissions and Sinks: Fast Facts.* www.epa.gov/climatechange/emissions/downloads06/06FastFacts.pdf.

U.S. EPA. 2009. *Emission Factors for Locomotives*, EPA-420-F-09-025. April.

Appendix A

CalEEMod
Model Outputs

Las Terrazas Residential Development

South Coast Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Low Rise	112.00	Dwelling Unit	5.00	112,000.00	320
General Office Building	2.00	1000sqft	0.41	2,000.00	0
Day-Care Center	50.00	Student	1.00	2,826.14	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	9			**Operational Year**	2016

Utility Company

CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0	**N2O Intensity (lb/MWhr)**	0

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Based on project description

Construction Phase - Assuming 12-month construction schedule

Grading - Assuming no export

Trips and VMT - Assuming paving materials brought to site

Vehicle Trips - Based on trip generation rates from traffic report

Woodstoves - assuming no fireplaces

Construction Off-road Equipment Mitigation -

Water Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	66.00
tblConstructionPhase	NumDays	230.00	132.00
tblConstructionPhase	NumDays	20.00	42.00
tblConstructionPhase	NumDays	20.00	87.00
tblConstructionPhase	PhaseEndDate	4/1/2016	12/31/2015
tblConstructionPhase	PhaseEndDate	2/27/2015	2/28/2015
tblConstructionPhase	PhaseStartDate	1/1/2016	10/1/2015
tblFireplaces	NumberGas	95.20	0.00
tblFireplaces	NumberNoFireplace	11.20	112.00
tblFireplaces	NumberWood	5.60	0.00
tblGrading	AcresOfGrading	21.00	6.41
tblLandUse	LotAcreage	7.00	5.00
tblLandUse	LotAcreage	0.05	0.41
tblLandUse	LotAcreage	0.06	1.00
tblProjectCharacteristics	OperationalYear	2014	2016
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblVehicleTrips	ST_TR	7.16	6.65
tblVehicleTrips	ST_TR	0.39	4.38
tblVehicleTrips	ST_TR	2.37	0.00
tblVehicleTrips	SU_TR	6.07	6.65
tblVehicleTrips	SU_TR	0.37	4.38
tblVehicleTrips	SU_TR	0.98	0.00
tblVehicleTrips	WD_TR	6.59	6.65
tblVehicleTrips	WD_TR	4.48	4.38
tblVehicleTrips	WD_TR	11.01	0.00
tblWoodstoves	NumberCatalytic	5.60	0.00
tblWoodstoves	NumberNoncatalytic	5.60	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	19.6080	40.5027	29.0754	0.0465	6.3516	2.3694	8.6814	3.3722	2.2404	5.5156	0.0000	4,465.2257	4,465.2257	0.9441	0.0000	4,485.0514
Total	**19.6080**	**40.5027**	**29.0754**	**0.0465**	**6.3516**	**2.3694**	**8.6814**	**3.3722**	**2.2404**	**5.5156**	**0.0000**	**4,465.2257**	**4,465.2257**	**0.9441**	**0.0000**	**4,485.0514**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	19.6080	40.5027	29.0754	0.0465	2.5794	2.3694	4.9092	1.3423	2.2404	3.4857	0.0000	4,465.2257	4,465.2257	0.9441	0.0000	4,485.0514
Total	**19.6080**	**40.5027**	**29.0754**	**0.0465**	**2.5794**	**2.3694**	**4.9092**	**1.3423**	**2.2404**	**3.4857**	**0.0000**	**4,465.2257**	**4,465.2257**	**0.9441**	**0.0000**	**4,485.0514**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	59.39	0.00	43.45	60.20	0.00	36.80	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060
Energy	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471
Mobile	3.5100	9.4129	39.2365	0.0908	6.0710	0.1344	6.2054	1.6220	0.1236	1.7456		7,969.247 4	7,969.247 4	0.3177		7,975.918 3
Total	**6.4381**	**9.9391**	**48.7939**	**0.0939**	**6.0710**	**0.2186**	**6.2896**	**1.6220**	**0.2078**	**1.8297**	**0.0000**	**8,516.613 9**	**8,516.613 9**	**0.3448**	**9.7300e-003**	**8,526.871 3**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060
Energy	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471
Mobile	3.5100	9.4129	39.2365	0.0908	6.0710	0.1344	6.2054	1.6220	0.1236	1.7456		7,969.247 4	7,969.247 4	0.3177		7,975.918 3
Total	**6.4381**	**9.9391**	**48.7939**	**0.0939**	**6.0710**	**0.2186**	**6.2896**	**1.6220**	**0.2078**	**1.8297**	**0.0000**	**8,516.613 9**	**8,516.613 9**	**0.3448**	**9.7300e-003**	**8,526.871 3**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	1/1/2015	2/28/2015	5	42	
2	Paving	Paving	3/1/2015	6/30/2015	5	87	
3	Building Construction	Building Construction	7/1/2015	12/31/2015	5	132	
4	Architectural Coating	Architectural Coating	10/1/2015	12/31/2015	5	66	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 6.41

Acres of Paving: 0

Residential Indoor: 226,800; Residential Outdoor: 75,600; Non-Residential Indoor: 7,239; Non-Residential Outdoor: 2,413 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Grading	Excavators	1	8.00	162	0.38
Building Construction	Cranes	1	7.00	226	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	125	0.42
Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Paving Equipment	2	8.00	130	0.36
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	82.00	13.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	10.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	16.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.1839	0.0000	6.1839	3.3277	0.0000	3.3277			0.0000			0.0000
Off-Road	3.8327	40.4161	26.6731	0.0298		2.3284	2.3284		2.1421	2.1421		3,129.0158	3,129.0158	0.9341		3,148.6328
Total	**3.8327**	**40.4161**	**26.6731**	**0.0298**	**6.1839**	**2.3284**	**8.5123**	**3.3277**	**2.1421**	**5.4698**		**3,129.0158**	**3,129.0158**	**0.9341**		**3,148.6328**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0692	0.0866	1.0745	2.1300e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		184.8048	184.8048	9.9400e-003		185.0135
Total	**0.0692**	**0.0866**	**1.0745**	**2.1300e-003**	**0.1677**	**1.4800e-003**	**0.1691**	**0.0445**	**1.3500e-003**	**0.0458**		**184.8048**	**184.8048**	**9.9400e-003**		**185.0135**

3.2 Grading - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.4117	0.0000	2.4117	1.2978	0.0000	1.2978			0.0000			0.0000
Off-Road	3.8327	40.4161	26.6731	0.0298		2.3284	2.3284		2.1421	2.1421	0.0000	3,129.015 8	3,129.015 8	0.9341		3,148.632 8
Total	**3.8327**	**40.4161**	**26.6731**	**0.0298**	**2.4117**	**2.3284**	**4.7401**	**1.2978**	**2.1421**	**3.4399**	**0.0000**	**3,129.015 8**	**3,129.015 8**	**0.9341**		**3,148.632 8**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0692	0.0866	1.0745	2.1300e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		184.8048	184.8048	9.9400e-003		185.0135
Total	**0.0692**	**0.0866**	**1.0745**	**2.1300e-003**	**0.1677**	**1.4800e-003**	**0.1691**	**0.0445**	**1.3500e-003**	**0.0458**		**184.8048**	**184.8048**	**9.9400e-003**		**185.0135**

3.3 Paving - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3172	25.1758	14.9781	0.0223		1.4148	1.4148		1.3016	1.3016		2,339.898 4	2,339.898 4	0.6986		2,354.568 1
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.3172**	**25.1758**	**14.9781**	**0.0223**		**1.4148**	**1.4148**		**1.3016**	**1.3016**		**2,339.898 4**	**2,339.898 4**	**0.6986**		**2,354.568 1**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0945	0.9827	1.0840	2.1800e-003	0.0625	0.0170	0.0795	0.0178	0.0156	0.0334		220.6226	220.6226	1.7300e-003		220.6590
Worker	0.0692	0.0866	1.0745	2.1300e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		184.8048	184.8048	9.9400e-003		185.0135
Total	**0.1637**	**1.0692**	**2.1585**	**4.3100e-003**	**0.2301**	**0.0185**	**0.2486**	**0.0623**	**0.0170**	**0.0792**		**405.4274**	**405.4274**	**0.0117**		**405.6726**

3.3 Paving - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3172	25.1758	14.9781	0.0223		1.4148	1.4148		1.3016	1.3016	0.0000	2,339.8984	2,339.8984	0.6986		2,354.5681
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.3172**	**25.1758**	**14.9781**	**0.0223**		**1.4148**	**1.4148**		**1.3016**	**1.3016**	**0.0000**	**2,339.8984**	**2,339.8984**	**0.6986**		**2,354.5681**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0945	0.9827	1.0840	2.1800e-003	0.0625	0.0170	0.0795	0.0178	0.0156	0.0334		220.6226	220.6226	1.7300e-003		220.6590
Worker	0.0692	0.0866	1.0745	2.1300e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		184.8048	184.8048	9.9400e-003		185.0135
Total	**0.1637**	**1.0692**	**2.1585**	**4.3100e-003**	**0.2301**	**0.0185**	**0.2486**	**0.0623**	**0.0170**	**0.0792**		**405.4274**	**405.4274**	**0.0117**		**405.6726**

3.4 Building Construction - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.6591	30.0299	18.7446	0.0268		2.1167	2.1167		1.9904	1.9904		2,689.5771	2,689.5771	0.6748		2,703.7483
Total	**3.6591**	**30.0299**	**18.7446**	**0.0268**		**2.1167**	**2.1167**		**1.9904**	**1.9904**		**2,689.5771**	**2,689.5771**	**0.6748**		**2,703.7483**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1229	1.2775	1.4092	2.8300e-003	0.0812	0.0221	0.1033	0.0231	0.0203	0.0434		286.8094	286.8094	2.2500e-003		286.8568
Worker	0.3782	0.4733	5.8738	0.0116	0.9166	8.0700e-003	0.9246	0.2431	7.3900e-003	0.2505		1,010.2660	1,010.2660	0.0544		1,011.4073
Total	**0.5010**	**1.7507**	**7.2830**	**0.0145**	**0.9978**	**0.0302**	**1.0279**	**0.2662**	**0.0277**	**0.2939**		**1,297.0754**	**1,297.0754**	**0.0566**		**1,298.2640**

3.4 Building Construction - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.6591	30.0299	18.7446	0.0268		2.1167	2.1167		1.9904	1.9904	0.0000	2,689.5771	2,689.5771	0.6748		2,703.7483
Total	**3.6591**	**30.0299**	**18.7446**	**0.0268**		**2.1167**	**2.1167**		**1.9904**	**1.9904**	**0.0000**	**2,689.5771**	**2,689.5771**	**0.6748**		**2,703.7483**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1229	1.2775	1.4092	2.8300e-003	0.0812	0.0221	0.1033	0.0231	0.0203	0.0434		286.8094	286.8094	2.2500e-003		286.8568
Worker	0.3782	0.4733	5.8738	0.0116	0.9166	8.0700e-003	0.9246	0.2431	7.3900e-003	0.2505		1,010.2660	1,010.2660	0.0544		1,011.4073
Total	**0.5010**	**1.7507**	**7.2830**	**0.0145**	**0.9978**	**0.0302**	**1.0279**	**0.2662**	**0.0277**	**0.2939**		**1,297.0754**	**1,297.0754**	**0.0566**		**1,298.2640**

3.5 Architectural Coating - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	14.9675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.4066	2.5703	1.9018	2.9700e-003		0.2209	0.2209		0.2209	0.2209		281.4481	281.4481	0.0367		282.2177
Total	**15.3741**	**2.5703**	**1.9018**	**2.9700e-003**		**0.2209**	**0.2209**		**0.2209**	**0.2209**		**281.4481**	**281.4481**	**0.0367**		**282.2177**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0738	0.0923	1.1461	2.2700e-003	0.1788	1.5700e-003	0.1804	0.0474	1.4400e-003	0.0489		197.1251	197.1251	0.0106		197.3478
Total	**0.0738**	**0.0923**	**1.1461**	**2.2700e-003**	**0.1788**	**1.5700e-003**	**0.1804**	**0.0474**	**1.4400e-003**	**0.0489**		**197.1251**	**197.1251**	**0.0106**		**197.3478**

3.5 Architectural Coating - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	14.9675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.4066	2.5703	1.9018	2.9700e-003		0.2209	0.2209		0.2209	0.2209	0.0000	281.4481	281.4481	0.0367		282.2177
Total	**15.3741**	**2.5703**	**1.9018**	**2.9700e-003**		**0.2209**	**0.2209**		**0.2209**	**0.2209**	**0.0000**	**281.4481**	**281.4481**	**0.0367**		**282.2177**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0738	0.0923	1.1461	2.2700e-003	0.1788	1.5700e-003	0.1804	0.0474	1.4400e-003	0.0489		197.1251	197.1251	0.0106		197.3478
Total	**0.0738**	**0.0923**	**1.1461**	**2.2700e-003**	**0.1788**	**1.5700e-003**	**0.1804**	**0.0474**	**1.4400e-003**	**0.0489**		**197.1251**	**197.1251**	**0.0106**		**197.3478**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	3.5100	9.4129	39.2365	0.0908	6.0710	0.1344	6.2054	1.6220	0.1236	1.7456		7,969.247 4	7,969.247 4	0.3177		7,975.918 3
Unmitigated	3.5100	9.4129	39.2365	0.0908	6.0710	0.1344	6.2054	1.6220	0.1236	1.7456		7,969.247 4	7,969.247 4	0.3177		7,975.918 3

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	744.80	744.80	744.80	2,545,095	2,545,095
Day-Care Center	219.00	219.00	219.00	318,443	318,443
General Office Building	0.00	0.00	0.00		
Total	963.80	963.80	963.80	2,863,538	2,863,538

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Low Rise	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3
Day-Care Center	16.60	8.40	6.90	12.70	82.30	5.00	28	58	14
General Office Building	16.60	8.40	6.90	33.00	48.00	19.00	77	19	4

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.514315	0.060290	0.180146	0.139458	0.042007	0.006636	0.015782	0.029894	0.001929	0.002512	0.004343	0.000595	0.002093

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471
NaturalGas Unmitigated	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Day-Care Center	84.3196	9.1000e-004	8.2700e-003	6.9400e-003	5.0000e-005		6.3000e-004	6.3000e-004		6.3000e-004	6.3000e-004		9.9200	9.9200	1.9000e-004	1.8000e-004	9.9803
General Office Building	59.8904	6.5000e-004	5.8700e-003	4.9300e-003	4.0000e-005		4.5000e-004	4.5000e-004		4.5000e-004	4.5000e-004		7.0459	7.0459	1.4000e-004	1.3000e-004	7.0888
Apartments Low Rise	4366.89	0.0471	0.4024	0.1713	2.5700e-003		0.0325	0.0325		0.0325	0.0325		513.7513	513.7513	9.8500e-003	9.4200e-003	516.8779
Total		**0.0487**	**0.4166**	**0.1831**	**2.6600e-003**		**0.0336**	**0.0336**		**0.0336**	**0.0336**		**530.7172**	**530.7172**	**0.0102**	**9.7300e-003**	**533.9471**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Day-Care Center	0.0843196	9.1000e-004	8.2700e-003	6.9400e-003	5.0000e-005		6.3000e-004	6.3000e-004		6.3000e-004	6.3000e-004		9.9200	9.9200	1.9000e-004	1.8000e-004	9.9803
General Office Building	0.0598904	6.5000e-004	5.8700e-003	4.9300e-003	4.0000e-005		4.5000e-004	4.5000e-004		4.5000e-004	4.5000e-004		7.0459	7.0459	1.4000e-004	1.3000e-004	7.0888
Apartments Low Rise	4.36689	0.0471	0.4024	0.1713	2.5700e-003		0.0325	0.0325		0.0325	0.0325		513.7513	513.7513	9.8500e-003	9.4200e-003	516.8779
Total		**0.0487**	**0.4166**	**0.1831**	**2.6600e-003**		**0.0336**	**0.0336**		**0.0336**	**0.0336**		**530.7172**	**530.7172**	**0.0102**	**9.7300e-003**	**533.9471**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060
Unmitigated	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2707					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3132					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.2956	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506		16.6492	16.6492	0.0170		17.0060
Total	**2.8794**	**0.1097**	**9.3743**	**4.9000e-004**		**0.0506**	**0.0506**		**0.0506**	**0.0506**	**0.0000**	**16.6492**	**16.6492**	**0.0170**	**0.0000**	**17.0060**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2707					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3132					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.2956	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506		16.6492	16.6492	0.0170		17.0060
Total	**2.8794**	**0.1097**	**9.3743**	**4.9000e-004**		**0.0506**	**0.0506**		**0.0506**	**0.0506**	**0.0000**	**16.6492**	**16.6492**	**0.0170**	**0.0000**	**17.0060**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Las Terrazas Residential Development

South Coast Air Basin, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Low Rise	112.00	Dwelling Unit	5.00	112,000.00	320
General Office Building	2.00	1000sqft	0.41	2,000.00	0
Day-Care Center	50.00	Student	1.00	2,826.14	0

1.2 Other Project Characteristics

Urbanization Urban

Wind Speed (m/s) 2.2

Precipitation Freq (Days) 31

Climate Zone 9

Operational Year 2016

Utility Company

CO2 Intensity (lb/MWhr) 0

CH4 Intensity (lb/MWhr) 0

N2O Intensity (lb/MWhr) 0

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Based on project description

Construction Phase - Assuming 12-month construction schedule

Grading - Assuming no export

Trips and VMT - Assuming paving materials brought to site

Vehicle Trips - Based on trip generation rates from traffic report

Woodstoves - assuming no fireplaces

Construction Off-road Equipment Mitigation -

Water Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	66.00
tblConstructionPhase	NumDays	230.00	132.00
tblConstructionPhase	NumDays	20.00	42.00
tblConstructionPhase	NumDays	20.00	87.00
tblConstructionPhase	PhaseEndDate	4/1/2016	12/31/2015
tblConstructionPhase	PhaseEndDate	2/27/2015	2/28/2015
tblConstructionPhase	PhaseStartDate	1/1/2016	10/1/2015
tblFireplaces	NumberGas	95.20	0.00
tblFireplaces	NumberNoFireplace	11.20	112.00
tblFireplaces	NumberWood	5.60	0.00
tblGrading	AcresOfGrading	21.00	6.41
tblLandUse	LotAcreage	7.00	5.00
tblLandUse	LotAcreage	0.05	0.41
tblLandUse	LotAcreage	0.06	1.00
tblProjectCharacteristics	OperationalYear	2014	2016
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblVehicleTrips	ST_TR	7.16	6.65
tblVehicleTrips	ST_TR	0.39	4.38
tblVehicleTrips	ST_TR	2.37	0.00
tblVehicleTrips	SU_TR	6.07	6.65
tblVehicleTrips	SU_TR	0.37	4.38
tblVehicleTrips	SU_TR	0.98	0.00
tblVehicleTrips	WD_TR	6.59	6.65
tblVehicleTrips	WD_TR	4.48	4.38
tblVehicleTrips	WD_TR	11.01	0.00
tblWoodstoves	NumberCatalytic	5.60	0.00
tblWoodstoves	NumberNoncatalytic	5.60	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	19.6311	40.5112	28.8107	0.0456	6.3516	2.3696	8.6814	3.3722	2.2407	5.5156	0.0000	4,387.9730	4,387.9730	0.9441	0.0000	4,407.7987
Total	**19.6311**	**40.5112**	**28.8107**	**0.0456**	**6.3516**	**2.3696**	**8.6814**	**3.3722**	**2.2407**	**5.5156**	**0.0000**	**4,387.9730**	**4,387.9730**	**0.9441**	**0.0000**	**4,407.7987**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	19.6311	40.5112	28.8107	0.0456	2.5794	2.3696	4.9092	1.3423	2.2407	3.4857	0.0000	4,387.9730	4,387.9730	0.9441	0.0000	4,407.7987
Total	**19.6311**	**40.5112**	**28.8107**	**0.0456**	**2.5794**	**2.3696**	**4.9092**	**1.3423**	**2.2407**	**3.4857**	**0.0000**	**4,387.9730**	**4,387.9730**	**0.9441**	**0.0000**	**4,407.7987**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	59.39	0.00	43.45	60.20	0.00	36.80	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060
Energy	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471
Mobile	3.6376	9.8998	38.7481	0.0862	6.0710	0.1350	6.2060	1.6220	0.1242	1.7461		7,581.8728	7,581.8728	0.3179		7,588.5489
Total	**6.5657**	**10.4261**	**48.3056**	**0.0893**	**6.0710**	**0.2192**	**6.2902**	**1.6220**	**0.2083**	**1.8303**	**0.0000**	**8,129.2392**	**8,129.2392**	**0.3451**	**9.7300e-003**	**8,139.5019**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060
Energy	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471
Mobile	3.6376	9.8998	38.7481	0.0862	6.0710	0.1350	6.2060	1.6220	0.1242	1.7461		7,581.8728	7,581.8728	0.3179		7,588.5489
Total	**6.5657**	**10.4261**	**48.3056**	**0.0893**	**6.0710**	**0.2192**	**6.2902**	**1.6220**	**0.2083**	**1.8303**	**0.0000**	**8,129.2392**	**8,129.2392**	**0.3451**	**9.7300e-003**	**8,139.5019**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	1/1/2015	2/28/2015	5	42	
2	Paving	Paving	3/1/2015	6/30/2015	5	87	
3	Building Construction	Building Construction	7/1/2015	12/31/2015	5	132	
4	Architectural Coating	Architectural Coating	10/1/2015	12/31/2015	5	66	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 6.41

Acres of Paving: 0

Residential Indoor: 226,800; Residential Outdoor: 75,600; Non-Residential Indoor: 7,239; Non-Residential Outdoor: 2,413 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Grading	Excavators	1	8.00	162	0.38
Building Construction	Cranes	1	7.00	226	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	125	0.42
Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Paving Equipment	2	8.00	130	0.36
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	82.00	13.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	10.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	16.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.1839	0.0000	6.1839	3.3277	0.0000	3.3277			0.0000			0.0000
Off-Road	3.8327	40.4161	26.6731	0.0298		2.3284	2.3284		2.1421	2.1421		3,129.015 8	3,129.015 8	0.9341		3,148.632 8
Total	**3.8327**	**40.4161**	**26.6731**	**0.0298**	**6.1839**	**2.3284**	**8.5123**	**3.3277**	**2.1421**	**5.4698**		**3,129.015 8**	**3,129.015 8**	**0.9341**		**3,148.632 8**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0709	0.0951	0.9938	1.9900e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		173.3466	173.3466	9.9400e-003		173.5553
Total	**0.0709**	**0.0951**	**0.9938**	**1.9900e-003**	**0.1677**	**1.4800e-003**	**0.1691**	**0.0445**	**1.3500e-003**	**0.0458**		**173.3466**	**173.3466**	**9.9400e-003**		**173.5553**

3.2 Grading - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.4117	0.0000	2.4117	1.2978	0.0000	1.2978			0.0000			0.0000
Off-Road	3.8327	40.4161	26.6731	0.0298		2.3284	2.3284		2.1421	2.1421	0.0000	3,129.0158	3,129.0158	0.9341		3,148.6328
Total	**3.8327**	**40.4161**	**26.6731**	**0.0298**	**2.4117**	**2.3284**	**4.7401**	**1.2978**	**2.1421**	**3.4399**	**0.0000**	**3,129.0158**	**3,129.0158**	**0.9341**		**3,148.6328**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0709	0.0951	0.9938	1.9900e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		173.3466	173.3466	9.9400e-003		173.5553
Total	**0.0709**	**0.0951**	**0.9938**	**1.9900e-003**	**0.1677**	**1.4800e-003**	**0.1691**	**0.0445**	**1.3500e-003**	**0.0458**		**173.3466**	**173.3466**	**9.9400e-003**		**173.5553**

3.3 Paving - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3172	25.1758	14.9781	0.0223		1.4148	1.4148		1.3016	1.3016		2,339.8984	2,339.8984	0.6986		2,354.5681
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.3172**	**25.1758**	**14.9781**	**0.0223**		**1.4148**	**1.4148**		**1.3016**	**1.3016**		**2,339.8984**	**2,339.8984**	**0.6986**		**2,354.5681**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1038	1.0082	1.2857	2.1600e-003	0.0625	0.0172	0.0797	0.0178	0.0158	0.0336		218.7823	218.7823	1.7800e-003		218.8197
Worker	0.0709	0.0951	0.9938	1.9900e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		173.3466	173.3466	9.9400e-003		173.5553
Total	**0.1747**	**1.1033**	**2.2795**	**4.1500e-003**	**0.2301**	**0.0187**	**0.2488**	**0.0623**	**0.0172**	**0.0794**		**392.1289**	**392.1289**	**0.0117**		**392.3750**

3.3 Paving - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3172	25.1758	14.9781	0.0223		1.4148	1.4148		1.3016	1.3016	0.0000	2,339.8984	2,339.8984	0.6986		2,354.5681
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.3172**	**25.1758**	**14.9781**	**0.0223**		**1.4148**	**1.4148**		**1.3016**	**1.3016**	**0.0000**	**2,339.8984**	**2,339.8984**	**0.6986**		**2,354.5681**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1038	1.0082	1.2857	2.1600e-003	0.0625	0.0172	0.0797	0.0178	0.0158	0.0336		218.7823	218.7823	1.7800e-003		218.8197
Worker	0.0709	0.0951	0.9938	1.9900e-003	0.1677	1.4800e-003	0.1691	0.0445	1.3500e-003	0.0458		173.3466	173.3466	9.9400e-003		173.5553
Total	**0.1747**	**1.1033**	**2.2795**	**4.1500e-003**	**0.2301**	**0.0187**	**0.2488**	**0.0623**	**0.0172**	**0.0794**		**392.1289**	**392.1289**	**0.0117**		**392.3750**

3.4 Building Construction - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.6591	30.0299	18.7446	0.0268		2.1167	2.1167		1.9904	1.9904		2,689.5771	2,689.5771	0.6748		2,703.7483
Total	**3.6591**	**30.0299**	**18.7446**	**0.0268**		**2.1167**	**2.1167**		**1.9904**	**1.9904**		**2,689.5771**	**2,689.5771**	**0.6748**		**2,703.7483**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1349	1.3107	1.6714	2.8100e-003	0.0812	0.0224	0.1036	0.0231	0.0206	0.0437		284.4170	284.4170	2.3200e-003		284.4656
Worker	0.3874	0.5200	5.4329	0.0109	0.9166	8.0700e-003	0.9246	0.2431	7.3900e-003	0.2505		947.6278	947.6278	0.0544		948.7691
Total	**0.5223**	**1.8307**	**7.1043**	**0.0137**	**0.9978**	**0.0304**	**1.0282**	**0.2662**	**0.0280**	**0.2942**		**1,232.0448**	**1,232.0448**	**0.0567**		**1,233.2347**

3.4 Building Construction - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.6591	30.0299	18.7446	0.0268		2.1167	2.1167		1.9904	1.9904	0.0000	2,689.5771	2,689.5771	0.6748		2,703.7483
Total	**3.6591**	**30.0299**	**18.7446**	**0.0268**		**2.1167**	**2.1167**		**1.9904**	**1.9904**	**0.0000**	**2,689.5771**	**2,689.5771**	**0.6748**		**2,703.7483**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.1349	1.3107	1.6714	2.8100e-003	0.0812	0.0224	0.1036	0.0231	0.0206	0.0437		284.4170	284.4170	2.3200e-003		284.4656
Worker	0.3874	0.5200	5.4329	0.0109	0.9166	8.0700e-003	0.9246	0.2431	7.3900e-003	0.2505		947.6278	947.6278	0.0544		948.7691
Total	**0.5223**	**1.8307**	**7.1043**	**0.0137**	**0.9978**	**0.0304**	**1.0282**	**0.2662**	**0.0280**	**0.2942**		**1,232.0448**	**1,232.0448**	**0.0567**		**1,233.2347**

3.5 Architectural Coating - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	14.9675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.4066	2.5703	1.9018	2.9700e-003		0.2209	0.2209		0.2209	0.2209		281.4481	281.4481	0.0367		282.2177
Total	**15.3741**	**2.5703**	**1.9018**	**2.9700e-003**		**0.2209**	**0.2209**		**0.2209**	**0.2209**		**281.4481**	**281.4481**	**0.0367**		**282.2177**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0756	0.1015	1.0601	2.1300e-003	0.1788	1.5700e-003	0.1804	0.0474	1.4400e-003	0.0489		184.9030	184.9030	0.0106		185.1257
Total	**0.0756**	**0.1015**	**1.0601**	**2.1300e-003**	**0.1788**	**1.5700e-003**	**0.1804**	**0.0474**	**1.4400e-003**	**0.0489**		**184.9030**	**184.9030**	**0.0106**		**185.1257**

3.5 Architectural Coating - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	14.9675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.4066	2.5703	1.9018	2.9700e-003		0.2209	0.2209		0.2209	0.2209	0.0000	281.4481	281.4481	0.0367		282.2177
Total	**15.3741**	**2.5703**	**1.9018**	**2.9700e-003**		**0.2209**	**0.2209**		**0.2209**	**0.2209**	**0.0000**	**281.4481**	**281.4481**	**0.0367**		**282.2177**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0756	0.1015	1.0601	2.1300e-003	0.1788	1.5700e-003	0.1804	0.0474	1.4400e-003	0.0489		184.9030	184.9030	0.0106		185.1257
Total	**0.0756**	**0.1015**	**1.0601**	**2.1300e-003**	**0.1788**	**1.5700e-003**	**0.1804**	**0.0474**	**1.4400e-003**	**0.0489**		**184.9030**	**184.9030**	**0.0106**		**185.1257**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Mitigated	3.6376	9.8998	38.7481	0.0862	6.0710	0.1350	6.2060	1.6220	0.1242	1.7461		7,581.8728	7,581.8728	0.3179		7,588.5489
Unmitigated	3.6376	9.8998	38.7481	0.0862	6.0710	0.1350	6.2060	1.6220	0.1242	1.7461		7,581.8728	7,581.8728	0.3179		7,588.5489

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	744.80	744.80	744.80	2,545,095	2,545,095
Day-Care Center	219.00	219.00	219.00	318,443	318,443
General Office Building	0.00	0.00	0.00		
Total	963.80	963.80	963.80	2,863,538	2,863,538

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Low Rise	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3
Day-Care Center	16.60	8.40	6.90	12.70	82.30	5.00	28	58	14
General Office Building	16.60	8.40	6.90	33.00	48.00	19.00	77	19	4

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.514315	0.060290	0.180146	0.139458	0.042007	0.006636	0.015782	0.029894	0.001929	0.002512	0.004343	0.000595	0.002093

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471
NaturalGas Unmitigated	0.0487	0.4166	0.1831	2.6500e-003		0.0336	0.0336		0.0336	0.0336		530.7172	530.7172	0.0102	9.7300e-003	533.9471

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Apartments Low Rise	4366.89	0.0471	0.4024	0.1713	2.5700e-003		0.0325	0.0325		0.0325	0.0325		513.7513	513.7513	9.8500e-003	9.4200e-003	516.8779
Day-Care Center	84.3196	9.1000e-004	8.2700e-003	6.9400e-003	5.0000e-005		6.3000e-004	6.3000e-004		6.3000e-004	6.3000e-004		9.9200	9.9200	1.9000e-004	1.8000e-004	9.9803
General Office Building	59.8904	6.5000e-004	5.8700e-003	4.9300e-003	4.0000e-005		4.5000e-004	4.5000e-004		4.5000e-004	4.5000e-004		7.0459	7.0459	1.4000e-004	1.3000e-004	7.0888
Total		**0.0487**	**0.4166**	**0.1831**	**2.6600e-003**		**0.0336**	**0.0336**		**0.0336**	**0.0336**		**530.7172**	**530.7172**	**0.0102**	**9.7300e-003**	**533.9471**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Day-Care Center	0.0843196	9.1000e-004	8.2700e-003	6.9400e-003	5.0000e-005		6.3000e-004	6.3000e-004		6.3000e-004	6.3000e-004		9.9200	9.9200	1.9000e-004	1.8000e-004	9.9803
General Office Building	0.0598904	6.5000e-004	5.8700e-003	4.9300e-003	4.0000e-005		4.5000e-004	4.5000e-004		4.5000e-004	4.5000e-004		7.0459	7.0459	1.4000e-004	1.3000e-004	7.0888
Apartments Low Rise	4.36689	0.0471	0.4024	0.1713	2.5700e-003		0.0325	0.0325		0.0325	0.0325		513.7513	513.7513	9.8500e-003	9.4200e-003	516.8779
Total		**0.0487**	**0.4166**	**0.1831**	**2.6600e-003**		**0.0336**	**0.0336**		**0.0336**	**0.0336**		**530.7172**	**530.7172**	**0.0102**	**9.7300e-003**	**533.9471**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060
Unmitigated	2.8794	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506	0.0000	16.6492	16.6492	0.0170	0.0000	17.0060

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2707					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3132					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.2956	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506		16.6492	16.6492	0.0170		17.0060
Total	**2.8794**	**0.1097**	**9.3743**	**4.9000e-004**		**0.0506**	**0.0506**		**0.0506**	**0.0506**	**0.0000**	**16.6492**	**16.6492**	**0.0170**	**0.0000**	**17.0060**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2707					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3132					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.2956	0.1097	9.3743	4.9000e-004		0.0506	0.0506		0.0506	0.0506		16.6492	16.6492	0.0170		17.0060
Total	**2.8794**	**0.1097**	**9.3743**	**4.9000e-004**		**0.0506**	**0.0506**		**0.0506**	**0.0506**	**0.0000**	**16.6492**	**16.6492**	**0.0170**	**0.0000**	**17.0060**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Las Terrazas Residential Development

South Coast Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Low Rise	112.00	Dwelling Unit	5.00	112,000.00	320
General Office Building	2.00	1000sqft	0.41	2,000.00	0
Day-Care Center	50.00	Student	1.00	2,826.14	0

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 31

Climate Zone 9 **Operational Year** 2016

Utility Company

CO2 Intensity (lb/MWhr) 0 **CH4 Intensity (lb/MWhr)** 0 **N2O Intensity (lb/MWhr)** 0

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Based on project description

Construction Phase - Assuming 12-month construction schedule

Grading - Assuming no export

Trips and VMT - Assuming paving materials brought to site

Vehicle Trips - Based on trip generation rates from traffic report

Woodstoves - assuming no fireplaces

Construction Off-road Equipment Mitigation -

Water Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	66.00
tblConstructionPhase	NumDays	230.00	132.00
tblConstructionPhase	NumDays	20.00	42.00
tblConstructionPhase	NumDays	20.00	87.00
tblConstructionPhase	PhaseEndDate	4/1/2016	12/31/2015
tblConstructionPhase	PhaseEndDate	2/27/2015	2/28/2015
tblConstructionPhase	PhaseStartDate	1/1/2016	10/1/2015
tblFireplaces	NumberGas	95.20	0.00
tblFireplaces	NumberNoFireplace	11.20	112.00
tblFireplaces	NumberWood	5.60	0.00
tblGrading	AcresOfGrading	21.00	6.41
tblLandUse	LotAcreage	7.00	5.00
tblLandUse	LotAcreage	0.05	0.41
tblLandUse	LotAcreage	0.06	1.00
tblProjectCharacteristics	OperationalYear	2014	2016
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblVehicleTrips	ST_TR	7.16	6.65
tblVehicleTrips	ST_TR	0.39	4.38
tblVehicleTrips	ST_TR	2.37	0.00
tblVehicleTrips	SU_TR	6.07	6.65
tblVehicleTrips	SU_TR	0.37	4.38
tblVehicleTrips	SU_TR	0.98	0.00
tblVehicleTrips	WD_TR	6.59	6.65
tblVehicleTrips	WD_TR	4.48	4.38
tblVehicleTrips	WD_TR	11.01	0.00
tblWoodstoves	NumberCatalytic	5.60	0.00
tblWoodstoves	NumberNoncatalytic	5.60	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.9739	4.1887	3.1422	4.6800e-003	0.2136	0.2603	0.4739	0.0923	0.2429	0.3352	0.0000	420.7426	420.7426	0.0912	0.0000	422.6582
Total	**0.9739**	**4.1887**	**3.1422**	**4.6800e-003**	**0.2136**	**0.2603**	**0.4739**	**0.0923**	**0.2429**	**0.3352**	**0.0000**	**420.7426**	**420.7426**	**0.0912**	**0.0000**	**422.6582**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.9739	4.1887	3.1422	4.6800e-003	0.1344	0.2603	0.3947	0.0497	0.2429	0.2926	0.0000	420.7422	420.7422	0.0912	0.0000	422.6579
Total	**0.9739**	**4.1887**	**3.1422**	**4.6800e-003**	**0.1344**	**0.2603**	**0.3947**	**0.0497**	**0.2429**	**0.2926**	**0.0000**	**420.7422**	**420.7422**	**0.0912**	**0.0000**	**422.6579**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**37.09**	**0.00**	**16.72**	**46.20**	**0.00**	**12.72**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.5085	0.0137	1.1718	6.0000e-005		6.3200e-003	6.3200e-003		6.3200e-003	6.3200e-003	0.0000	1.8880	1.8880	1.9300e-003	0.0000	1.9284
Energy	8.8800e-003	0.0760	0.0334	4.8000e-004		6.1300e-003	6.1300e-003		6.1300e-003	6.1300e-003	0.0000	87.8662	87.8662	1.6800e-003	1.6100e-003	88.4009
Mobile	0.6282	1.8373	7.1188	0.0159	1.0848	0.0245	1.1093	0.2903	0.0225	0.3128	0.0000	1,265.7940	1,265.7940	0.0524	0.0000	1,266.8945
Waste						0.0000	0.0000		0.0000	0.0000	12.6890	0.0000	12.6890	0.7499	0.0000	28.4368
Water						0.0000	0.0000		0.0000	0.0000	2.4663	0.0000	2.4663	0.2533	5.9800e-003	9.6401
Total	**1.1455**	**1.9270**	**8.3241**	**0.0164**	**1.0848**	**0.0369**	**1.1218**	**0.2903**	**0.0350**	**0.3252**	**15.1553**	**1,355.5482**	**1,370.7035**	**1.0592**	**7.5900e-003**	**1,395.3008**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.5085	0.0137	1.1718	6.0000e-005		6.3200e-003	6.3200e-003		6.3200e-003	6.3200e-003	0.0000	1.8880	1.8880	1.9300e-003	0.0000	1.9284
Energy	8.8800e-003	0.0760	0.0334	4.8000e-004		6.1300e-003	6.1300e-003		6.1300e-003	6.1300e-003	0.0000	87.8662	87.8662	1.6800e-003	1.6100e-003	88.4009
Mobile	0.6282	1.8373	7.1188	0.0159	1.0848	0.0245	1.1093	0.2903	0.0225	0.3128	0.0000	1,265.7940	1,265.7940	0.0524	0.0000	1,266.8945
Waste						0.0000	0.0000		0.0000	0.0000	12.6890	0.0000	12.6890	0.7499	0.0000	28.4368
Water						0.0000	0.0000		0.0000	0.0000	1.9731	0.0000	1.9731	0.2027	4.7900e-003	7.7121
Total	**1.1455**	**1.9270**	**8.3241**	**0.0164**	**1.0848**	**0.0369**	**1.1218**	**0.2903**	**0.0350**	**0.3252**	**14.6620**	**1,355.5482**	**1,370.2102**	**1.0086**	**6.4000e-003**	**1,393.3727**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.25**	**0.00**	**0.04**	**4.78**	**15.68**	**0.14**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	1/1/2015	2/28/2015	5	42	
2	Paving	Paving	3/1/2015	6/30/2015	5	87	
3	Building Construction	Building Construction	7/1/2015	12/31/2015	5	132	
4	Architectural Coating	Architectural Coating	10/1/2015	12/31/2015	5	66	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 6.41

Acres of Paving: 0

Residential Indoor: 226,800; Residential Outdoor: 75,600; Non-Residential Indoor: 7,239; Non-Residential Outdoor: 2,413 (Architectural Coating – sqft)

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Grading	Excavators	1	8.00	162	0.38
Building Construction	Cranes	1	7.00	226	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	125	0.42
Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Paving Equipment	2	8.00	130	0.36
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	82.00	13.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	10.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	16.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1299	0.0000	0.1299	0.0699	0.0000	0.0699	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0805	0.8487	0.5601	6.3000e-004		0.0489	0.0489		0.0450	0.0450	0.0000	59.6105	59.6105	0.0178	0.0000	59.9842
Total	**0.0805**	**0.8487**	**0.5601**	**6.3000e-004**	**0.1299**	**0.0489**	**0.1788**	**0.0699**	**0.0450**	**0.1149**	**0.0000**	**59.6105**	**59.6105**	**0.0178**	**0.0000**	**59.9842**

3.2 Grading - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-003	2.0600e-003	0.0214	4.0000e-005	3.4600e-003	3.0000e-005	3.4900e-003	9.2000e-004	3.0000e-005	9.5000e-004	0.0000	3.3538	3.3538	1.9000e-004	0.0000	3.3578
Total	**1.4000e-003**	**2.0600e-003**	**0.0214**	**4.0000e-005**	**3.4600e-003**	**3.0000e-005**	**3.4900e-003**	**9.2000e-004**	**3.0000e-005**	**9.5000e-004**	**0.0000**	**3.3538**	**3.3538**	**1.9000e-004**	**0.0000**	**3.3578**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0507	0.0000	0.0507	0.0273	0.0000	0.0273	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0805	0.8487	0.5601	6.3000e-004		0.0489	0.0489		0.0450	0.0450	0.0000	59.6104	59.6104	0.0178	0.0000	59.9842
Total	**0.0805**	**0.8487**	**0.5601**	**6.3000e-004**	**0.0507**	**0.0489**	**0.0996**	**0.0273**	**0.0450**	**0.0722**	**0.0000**	**59.6104**	**59.6104**	**0.0178**	**0.0000**	**59.9842**

3.2 Grading - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-003	2.0600e-003	0.0214	4.0000e-005	3.4600e-003	3.0000e-005	3.4900e-003	9.2000e-004	3.0000e-005	9.5000e-004	0.0000	3.3538	3.3538	1.9000e-004	0.0000	3.3578
Total	**1.4000e-003**	**2.0600e-003**	**0.0214**	**4.0000e-005**	**3.4600e-003**	**3.0000e-005**	**3.4900e-003**	**9.2000e-004**	**3.0000e-005**	**9.5000e-004**	**0.0000**	**3.3538**	**3.3538**	**1.9000e-004**	**0.0000**	**3.3578**

3.3 Paving - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1008	1.0952	0.6516	9.7000e-004		0.0615	0.0615		0.0566	0.0566	0.0000	92.3383	92.3383	0.0276	0.0000	92.9172
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.1008**	**1.0952**	**0.6516**	**9.7000e-004**		**0.0615**	**0.0615**		**0.0566**	**0.0566**	**0.0000**	**92.3383**	**92.3383**	**0.0276**	**0.0000**	**92.9172**

3.3 Paving - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.3800e-003	0.0447	0.0545	9.0000e-005	2.6800e-003	7.4000e-004	3.4200e-003	7.6000e-004	6.8000e-004	1.4500e-003	0.0000	8.6758	8.6758	7.0000e-005	0.0000	8.6773
Worker	2.9100e-003	4.2600e-003	0.0443	9.0000e-005	7.1600e-003	6.0000e-005	7.2200e-003	1.9000e-003	6.0000e-005	1.9600e-003	0.0000	6.9471	6.9471	3.9000e-004	0.0000	6.9554
Total	**7.2900e-003**	**0.0490**	**0.0988**	**1.8000e-004**	**9.8400e-003**	**8.0000e-004**	**0.0106**	**2.6600e-003**	**7.4000e-004**	**3.4100e-003**	**0.0000**	**15.6229**	**15.6229**	**4.6000e-004**	**0.0000**	**15.6326**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1008	1.0952	0.6516	9.7000e-004		0.0615	0.0615		0.0566	0.0566	0.0000	92.3382	92.3382	0.0276	0.0000	92.9171
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.1008**	**1.0952**	**0.6516**	**9.7000e-004**		**0.0615**	**0.0615**		**0.0566**	**0.0566**	**0.0000**	**92.3382**	**92.3382**	**0.0276**	**0.0000**	**92.9171**

3.3 Paving - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.3800e-003	0.0447	0.0545	9.0000e-005	2.6800e-003	7.4000e-004	3.4200e-003	7.6000e-004	6.8000e-004	1.4500e-003	0.0000	8.6758	8.6758	7.0000e-005	0.0000	8.6773
Worker	2.9100e-003	4.2600e-003	0.0443	9.0000e-005	7.1600e-003	6.0000e-005	7.2200e-003	1.9000e-003	6.0000e-005	1.9600e-003	0.0000	6.9471	6.9471	3.9000e-004	0.0000	6.9554
Total	**7.2900e-003**	**0.0490**	**0.0988**	**1.8000e-004**	**9.8400e-003**	**8.0000e-004**	**0.0106**	**2.6600e-003**	**7.4000e-004**	**3.4100e-003**	**0.0000**	**15.6229**	**15.6229**	**4.6000e-004**	**0.0000**	**15.6326**

3.4 Building Construction - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2415	1.9820	1.2371	1.7700e-003		0.1397	0.1397		0.1314	0.1314	0.0000	161.0363	161.0363	0.0404	0.0000	161.8848
Total	**0.2415**	**1.9820**	**1.2371**	**1.7700e-003**		**0.1397**	**0.1397**		**0.1314**	**0.1314**	**0.0000**	**161.0363**	**161.0363**	**0.0404**	**0.0000**	**161.8848**

3.4 Building Construction - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.6500e-003	0.0882	0.1076	1.9000e-004	5.2800e-003	1.4700e-003	6.7400e-003	1.5100e-003	1.3500e-003	2.8500e-003	0.0000	17.1123	17.1123	1.4000e-004	0.0000	17.1152
Worker	0.0241	0.0353	0.3670	7.3000e-004	0.0594	5.3000e-004	0.0599	0.0158	4.9000e-004	0.0163	0.0000	57.6211	57.6211	3.2500e-003	0.0000	57.6895
Total	**0.0328**	**0.1235**	**0.4746**	**9.2000e-004**	**0.0647**	**2.0000e-003**	**0.0667**	**0.0173**	**1.8400e-003**	**0.0191**	**0.0000**	**74.7334**	**74.7334**	**3.3900e-003**	**0.0000**	**74.8046**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2415	1.9820	1.2371	1.7700e-003		0.1397	0.1397		0.1314	0.1314	0.0000	161.0361	161.0361	0.0404	0.0000	161.8846
Total	**0.2415**	**1.9820**	**1.2371**	**1.7700e-003**		**0.1397**	**0.1397**		**0.1314**	**0.1314**	**0.0000**	**161.0361**	**161.0361**	**0.0404**	**0.0000**	**161.8846**

3.4 Building Construction - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.6500e-003	0.0882	0.1076	1.9000e-004	5.2800e-003	1.4700e-003	6.7400e-003	1.5100e-003	1.3500e-003	2.8500e-003	0.0000	17.1123	17.1123	1.4000e-004	0.0000	17.1152
Worker	0.0241	0.0353	0.3670	7.3000e-004	0.0594	5.3000e-004	0.0599	0.0158	4.9000e-004	0.0163	0.0000	57.6211	57.6211	3.2500e-003	0.0000	57.6895
Total	**0.0328**	**0.1235**	**0.4746**	**9.2000e-004**	**0.0647**	**2.0000e-003**	**0.0667**	**0.0173**	**1.8400e-003**	**0.0191**	**0.0000**	**74.7334**	**74.7334**	**3.3900e-003**	**0.0000**	**74.8046**

3.5 Architectural Coating - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.4939					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0134	0.0848	0.0628	1.0000e-004		7.2900e-003	7.2900e-003		7.2900e-003	7.2900e-003	0.0000	8.4257	8.4257	1.1000e-003	0.0000	8.4488
Total	**0.5074**	**0.0848**	**0.0628**	**1.0000e-004**		**7.2900e-003**	**7.2900e-003**		**7.2900e-003**	**7.2900e-003**	**0.0000**	**8.4257**	**8.4257**	**1.1000e-003**	**0.0000**	**8.4488**

3.5 Architectural Coating - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3500e-003	3.4500e-003	0.0358	7.0000e-005	5.7900e-003	5.0000e-005	5.8400e-003	1.5400e-003	5.0000e-005	1.5900e-003	0.0000	5.6216	5.6216	3.2000e-004	0.0000	5.6282
Total	**2.3500e-003**	**3.4500e-003**	**0.0358**	**7.0000e-005**	**5.7900e-003**	**5.0000e-005**	**5.8400e-003**	**1.5400e-003**	**5.0000e-005**	**1.5900e-003**	**0.0000**	**5.6216**	**5.6216**	**3.2000e-004**	**0.0000**	**5.6282**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.4939					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0134	0.0848	0.0628	1.0000e-004		7.2900e-003	7.2900e-003		7.2900e-003	7.2900e-003	0.0000	8.4257	8.4257	1.1000e-003	0.0000	8.4488
Total	**0.5074**	**0.0848**	**0.0628**	**1.0000e-004**		**7.2900e-003**	**7.2900e-003**		**7.2900e-003**	**7.2900e-003**	**0.0000**	**8.4257**	**8.4257**	**1.1000e-003**	**0.0000**	**8.4488**

3.5 Architectural Coating - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3500e-003	3.4500e-003	0.0358	7.0000e-005	5.7900e-003	5.0000e-005	5.8400e-003	1.5400e-003	5.0000e-005	1.5900e-003	0.0000	5.6216	5.6216	3.2000e-004	0.0000	5.6282
Total	**2.3500e-003**	**3.4500e-003**	**0.0358**	**7.0000e-005**	**5.7900e-003**	**5.0000e-005**	**5.8400e-003**	**1.5400e-003**	**5.0000e-005**	**1.5900e-003**	**0.0000**	**5.6216**	**5.6216**	**3.2000e-004**	**0.0000**	**5.6282**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.6282	1.8373	7.1188	0.0159	1.0848	0.0245	1.1093	0.2903	0.0225	0.3128	0.0000	1,265.7940	1,265.7940	0.0524	0.0000	1,266.8945
Unmitigated	0.6282	1.8373	7.1188	0.0159	1.0848	0.0245	1.1093	0.2903	0.0225	0.3128	0.0000	1,265.7940	1,265.7940	0.0524	0.0000	1,266.8945

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	744.80	744.80	744.80	2,545,095	2,545,095
Day-Care Center	219.00	219.00	219.00	318,443	318,443
General Office Building	0.00	0.00	0.00		
Total	963.80	963.80	963.80	2,863,538	2,863,538

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Low Rise	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3
Day-Care Center	16.60	8.40	6.90	12.70	82.30	5.00	28	58	14
General Office Building	16.60	8.40	6.90	33.00	48.00	19.00	77	19	4

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.514315	0.060290	0.180146	0.139458	0.042007	0.006636	0.015782	0.029894	0.001929	0.002512	0.004343	0.000595	0.002093

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	8.8800e-003	0.0760	0.0334	4.8000e-004		6.1300e-003	6.1300e-003		6.1300e-003	6.1300e-003	0.0000	87.8662	87.8662	1.6800e-003	1.6100e-003	88.4009
NaturalGas Unmitigated	8.8800e-003	0.0760	0.0334	4.8000e-004		6.1300e-003	6.1300e-003		6.1300e-003	6.1300e-003	0.0000	87.8662	87.8662	1.6800e-003	1.6100e-003	88.4009

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Day-Care Center	30776.7	1.7000e-004	1.5100e-003	1.2700e-003	1.0000e-005		1.1000e-004	1.1000e-004		1.1000e-004	1.1000e-004	0.0000	1.6424	1.6424	3.0000e-005	3.0000e-005	1.6524
General Office Building	21860	1.2000e-004	1.0700e-003	9.0000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1665	1.1665	2.0000e-005	2.0000e-005	1.1736
Apartments Low Rise	1.59391e+006	8.5900e-003	0.0735	0.0313	4.7000e-004		5.9400e-003	5.9400e-003		5.9400e-003	5.9400e-003	0.0000	85.0573	85.0573	1.6300e-003	1.5600e-003	85.5749
Total		**8.8800e-003**	**0.0760**	**0.0334**	**4.9000e-004**		**6.1300e-003**	**6.1300e-003**		**6.1300e-003**	**6.1300e-003**	**0.0000**	**87.8662**	**87.8662**	**1.6800e-003**	**1.6100e-003**	**88.4009**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Day-Care Center	30776.7	1.7000e-004	1.5100e-003	1.2700e-003	1.0000e-005		1.1000e-004	1.1000e-004		1.1000e-004	1.1000e-004	0.0000	1.6424	1.6424	3.0000e-005	3.0000e-005	1.6524
General Office Building	21860	1.2000e-004	1.0700e-003	9.0000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1665	1.1665	2.0000e-005	2.0000e-005	1.1736
Apartments Low Rise	1.59391e+006	8.5900e-003	0.0735	0.0313	4.7000e-004		5.9400e-003	5.9400e-003		5.9400e-003	5.9400e-003	0.0000	85.0573	85.0573	1.6300e-003	1.5600e-003	85.5749
Total		**8.8800e-003**	**0.0760**	**0.0334**	**4.9000e-004**		**6.1300e-003**	**6.1300e-003**		**6.1300e-003**	**6.1300e-003**	**0.0000**	**87.8662**	**87.8662**	**1.6800e-003**	**1.6100e-003**	**88.4009**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	411172	0.0000	0.0000	0.0000	0.0000
Day-Care Center	18935.1	0.0000	0.0000	0.0000	0.0000
General Office Building	29060	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	411172	0.0000	0.0000	0.0000	0.0000
Day-Care Center	18935.1	0.0000	0.0000	0.0000	0.0000
General Office Building	29060	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.5085	0.0137	1.1718	6.0000e-005		6.3200e-003	6.3200e-003		6.3200e-003	6.3200e-003	0.0000	1.8880	1.8880	1.9300e-003	0.0000	1.9284
Unmitigated	0.5085	0.0137	1.1718	6.0000e-005		6.3200e-003	6.3200e-003		6.3200e-003	6.3200e-003	0.0000	1.8880	1.8880	1.9300e-003	0.0000	1.9284

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0494					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.4222					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0370	0.0137	1.1718	6.0000e-005		6.3200e-003	6.3200e-003		6.3200e-003	6.3200e-003	0.0000	1.8880	1.8880	1.9300e-003	0.0000	1.9284
Total	**0.5085**	**0.0137**	**1.1718**	**6.0000e-005**		**6.3200e-003**	**6.3200e-003**		**6.3200e-003**	**6.3200e-003**	**0.0000**	**1.8880**	**1.8880**	**1.9300e-003**	**0.0000**	**1.9284**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0494					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.4222					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0370	0.0137	1.1718	6.0000e-005		6.3200e-003	6.3200e-003		6.3200e-003	6.3200e-003	0.0000	1.8880	1.8880	1.9300e-003	0.0000	1.9284
Total	**0.5085**	**0.0137**	**1.1718**	**6.0000e-005**		**6.3200e-003**	**6.3200e-003**		**6.3200e-003**	**6.3200e-003**	**0.0000**	**1.8880**	**1.8880**	**1.9300e-003**	**0.0000**	**1.9284**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	1.9731	0.2027	4.7900e-003	7.7121
Unmitigated	2.4663	0.2533	5.9800e-003	9.6401

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	7.29725 / 4.60044	2.3151	0.2378	5.6100e-003	9.0490
Day-Care Center	0.121212 / 0.311688	0.0385	3.9500e-003	9.0000e-005	0.1503
General Office Building	0.355467 / 0.217867	0.1128	0.0116	2.7000e-004	0.4408
Total		**2.4663**	**0.2533**	**5.9700e-003**	**9.6401**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	5.8378 / 4.31981	1.8521	0.1902	4.4900e-003	7.2392
Day-Care Center	0.0969696 / 0.292675	0.0308	3.1600e-003	7.0000e-005	0.1203
General Office Building	0.284374 / 0.204577	0.0902	9.2700e-003	2.2000e-004	0.3526
Total		**1.9730**	**0.2027**	**4.7800e-003**	**7.7121**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	12.6890	0.7499	0.0000	28.4368
Unmitigated	12.6890	0.7499	0.0000	28.4368

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Low Rise	51.52	10.4581	0.6181	0.0000	23.4373
Day-Care Center	9.13	1.8533	0.1095	0.0000	4.1534
General Office Building	1.86	0.3776	0.0223	0.0000	0.8461
Total		**12.6890**	**0.7499**	**0.0000**	**28.4368**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Low Rise	51.52	10.4581	0.6181	0.0000	23.4373
Day-Care Center	9.13	1.8533	0.1095	0.0000	4.1534
General Office Building	1.86	0.3776	0.0223	0.0000	0.8461
Total		**12.6890**	**0.7499**	**0.0000**	**28.4368**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Appendix B
Health Risk Modeling
Emission Calculations
HARP Model Outputs

Table B-1
Truck Traffic Breakdown
Interstate 10 Health Risk Assessment

	Truck Trips			
Year	**2-Axle Trucks**	**3-Axle Trucks**	**4+ Axle Trucks**	
2013	4753	1746	12895	
TOTAL	**4753**	**1746**	**12895**	19394

Table B-2
Diesel Particulate Emission Calculation
Interstate 10 Health Risk Assessment

Emissions per Source

	LHD2	**MHD**	**HHD**	**Total, lbs/year**
Segment	**30-year average Diesel Particulate**	**30-year average Diesel Particulate**	**30-year average Diesel Particulate**	**30-year average Diesel Particulate**
All	0.155	0.049	0.644	0.848

Table B-3
Diesel Particulate Emission Factors - 45 mph
Interstate 10 Health Risk Assessment

Year	Diesel particulate Emission Factor, grams/mile (LDT) 45mph	Diesel particulate Emission Factor, grams/mile (MDT) 45mph	Diesel particulate Emission Factor, grams/mile (HDT) 45mph
2015	0.015297045	0.056560904	0.080401674
2016	0.014585126	0.042440436	0.065051112
2017	0.013895071	0.019780979	0.0333377
2018	0.013199258	0.008252774	0.01813724
2019	0.012512399	0.007143293	0.016253888
2020	0.01183816	0.006180052	0.014534633
2021	0.011167032	0.005032954	0.01225197

Table B-4
HARP2 Risk Calculations

REC	GRP	NETID	X	Y	CONC	POLID	POLABBRE	RISK_SUM	SCENARIO	DETAILS	INH_RISK
1	ALL		468330	3769867	0.054793	9901	DieselExhP	4.74E-05	30YrCance	*	4.74E-05
1	ALL		468330	3769867	7.88E-05	106990	1,3-Butadi	3.72E-08	30YrCance	*	3.72E-08
1	ALL		468330	3769867	4.88E-05	75070	Acetaldehy	3.84E-10	30YrCance	*	3.84E-10
1	ALL		468330	3769867	6.60E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
1	ALL		468330	3769867	4.39E-06	7440382	Arsenic	5.35E-07	30YrCance	*	4.14E-08
1	ALL		468330	3769867	0.005718	71432	Benzene	4.50E-07	30YrCance	*	4.50E-07
1	ALL		468330	3769867	3.91E-07	7440417	Beryllium	2.58E-09	30YrCance	*	2.58E-09
1	ALL		468330	3769867	0.000851	7440439	Cadmium	1.00E-05	30YrCance	*	1.00E-05
1	ALL		468330	3769867	1.62E-06	18540299	Cr(VI)	7.08E-07	30YrCance	*	6.49E-07
1	ALL		468330	3769867	1.68E-05	100414	Ethyl Benz	1.15E-10	30YrCance	*	1.15E-10
1	ALL		468330	3769867	0.270873	50000	Formaldeh	4.47E-06	30YrCance	*	4.47E-06
1	ALL		468330	3769867	9.92E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
1	ALL		468330	3769867	1.18E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
1	ALL		468330	3769867	5.63E-05	7439921	Lead	3.74E-08	30YrCance	*	1.86E-09
1	ALL		468330	3769867	1.72E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
1	ALL		468330	3769867	1.14E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
1	ALL		468330	3769867	0.028696	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
1	ALL		468330	3769867	1.46E-06	91203	Naphthale	1.38E-10	30YrCance	*	1.38E-10
1	ALL		468330	3769867	7.19E-05	1151	PAHs-w/o	4.25E-06	30YrCance	*	1.34E-07
1	ALL		468330	3769867	1.14E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
1	ALL		468330	3769867	6.85E-05	91087	T-2,6-diiso	2.10E-09	30YrCance	*	2.10E-09
1	ALL		468330	3769867	4.88E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	0.053017	9901	DieselExhP	4.59E-05	30YrCance	*	4.59E-05
2	ALL		468355	3769867	8.14E-05	106990	1,3-Butadi	3.84E-08	30YrCance	*	3.84E-08
2	ALL		468355	3769867	5.04E-05	75070	Acetaldehy	3.97E-10	30YrCance	*	3.97E-10
2	ALL		468355	3769867	6.82E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	4.54E-06	7440382	Arsenic	5.53E-07	30YrCance	*	4.28E-08
2	ALL		468355	3769867	0.005906	71432	Benzene	4.65E-07	30YrCance	*	4.65E-07
2	ALL		468355	3769867	4.04E-07	7440417	Beryllium	2.67E-09	30YrCance	*	2.67E-09
2	ALL		468355	3769867	0.000879	7440439	Cadmium	1.04E-05	30YrCance	*	1.04E-05
2	ALL		468355	3769867	1.67E-06	18540299	Cr(VI)	7.31E-07	30YrCance	*	6.71E-07
2	ALL		468355	3769867	1.73E-05	100414	Ethyl Benz	1.19E-10	30YrCance	*	1.19E-10
2	ALL		468355	3769867	0.27981	50000	Formaldeh	4.62E-06	30YrCance	*	4.62E-06
2	ALL		468355	3769867	1.02E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	1.22E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	5.81E-05	7439921	Lead	3.86E-08	30YrCance	*	1.92E-09
2	ALL		468355	3769867	1.77E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	1.18E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	0.029643	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	1.51E-06	91203	Naphthale	1.43E-10	30YrCance	*	1.43E-10
2	ALL		468355	3769867	7.43E-05	1151	PAHs-w/o	4.39E-06	30YrCance	*	1.38E-07
2	ALL		468355	3769867	1.18E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
2	ALL		468355	3769867	7.07E-05	91087	T-2,6-diiso	2.17E-09	30YrCance	*	2.17E-09
2	ALL		468355	3769867	5.04E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	0.051311	9901	DieselExhP	4.44E-05	30YrCance	*	4.44E-05
3	ALL		468380	3769867	8.63E-05	106990	1,3-Butadi	4.07E-08	30YrCance	*	4.07E-08
3	ALL		468380	3769867	5.35E-05	75070	Acetaldehy	4.21E-10	30YrCance	*	4.21E-10
3	ALL		468380	3769867	7.23E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	4.81E-06	7440382	Arsenic	5.86E-07	30YrCance	*	4.54E-08
3	ALL		468380	3769867	0.006264	71432	Benzene	4.93E-07	30YrCance	*	4.93E-07
3	ALL		468380	3769867	4.28E-07	7440417	Beryllium	2.83E-09	30YrCance	*	2.83E-09
3	ALL		468380	3769867	0.000933	7440439	Cadmium	1.10E-05	30YrCance	*	1.10E-05
3	ALL		468380	3769867	1.77E-06	18540299	Cr(VI)	7.76E-07	30YrCance	*	7.11E-07
3	ALL		468380	3769867	1.84E-05	100414	Ethyl Benz	1.26E-10	30YrCance	*	1.26E-10
3	ALL		468380	3769867	0.296766	50000	Formaldeh	4.90E-06	30YrCance	*	4.90E-06
3	ALL		468380	3769867	1.09E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	1.30E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	6.17E-05	7439921	Lead	4.10E-08	30YrCance	*	2.04E-09
3	ALL		468380	3769867	1.88E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	1.25E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	0.031439	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	1.60E-06	91203	Naphthale	1.51E-10	30YrCance	*	1.51E-10
3	ALL		468380	3769867	7.88E-05	1151	PAHs-w/o	4.66E-06	30YrCance	*	1.47E-07
3	ALL		468380	3769867	1.25E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
3	ALL		468380	3769867	7.50E-05	91087	T-2,6-diiso	2.30E-09	30YrCance	*	2.30E-09
3	ALL		468380	3769867	5.35E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	0.0497	9901	DieselExhP	4.30E-05	30YrCance	*	4.30E-05
4	ALL		468405	3769867	9.35E-05	106990	1,3-Butadi	4.41E-08	30YrCance	*	4.41E-08
4	ALL		468405	3769867	5.80E-05	75070	Acetaldehy	4.56E-10	30YrCance	*	4.56E-10
4	ALL		468405	3769867	7.83E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	5.21E-06	7440382	Arsenic	6.35E-07	30YrCance	*	4.92E-08
4	ALL		468405	3769867	0.006788	71432	Benzene	5.34E-07	30YrCance	*	5.34E-07
4	ALL		468405	3769867	4.64E-07	7440417	Beryllium	3.07E-09	30YrCance	*	3.07E-09
4	ALL		468405	3769867	0.001011	7440439	Cadmium	1.19E-05	30YrCance	*	1.19E-05
4	ALL		468405	3769867	1.92E-06	18540299	Cr(VI)	8.41E-07	30YrCance	*	7.71E-07
4	ALL		468405	3769867	1.99E-05	100414	Ethyl Benz	1.36E-10	30YrCance	*	1.36E-10
4	ALL		468405	3769867	0.321589	50000	Formaldeh	5.31E-06	30YrCance	*	5.31E-06
4	ALL		468405	3769867	1.18E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	1.40E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	6.68E-05	7439921	Lead	4.44E-08	30YrCance	*	2.21E-09
4	ALL		468405	3769867	2.04E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	1.36E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	0.034069	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	1.74E-06	91203	Naphthale	1.64E-10	30YrCance	*	1.64E-10
4	ALL		468405	3769867	8.53E-05	1151	PAHs-w/o	5.05E-06	30YrCance	*	1.59E-07
4	ALL		468405	3769867	1.36E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
4	ALL		468405	3769867	8.13E-05	91087	T-2,6-diiso	2.49E-09	30YrCance	*	2.49E-09
4	ALL		468405	3769867	5.80E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
5	ALL		468430	3769867	0.048553	9901	DieselExhP	4.20E-05	30YrCance	*	4.20E-05

5	ALL	468430	3769867	0.0001	106990	1,3-Butadi	4.73E-08	30YrCance	*	4.73E-08
5	ALL	468430	3769867	6.21E-05	75070	Acetaldehy	4.89E-10	30YrCance	*	4.89E-10
5	ALL	468430	3769867	8.40E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
5	ALL	468430	3769867	5.59E-06	7440382	Arsenic	6.81E-07	30YrCance	*	5.27E-08
5	ALL	468430	3769867	0.007276	71432	Benzene	5.72E-07	30YrCance	*	5.72E-07
5	ALL	468430	3769867	4.97E-07	7440417	Beryllium	3.29E-09	30YrCance	*	3.29E-09
5	ALL	468430	3769867	0.001083	7440439	Cadmium	1.28E-05	30YrCance	*	1.28E-05
5	ALL	468430	3769867	2.06E-06	18540299	Cr(VI)	9.01E-07	30YrCance	*	8.26E-07
5	ALL	468430	3769867	2.14E-05	100414	Ethyl Benz	1.46E-10	30YrCance	*	1.46E-10
5	ALL	468430	3769867	0.344718	50000	Formaldeh	5.69E-06	30YrCance	*	5.69E-06
5	ALL	468430	3769867	1.26E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
5	ALL	468430	3769867	1.50E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
5	ALL	468430	3769867	7.16E-05	7439921	Lead	4.76E-08	30YrCance	*	2.37E-09
5	ALL	468430	3769867	2.18E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
5	ALL	468430	3769867	1.46E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
5	ALL	468430	3769867	0.03652	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
5	ALL	468430	3769867	1.86E-06	91203	Naphthale	1.76E-10	30YrCance	*	1.76E-10
5	ALL	468430	3769867	9.15E-05	1151	PAHs-w/o	5.41E-06	30YrCance	*	1.70E-07
5	ALL	468430	3769867	1.46E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
5	ALL	468430	3769867	8.71E-05	91087	T-2,6-diiso	2.67E-09	30YrCance	*	2.67E-09
5	ALL	468430	3769867	6.21E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	0.040695	9901	DieselExhP	3.52E-05	30YrCance	*	3.52E-05
6	ALL	468330	3769892	7.54E-05	106990	1,3-Butadi	3.56E-08	30YrCance	*	3.56E-08
6	ALL	468330	3769892	4.68E-05	75070	Acetaldehy	3.68E-10	30YrCance	*	3.68E-10
6	ALL	468330	3769892	6.32E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	4.21E-06	7440382	Arsenic	5.12E-07	30YrCance	*	3.97E-08
6	ALL	468330	3769892	0.005476	71432	Benzene	4.31E-07	30YrCance	*	4.31E-07
6	ALL	468330	3769892	3.74E-07	7440417	Beryllium	2.47E-09	30YrCance	*	2.47E-09
6	ALL	468330	3769892	0.000815	7440439	Cadmium	9.62E-06	30YrCance	*	9.62E-06
6	ALL	468330	3769892	1.55E-06	18540299	Cr(VI)	6.78E-07	30YrCance	*	6.22E-07
6	ALL	468330	3769892	1.61E-05	100414	Ethyl Benz	1.10E-10	30YrCance	*	1.10E-10
6	ALL	468330	3769892	0.259434	50000	Formaldeh	4.29E-06	30YrCance	*	4.29E-06
6	ALL	468330	3769892	9.50E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	1.13E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	5.39E-05	7439921	Lead	3.58E-08	30YrCance	*	1.78E-09
6	ALL	468330	3769892	1.64E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	1.10E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	0.027484	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	1.40E-06	91203	Naphthale	1.32E-10	30YrCance	*	1.32E-10
6	ALL	468330	3769892	6.88E-05	1151	PAHs-w/o	4.07E-06	30YrCance	*	1.28E-07
6	ALL	468330	3769892	1.10E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
6	ALL	468330	3769892	6.56E-05	91087	T-2,6-diiso	2.01E-09	30YrCance	*	2.01E-09
6	ALL	468330	3769892	4.68E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	0.039604	9901	DieselExhP	3.43E-05	30YrCance	*	3.43E-05
7	ALL	468355	3769892	7.76E-05	106990	1,3-Butadi	3.66E-08	30YrCance	*	3.66E-08
7	ALL	468355	3769892	4.81E-05	75070	Acetaldehy	3.78E-10	30YrCance	*	3.78E-10
7	ALL	468355	3769892	6.50E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	4.33E-06	7440382	Arsenic	5.27E-07	30YrCance	*	4.08E-08
7	ALL	468355	3769892	0.005635	71432	Benzene	4.43E-07	30YrCance	*	4.43E-07
7	ALL	468355	3769892	3.85E-07	7440417	Beryllium	2.54E-09	30YrCance	*	2.54E-09
7	ALL	468355	3769892	0.000839	7440439	Cadmium	9.90E-06	30YrCance	*	9.90E-06
7	ALL	468355	3769892	1.59E-06	18540299	Cr(VI)	6.98E-07	30YrCance	*	6.40E-07
7	ALL	468355	3769892	1.65E-05	100414	Ethyl Benz	1.13E-10	30YrCance	*	1.13E-10
7	ALL	468355	3769892	0.266943	50000	Formaldeh	4.41E-06	30YrCance	*	4.41E-06
7	ALL	468355	3769892	9.77E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	1.17E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	5.55E-05	7439921	Lead	3.69E-08	30YrCance	*	1.83E-09
7	ALL	468355	3769892	1.69E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	1.13E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	0.02828	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	1.44E-06	91203	Naphthale	1.36E-10	30YrCance	*	1.36E-10
7	ALL	468355	3769892	7.08E-05	1151	PAHs-w/o	4.19E-06	30YrCance	*	1.32E-07
7	ALL	468355	3769892	1.13E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
7	ALL	468355	3769892	6.75E-05	91087	T-2,6-diiso	2.07E-09	30YrCance	*	2.07E-09
7	ALL	468355	3769892	4.81E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	0.038636	9901	DieselExhP	3.34E-05	30YrCance	*	3.34E-05
8	ALL	468380	3769892	8.13E-05	106990	1,3-Butadi	3.84E-08	30YrCance	*	3.84E-08
8	ALL	468380	3769892	5.04E-05	75070	Acetaldehy	3.96E-10	30YrCance	*	3.96E-10
8	ALL	468380	3769892	6.81E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	4.53E-06	7440382	Arsenic	5.52E-07	30YrCance	*	4.28E-08
8	ALL	468380	3769892	0.005901	71432	Benzene	4.64E-07	30YrCance	*	4.64E-07
8	ALL	468380	3769892	4.03E-07	7440417	Beryllium	2.66E-09	30YrCance	*	2.66E-09
8	ALL	468380	3769892	0.000879	7440439	Cadmium	1.04E-05	30YrCance	*	1.04E-05
8	ALL	468380	3769892	1.67E-06	18540299	Cr(VI)	7.31E-07	30YrCance	*	6.70E-07
8	ALL	468380	3769892	1.73E-05	100414	Ethyl Benz	1.19E-10	30YrCance	*	1.19E-10
8	ALL	468380	3769892	0.279555	50000	Formaldeh	4.62E-06	30YrCance	*	4.62E-06
8	ALL	468380	3769892	1.02E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	1.22E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	5.81E-05	7439921	Lead	3.86E-08	30YrCance	*	1.92E-09
8	ALL	468380	3769892	1.77E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	1.18E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	0.029616	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	1.51E-06	91203	Naphthale	1.43E-10	30YrCance	*	1.43E-10
8	ALL	468380	3769892	7.42E-05	1151	PAHs-w/o	4.39E-06	30YrCance	*	1.38E-07
8	ALL	468380	3769892	1.18E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
8	ALL	468380	3769892	7.07E-05	91087	T-2,6-diiso	2.17E-09	30YrCance	*	2.17E-09
8	ALL	468380	3769892	5.04E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	0.037901	9901	DieselExhP	3.28E-05	30YrCance	*	3.28E-05
9	ALL	468405	3769892	8.72E-05	106990	1,3-Butadi	4.11E-08	30YrCance	*	4.11E-08
9	ALL	468405	3769892	5.40E-05	75070	Acetaldehy	4.25E-10	30YrCance	*	4.25E-10

9	ALL	468405	3769892	7.30E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	4.86E-06	7440382	Arsenic	5.92E-07	30YrCance	*	4.59E-08
9	ALL	468405	3769892	0.006328	71432	Benzene	4.98E-07	30YrCance	*	4.98E-07
9	ALL	468405	3769892	4.32E-07	7440417	Beryllium	2.86E-09	30YrCance	*	2.86E-09
9	ALL	468405	3769892	0.000942	7440439	Cadmium	1.11E-05	30YrCance	*	1.11E-05
9	ALL	468405	3769892	1.79E-06	18540299	Cr(VI)	7.84E-07	30YrCance	*	7.18E-07
9	ALL	468405	3769892	1.86E-05	100414	Ethyl Benz	1.27E-10	30YrCance	*	1.27E-10
9	ALL	468405	3769892	0.299769	50000	Formaldeh	4.95E-06	30YrCance	*	4.95E-06
9	ALL	468405	3769892	1.10E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	1.31E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	6.23E-05	7439921	Lead	4.14E-08	30YrCance	*	2.06E-09
9	ALL	468405	3769892	1.90E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	1.27E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	0.031758	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	1.62E-06	91203	Naphthale	1.53E-10	30YrCance	*	1.53E-10
9	ALL	468405	3769892	7.96E-05	1151	PAHs-w/o	4.70E-06	30YrCance	*	1.48E-07
9	ALL	468405	3769892	1.27E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
9	ALL	468405	3769892	7.58E-05	91087	T-2,6-diiso	2.32E-09	30YrCance	*	2.32E-09
9	ALL	468405	3769892	5.40E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	0.037136	9901	DieselExhP	3.21E-05	30YrCance	*	3.21E-05
10	ALL	468430	3769892	9.31E-05	106990	1,3-Butadi	4.39E-08	30YrCance	*	4.39E-08
10	ALL	468430	3769892	5.77E-05	75070	Acetaldehy	4.54E-10	30YrCance	*	4.54E-10
10	ALL	468430	3769892	7.80E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	5.19E-06	7440382	Arsenic	6.32E-07	30YrCance	*	4.90E-08
10	ALL	468430	3769892	0.006754	71432	Benzene	5.31E-07	30YrCance	*	5.31E-07
10	ALL	468430	3769892	4.62E-07	7440417	Beryllium	3.05E-09	30YrCance	*	3.05E-09
10	ALL	468430	3769892	0.001006	7440439	Cadmium	1.19E-05	30YrCance	*	1.19E-05
10	ALL	468430	3769892	1.91E-06	18540299	Cr(VI)	8.36E-07	30YrCance	*	7.67E-07
10	ALL	468430	3769892	1.98E-05	100414	Ethyl Benz	1.36E-10	30YrCance	*	1.36E-10
10	ALL	468430	3769892	0.319975	50000	Formaldeh	5.29E-06	30YrCance	*	5.29E-06
10	ALL	468430	3769892	1.17E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	1.40E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	6.65E-05	7439921	Lead	4.42E-08	30YrCance	*	2.20E-09
10	ALL	468430	3769892	2.03E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	1.35E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	0.033898	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	1.73E-06	91203	Naphthale	1.63E-10	30YrCance	*	1.63E-10
10	ALL	468430	3769892	8.49E-05	1151	PAHs-w/o	5.02E-06	30YrCance	*	1.58E-07
10	ALL	468430	3769892	1.35E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
10	ALL	468430	3769892	8.09E-05	91087	T-2,6-diiso	2.48E-09	30YrCance	*	2.48E-09
10	ALL	468430	3769892	5.77E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	0.032615	9901	DieselExhP	2.82E-05	30YrCance	*	2.82E-05
11	ALL	468330	3769917	7.18E-05	106990	1,3-Butadi	3.39E-08	30YrCance	*	3.39E-08
11	ALL	468330	3769917	4.45E-05	75070	Acetaldehy	3.50E-10	30YrCance	*	3.50E-10
11	ALL	468330	3769917	6.01E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	4.00E-06	7440382	Arsenic	4.87E-07	30YrCance	*	3.78E-08
11	ALL	468330	3769917	0.00521	71432	Benzene	4.10E-07	30YrCance	*	4.10E-07
11	ALL	468330	3769917	3.56E-07	7440417	Beryllium	2.35E-09	30YrCance	*	2.35E-09
11	ALL	468330	3769917	0.000776	7440439	Cadmium	9.15E-06	30YrCance	*	9.15E-06
11	ALL	468330	3769917	1.47E-06	18540299	Cr(VI)	6.45E-07	30YrCance	*	5.91E-07
11	ALL	468330	3769917	1.53E-05	100414	Ethyl Benz	1.05E-10	30YrCance	*	1.05E-10
11	ALL	468330	3769917	0.246835	50000	Formaldeh	4.08E-06	30YrCance	*	4.08E-06
11	ALL	468330	3769917	9.04E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	1.08E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	5.13E-05	7439921	Lead	3.41E-08	30YrCance	*	1.69E-09
11	ALL	468330	3769917	1.56E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	1.04E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	0.02615	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	1.33E-06	91203	Naphthale	1.26E-10	30YrCance	*	1.26E-10
11	ALL	468330	3769917	6.55E-05	1151	PAHs-w/o	3.87E-06	30YrCance	*	1.22E-07
11	ALL	468330	3769917	1.04E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
11	ALL	468330	3769917	6.24E-05	91087	T-2,6-diiso	1.91E-09	30YrCance	*	1.91E-09
11	ALL	468330	3769917	4.45E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	0.031945	9901	DieselExhP	2.76E-05	30YrCance	*	2.76E-05
12	ALL	468355	3769917	7.39E-05	106990	1,3-Butadi	3.49E-08	30YrCance	*	3.49E-08
12	ALL	468355	3769917	4.58E-05	75070	Acetaldehy	3.60E-10	30YrCance	*	3.60E-10
12	ALL	468355	3769917	6.19E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	4.12E-06	7440382	Arsenic	5.02E-07	30YrCance	*	3.89E-08
12	ALL	468355	3769917	0.005366	71432	Benzene	4.22E-07	30YrCance	*	4.22E-07
12	ALL	468355	3769917	3.67E-07	7440417	Beryllium	2.42E-09	30YrCance	*	2.42E-09
12	ALL	468355	3769917	0.000799	7440439	Cadmium	9.42E-06	30YrCance	*	9.42E-06
12	ALL	468355	3769917	1.52E-06	18540299	Cr(VI)	6.65E-07	30YrCance	*	6.09E-07
12	ALL	468355	3769917	1.58E-05	100414	Ethyl Benz	1.08E-10	30YrCance	*	1.08E-10
12	ALL	468355	3769917	0.254195	50000	Formaldeh	4.20E-06	30YrCance	*	4.20E-06
12	ALL	468355	3769917	9.31E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	1.11E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	5.28E-05	7439921	Lead	3.51E-08	30YrCance	*	1.74E-09
12	ALL	468355	3769917	1.61E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	1.07E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	0.026929	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	1.37E-06	91203	Naphthale	1.30E-10	30YrCance	*	1.30E-10
12	ALL	468355	3769917	6.75E-05	1151	PAHs-w/o	3.99E-06	30YrCance	*	1.26E-07
12	ALL	468355	3769917	1.07E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
12	ALL	468355	3769917	6.43E-05	91087	T-2,6-diiso	1.97E-09	30YrCance	*	1.97E-09
12	ALL	468355	3769917	4.58E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	0.031308	9901	DieselExhP	2.71E-05	30YrCance	*	2.71E-05
13	ALL	468380	3769917	7.66E-05	106990	1,3-Butadi	3.62E-08	30YrCance	*	3.62E-08
13	ALL	468380	3769917	4.75E-05	75070	Acetaldehy	3.74E-10	30YrCance	*	3.74E-10
13	ALL	468380	3769917	6.42E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	4.27E-06	7440382	Arsenic	5.20E-07	30YrCance	*	4.03E-08

13	ALL	468380	3769917	0.005561	71432	Benzene	4.37E-07	30YrCance	*	4.37E-07
13	ALL	468380	3769917	3.80E-07	7440417	Beryllium	2.51E-09	30YrCance	*	2.51E-09
13	ALL	468380	3769917	0.000828	7440439	Cadmium	9.77E-06	30YrCance	*	9.77E-06
13	ALL	468380	3769917	1.57E-06	18540299	Cr(VI)	6.89E-07	30YrCance	*	6.31E-07
13	ALL	468380	3769917	1.63E-05	100414	Ethyl Benz	1.12E-10	30YrCance	*	1.12E-10
13	ALL	468380	3769917	0.263462	50000	Formaldeh	4.35E-06	30YrCance	*	4.35E-06
13	ALL	468380	3769917	9.65E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	1.15E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	5.47E-05	7439921	Lead	3.64E-08	30YrCance	*	1.81E-09
13	ALL	468380	3769917	1.67E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	1.11E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	0.027911	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	1.42E-06	91203	Naphthale	1.34E-10	30YrCance	*	1.34E-10
13	ALL	468380	3769917	6.99E-05	1151	PAHs-w/o	4.13E-06	30YrCance	*	1.30E-07
13	ALL	468380	3769917	1.11E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
13	ALL	468380	3769917	6.66E-05	91087	T-2,6-diiso	2.04E-09	30YrCance	*	2.04E-09
13	ALL	468380	3769917	4.75E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	0.030725	9901	DieselExhP	2.66E-05	30YrCance	*	2.66E-05
14	ALL	468405	3769917	8.10E-05	106990	1,3-Butadi	3.82E-08	30YrCance	*	3.82E-08
14	ALL	468405	3769917	5.02E-05	75070	Acetaldehy	3.95E-10	30YrCance	*	3.95E-10
14	ALL	468405	3769917	6.78E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	4.51E-06	7440382	Arsenic	5.50E-07	30YrCance	*	4.26E-08
14	ALL	468405	3769917	0.005876	71432	Benzene	4.62E-07	30YrCance	*	4.62E-07
14	ALL	468405	3769917	4.02E-07	7440417	Beryllium	2.65E-09	30YrCance	*	2.65E-09
14	ALL	468405	3769917	0.000875	7440439	Cadmium	1.03E-05	30YrCance	*	1.03E-05
14	ALL	468405	3769917	1.66E-06	18540299	Cr(VI)	7.28E-07	30YrCance	*	6.67E-07
14	ALL	468405	3769917	1.72E-05	100414	Ethyl Benz	1.18E-10	30YrCance	*	1.18E-10
14	ALL	468405	3769917	0.278384	50000	Formaldeh	4.60E-06	30YrCance	*	4.60E-06
14	ALL	468405	3769917	1.02E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	1.22E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	5.78E-05	7439921	Lead	3.84E-08	30YrCance	*	1.91E-09
14	ALL	468405	3769917	1.76E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	1.18E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	0.029492	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	1.50E-06	91203	Naphthale	1.42E-10	30YrCance	*	1.42E-10
14	ALL	468405	3769917	7.39E-05	1151	PAHs-w/o	4.37E-06	30YrCance	*	1.38E-07
14	ALL	468405	3769917	1.18E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
14	ALL	468405	3769917	7.04E-05	91087	T-2,6-diiso	2.16E-09	30YrCance	*	2.16E-09
14	ALL	468405	3769917	5.02E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	0.030175	9901	DieselExhP	2.61E-05	30YrCance	*	2.61E-05
15	ALL	468430	3769917	8.64E-05	106990	1,3-Butadi	4.08E-08	30YrCance	*	4.08E-08
15	ALL	468430	3769917	5.36E-05	75070	Acetaldehy	4.21E-10	30YrCance	*	4.21E-10
15	ALL	468430	3769917	7.24E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	4.82E-06	7440382	Arsenic	5.87E-07	30YrCance	*	4.55E-08
15	ALL	468430	3769917	0.006272	71432	Benzene	4.93E-07	30YrCance	*	4.93E-07
15	ALL	468430	3769917	4.29E-07	7440417	Beryllium	2.83E-09	30YrCance	*	2.83E-09
15	ALL	468430	3769917	0.000934	7440439	Cadmium	1.10E-05	30YrCance	*	1.10E-05
15	ALL	468430	3769917	1.78E-06	18540299	Cr(VI)	7.77E-07	30YrCance	*	7.12E-07
15	ALL	468430	3769917	1.84E-05	100414	Ethyl Benz	1.26E-10	30YrCance	*	1.26E-10
15	ALL	468430	3769917	0.297148	50000	Formaldeh	4.91E-06	30YrCance	*	4.91E-06
15	ALL	468430	3769917	1.09E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	1.30E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	6.17E-05	7439921	Lead	4.10E-08	30YrCance	*	2.04E-09
15	ALL	468430	3769917	1.88E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	1.26E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	0.03148	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	1.61E-06	91203	Naphthale	1.52E-10	30YrCance	*	1.52E-10
15	ALL	468430	3769917	7.89E-05	1151	PAHs-w/o	4.66E-06	30YrCance	*	1.47E-07
15	ALL	468430	3769917	1.26E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
15	ALL	468430	3769917	7.51E-05	91087	T-2,6-diiso	2.30E-09	30YrCance	*	2.30E-09
15	ALL	468430	3769917	5.36E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	0.027335	9901	DieselExhP	2.37E-05	30YrCance	*	2.37E-05
16	ALL	468330	3769942	6.78E-05	106990	1,3-Butadi	3.20E-08	30YrCance	*	3.20E-08
16	ALL	468330	3769942	4.20E-05	75070	Acetaldehy	3.31E-10	30YrCance	*	3.31E-10
16	ALL	468330	3769942	5.68E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	3.78E-06	7440382	Arsenic	4.61E-07	30YrCance	*	3.57E-08
16	ALL	468330	3769942	0.004923	71432	Benzene	3.87E-07	30YrCance	*	3.87E-07
16	ALL	468330	3769942	3.36E-07	7440417	Beryllium	2.22E-09	30YrCance	*	2.22E-09
16	ALL	468330	3769942	0.000733	7440439	Cadmium	8.65E-06	30YrCance	*	8.65E-06
16	ALL	468330	3769942	1.39E-06	18540299	Cr(VI)	6.10E-07	30YrCance	*	5.59E-07
16	ALL	468330	3769942	1.45E-05	100414	Ethyl Benz	9.89E-11	30YrCance	*	9.89E-11
16	ALL	468330	3769942	0.23321	50000	Formaldeh	3.85E-06	30YrCance	*	3.85E-06
16	ALL	468330	3769942	8.54E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	1.02E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	4.85E-05	7439921	Lead	3.22E-08	30YrCance	*	1.60E-09
16	ALL	468330	3769942	1.48E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	9.85E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	0.024706	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	1.26E-06	91203	Naphthale	1.19E-10	30YrCance	*	1.19E-10
16	ALL	468330	3769942	6.19E-05	1151	PAHs-w/o	3.66E-06	30YrCance	*	1.15E-07
16	ALL	468330	3769942	9.85E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
16	ALL	468330	3769942	5.90E-05	91087	T-2,6-diiso	1.81E-09	30YrCance	*	1.81E-09
16	ALL	468330	3769942	4.20E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	0.026829	9901	DieselExhP	2.32E-05	30YrCance	*	2.32E-05
17	ALL	468355	3769942	6.96E-05	106990	1,3-Butadi	3.29E-08	30YrCance	*	3.29E-08
17	ALL	468355	3769942	4.32E-05	75070	Acetaldehy	3.40E-10	30YrCance	*	3.40E-10
17	ALL	468355	3769942	5.83E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	3.88E-06	7440382	Arsenic	4.73E-07	30YrCance	*	3.66E-08
17	ALL	468355	3769942	0.005055	71432	Benzene	3.98E-07	30YrCance	*	3.98E-07
17	ALL	468355	3769942	3.46E-07	7440417	Beryllium	2.28E-09	30YrCance	*	2.28E-09

17	ALL	468355	3769942	0.000753	7440439	Cadmium	8.88E-06	30YrCance	*	8.88E-06
17	ALL	468355	3769942	1.43E-06	18540299	Cr(VI)	6.26E-07	30YrCance	*	5.74E-07
17	ALL	468355	3769942	1.48E-05	100414	Ethyl Benz	1.02E-10	30YrCance	*	1.02E-10
17	ALL	468355	3769942	0.239475	50000	Formaldeh	3.96E-06	30YrCance	*	3.96E-06
17	ALL	468355	3769942	8.77E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	1.05E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	4.98E-05	7439921	Lead	3.31E-08	30YrCance	*	1.64E-09
17	ALL	468355	3769942	1.52E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	1.01E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	0.02537	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	1.29E-06	91203	Naphthale	1.22E-10	30YrCance	*	1.22E-10
17	ALL	468355	3769942	6.36E-05	1151	PAHs-w/o	3.76E-06	30YrCance	*	1.18E-07
17	ALL	468355	3769942	1.01E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
17	ALL	468355	3769942	6.05E-05	91087	T-2,6-diiso	1.86E-09	30YrCance	*	1.86E-09
17	ALL	468355	3769942	4.32E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	0.026318	9901	DieselExhP	2.28E-05	30YrCance	*	2.28E-05
18	ALL	468380	3769942	7.18E-05	106990	1,3-Butadi	3.39E-08	30YrCance	*	3.39E-08
18	ALL	468380	3769942	4.45E-05	75070	Acetaldehy	3.50E-10	30YrCance	*	3.50E-10
18	ALL	468380	3769942	6.02E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	4.00E-06	7440382	Arsenic	4.88E-07	30YrCance	*	3.78E-08
18	ALL	468380	3769942	0.005215	71432	Benzene	4.10E-07	30YrCance	*	4.10E-07
18	ALL	468380	3769942	3.56E-07	7440417	Beryllium	2.35E-09	30YrCance	*	2.35E-09
18	ALL	468380	3769942	0.000776	7440439	Cadmium	9.16E-06	30YrCance	*	9.16E-06
18	ALL	468380	3769942	1.48E-06	18540299	Cr(VI)	6.46E-07	30YrCance	*	5.92E-07
18	ALL	468380	3769942	1.53E-05	100414	Ethyl Benz	1.05E-10	30YrCance	*	1.05E-10
18	ALL	468380	3769942	0.247035	50000	Formaldeh	4.08E-06	30YrCance	*	4.08E-06
18	ALL	468380	3769942	9.05E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	1.08E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	5.13E-05	7439921	Lead	3.41E-08	30YrCance	*	1.70E-09
18	ALL	468380	3769942	1.57E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	1.04E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	0.026171	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	1.34E-06	91203	Naphthale	1.26E-10	30YrCance	*	1.26E-10
18	ALL	468380	3769942	6.56E-05	1151	PAHs-w/o	3.88E-06	30YrCance	*	1.22E-07
18	ALL	468380	3769942	1.04E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
18	ALL	468380	3769942	6.24E-05	91087	T-2,6-diiso	1.92E-09	30YrCance	*	1.92E-09
18	ALL	468380	3769942	4.45E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	0.025859	9901	DieselExhP	2.24E-05	30YrCance	*	2.24E-05
19	ALL	468405	3769942	7.55E-05	106990	1,3-Butadi	3.56E-08	30YrCance	*	3.56E-08
19	ALL	468405	3769942	4.68E-05	75070	Acetaldehy	3.68E-10	30YrCance	*	3.68E-10
19	ALL	468405	3769942	6.32E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	4.21E-06	7440382	Arsenic	5.12E-07	30YrCance	*	3.97E-08
19	ALL	468405	3769942	0.005477	71432	Benzene	4.31E-07	30YrCance	*	4.31E-07
19	ALL	468405	3769942	3.74E-07	7440417	Beryllium	2.47E-09	30YrCance	*	2.47E-09
19	ALL	468405	3769942	0.000815	7440439	Cadmium	9.62E-06	30YrCance	*	9.62E-06
19	ALL	468405	3769942	1.55E-06	18540299	Cr(VI)	6.78E-07	30YrCance	*	6.22E-07
19	ALL	468405	3769942	1.61E-05	100414	Ethyl Benz	1.10E-10	30YrCance	*	1.10E-10
19	ALL	468405	3769942	0.259477	50000	Formaldeh	4.29E-06	30YrCance	*	4.29E-06
19	ALL	468405	3769942	9.50E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	1.13E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	5.39E-05	7439921	Lead	3.58E-08	30YrCance	*	1.78E-09
19	ALL	468405	3769942	1.64E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	1.10E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	0.027489	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	1.40E-06	91203	Naphthale	1.32E-10	30YrCance	*	1.32E-10
19	ALL	468405	3769942	6.89E-05	1151	PAHs-w/o	4.07E-06	30YrCance	*	1.28E-07
19	ALL	468405	3769942	1.10E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
19	ALL	468405	3769942	6.56E-05	91087	T-2,6-diiso	2.01E-09	30YrCance	*	2.01E-09
19	ALL	468405	3769942	4.68E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	0.025432	9901	DieselExhP	2.20E-05	30YrCance	*	2.20E-05
20	ALL	468430	3769942	8.04E-05	106990	1,3-Butadi	3.79E-08	30YrCance	*	3.79E-08
20	ALL	468430	3769942	4.98E-05	75070	Acetaldehy	3.92E-10	30YrCance	*	3.92E-10
20	ALL	468430	3769942	6.73E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	4.48E-06	7440382	Arsenic	5.46E-07	30YrCance	*	4.23E-08
20	ALL	468430	3769942	0.005834	71432	Benzene	4.59E-07	30YrCance	*	4.59E-07
20	ALL	468430	3769942	3.99E-07	7440417	Beryllium	2.63E-09	30YrCance	*	2.63E-09
20	ALL	468430	3769942	0.000869	7440439	Cadmium	1.02E-05	30YrCance	*	1.02E-05
20	ALL	468430	3769942	1.65E-06	18540299	Cr(VI)	7.22E-07	30YrCance	*	6.62E-07
20	ALL	468430	3769942	1.71E-05	100414	Ethyl Benz	1.17E-10	30YrCance	*	1.17E-10
20	ALL	468430	3769942	0.276366	50000	Formaldeh	4.56E-06	30YrCance	*	4.56E-06
20	ALL	468430	3769942	1.01E-05	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	1.21E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	5.74E-05	7439921	Lead	3.82E-08	30YrCance	*	1.90E-09
20	ALL	468430	3769942	1.75E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	1.17E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	0.029278	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	1.49E-06	91203	Naphthale	1.41E-10	30YrCance	*	1.41E-10
20	ALL	468430	3769942	7.33E-05	1151	PAHs-w/o	4.34E-06	30YrCance	*	1.37E-07
20	ALL	468430	3769942	1.17E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
20	ALL	468430	3769942	6.99E-05	91087	T-2,6-diiso	2.14E-09	30YrCance	*	2.14E-09
20	ALL	468430	3769942	4.98E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
21	ALL	468330	3769967	0.023525	9901	DieselExhP	2.04E-05	30YrCance	*	2.04E-05
21	ALL	468330	3769967	6.42E-05	106990	1,3-Butadi	3.03E-08	30YrCance	*	3.03E-08
21	ALL	468330	3769967	3.98E-05	75070	Acetaldehy	3.13E-10	30YrCance	*	3.13E-10
21	ALL	468330	3769967	5.38E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
21	ALL	468330	3769967	3.58E-06	7440382	Arsenic	4.36E-07	30YrCance	*	3.38E-08
21	ALL	468330	3769967	0.004662	71432	Benzene	3.67E-07	30YrCance	*	3.67E-07
21	ALL	468330	3769967	3.19E-07	7440417	Beryllium	2.11E-09	30YrCance	*	2.11E-09
21	ALL	468330	3769967	0.000694	7440439	Cadmium	8.19E-06	30YrCance	*	8.19E-06
21	ALL	468330	3769967	1.32E-06	18540299	Cr(VI)	5.77E-07	30YrCance	*	5.29E-07

21	ALL	468330	3769967	1.37E-05	100414	Ethyl Benze	9.36E-11	30YrCancer	*	9.36E-11
21	ALL	468330	3769967	0.220837	50000	Formaldeh	3.65E-06	30YrCancer	*	3.65E-06
21	ALL	468330	3769967	8.09E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
21	ALL	468330	3769967	9.64E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
21	ALL	468330	3769967	4.59E-05	7439921	Lead	3.05E-08	30YrCancer	*	1.52E-09
21	ALL	468330	3769967	1.40E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
21	ALL	468330	3769967	9.33E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
21	ALL	468330	3769967	0.023396	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
21	ALL	468330	3769967	1.19E-06	91203	Naphthalen	1.13E-10	30YrCancer	*	1.13E-10
21	ALL	468330	3769967	5.86E-05	1151	PAHs-w/o	3.47E-06	30YrCancer	*	1.09E-07
21	ALL	468330	3769967	9.33E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
21	ALL	468330	3769967	5.58E-05	91087	T-2,6-diiso	1.71E-09	30YrCancer	*	1.71E-09
21	ALL	468330	3769967	3.98E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	0.023118	9901	DieselExhP	2.00E-05	30YrCancer	*	2.00E-05
22	ALL	468355	3769967	6.58E-05	106990	1,3-Butadie	3.10E-08	30YrCancer	*	3.10E-08
22	ALL	468355	3769967	4.08E-05	75070	Acetaldehy	3.21E-10	30YrCancer	*	3.21E-10
22	ALL	468355	3769967	5.51E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	3.67E-06	7440382	Arsenic	4.47E-07	30YrCancer	*	3.46E-08
22	ALL	468355	3769967	0.004775	71432	Benzene	3.76E-07	30YrCancer	*	3.76E-07
22	ALL	468355	3769967	3.26E-07	7440417	Beryllium	2.16E-09	30YrCancer	*	2.16E-09
22	ALL	468355	3769967	0.000711	7440439	Cadmium	8.39E-06	30YrCancer	*	8.39E-06
22	ALL	468355	3769967	1.35E-06	18540299	Cr(VI)	5.91E-07	30YrCancer	*	5.42E-07
22	ALL	468355	3769967	1.40E-05	100414	Ethyl Benze	9.59E-11	30YrCancer	*	9.59E-11
22	ALL	468355	3769967	0.226214	50000	Formaldeh	3.74E-06	30YrCancer	*	3.74E-06
22	ALL	468355	3769967	8.28E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	9.88E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	4.70E-05	7439921	Lead	3.12E-08	30YrCancer	*	1.55E-09
22	ALL	468355	3769967	1.43E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	9.56E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	0.023965	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	1.22E-06	91203	Naphthalen	1.15E-10	30YrCancer	*	1.15E-10
22	ALL	468355	3769967	6.00E-05	1151	PAHs-w/o	3.55E-06	30YrCancer	*	1.12E-07
22	ALL	468355	3769967	9.56E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
22	ALL	468355	3769967	5.72E-05	91087	T-2,6-diiso	1.75E-09	30YrCancer	*	1.75E-09
22	ALL	468355	3769967	4.08E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	0.022688	9901	DieselExhP	1.96E-05	30YrCancer	*	1.96E-05
23	ALL	468380	3769967	6.76E-05	106990	1,3-Butadie	3.19E-08	30YrCancer	*	3.19E-08
23	ALL	468380	3769967	4.19E-05	75070	Acetaldehy	3.30E-10	30YrCancer	*	3.30E-10
23	ALL	468380	3769967	5.66E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	3.77E-06	7440382	Arsenic	4.59E-07	30YrCancer	*	3.56E-08
23	ALL	468380	3769967	0.004906	71432	Benzene	3.86E-07	30YrCancer	*	3.86E-07
23	ALL	468380	3769967	3.35E-07	7440417	Beryllium	2.22E-09	30YrCancer	*	2.22E-09
23	ALL	468380	3769967	0.00073	7440439	Cadmium	8.62E-06	30YrCancer	*	8.62E-06
23	ALL	468380	3769967	1.39E-06	18540299	Cr(VI)	6.08E-07	30YrCancer	*	5.57E-07
23	ALL	468380	3769967	1.44E-05	100414	Ethyl Benze	9.85E-11	30YrCancer	*	9.85E-11
23	ALL	468380	3769967	0.232424	50000	Formaldeh	3.84E-06	30YrCancer	*	3.84E-06
23	ALL	468380	3769967	8.51E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	1.01E-05	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	4.83E-05	7439921	Lead	3.21E-08	30YrCancer	*	1.60E-09
23	ALL	468380	3769967	1.47E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	9.82E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	0.024623	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	1.26E-06	91203	Naphthalen	1.19E-10	30YrCancer	*	1.19E-10
23	ALL	468380	3769967	6.17E-05	1151	PAHs-w/o	3.65E-06	30YrCancer	*	1.15E-07
23	ALL	468380	3769967	9.82E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
23	ALL	468380	3769967	5.88E-05	91087	T-2,6-diiso	1.80E-09	30YrCancer	*	1.80E-09
23	ALL	468380	3769967	4.19E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	0.022308	9901	DieselExhP	1.93E-05	30YrCancer	*	1.93E-05
24	ALL	468405	3769967	7.06E-05	106990	1,3-Butadie	3.33E-08	30YrCancer	*	3.33E-08
24	ALL	468405	3769967	4.38E-05	75070	Acetaldehy	3.44E-10	30YrCancer	*	3.44E-10
24	ALL	468405	3769967	5.91E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	3.93E-06	7440382	Arsenic	4.79E-07	30YrCancer	*	3.71E-08
24	ALL	468405	3769967	0.005124	71432	Benzene	4.03E-07	30YrCancer	*	4.03E-07
24	ALL	468405	3769967	3.50E-07	7440417	Beryllium	2.31E-09	30YrCancer	*	2.31E-09
24	ALL	468405	3769967	0.000763	7440439	Cadmium	9.00E-06	30YrCancer	*	9.00E-06
24	ALL	468405	3769967	1.45E-06	18540299	Cr(VI)	6.35E-07	30YrCancer	*	5.82E-07
24	ALL	468405	3769967	1.50E-05	100414	Ethyl Benze	1.03E-10	30YrCancer	*	1.03E-10
24	ALL	468405	3769967	0.242741	50000	Formaldeh	4.01E-06	30YrCancer	*	4.01E-06
24	ALL	468405	3769967	8.89E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	1.06E-05	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	5.04E-05	7439921	Lead	3.35E-08	30YrCancer	*	1.67E-09
24	ALL	468405	3769967	1.54E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	1.03E-07	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	0.025716	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	1.31E-06	91203	Naphthalen	1.24E-10	30YrCancer	*	1.24E-10
24	ALL	468405	3769967	6.44E-05	1151	PAHs-w/o	3.81E-06	30YrCancer	*	1.20E-07
24	ALL	468405	3769967	1.03E-07	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
24	ALL	468405	3769967	6.14E-05	91087	T-2,6-diiso	1.88E-09	30YrCancer	*	1.88E-09
24	ALL	468405	3769967	4.38E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
25	ALL	468430	3769967	0.02196	9901	DieselExhP	1.90E-05	30YrCancer	*	1.90E-05
25	ALL	468430	3769967	7.49E-05	106990	1,3-Butadie	3.54E-08	30YrCancer	*	3.54E-08
25	ALL	468430	3769967	4.64E-05	75070	Acetaldehy	3.65E-10	30YrCancer	*	3.65E-10
25	ALL	468430	3769967	6.28E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
25	ALL	468430	3769967	4.18E-06	7440382	Arsenic	5.09E-07	30YrCancer	*	3.94E-08
25	ALL	468430	3769967	0.005437	71432	Benzene	4.28E-07	30YrCancer	*	4.28E-07
25	ALL	468430	3769967	3.72E-07	7440417	Beryllium	2.46E-09	30YrCancer	*	2.46E-09
25	ALL	468430	3769967	0.00081	7440439	Cadmium	9.55E-06	30YrCancer	*	9.55E-06
25	ALL	468430	3769967	1.54E-06	18540299	Cr(VI)	6.73E-07	30YrCancer	*	6.17E-07
25	ALL	468430	3769967	1.60E-05	100414	Ethyl Benze	1.09E-10	30YrCancer	*	1.09E-10
25	ALL	468430	3769967	0.257596	50000	Formaldeh	4.25E-06	30YrCancer	*	4.25E-06

25	ALL	468430	3769967	9.43E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
25	ALL	468430	3769967	1.12E-05	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
25	ALL	468430	3769967	5.35E-05	7439921	Lead	3.56E-08	30YrCance	*	1.77E-09
25	ALL	468430	3769967	1.63E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
25	ALL	468430	3769967	1.09E-07	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
25	ALL	468430	3769967	0.02729	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
25	ALL	468430	3769967	1.39E-06	91203	Naphthale	1.31E-10	30YrCance	*	1.31E-10
25	ALL	468430	3769967	6.84E-05	1151	PAHs-w/o	4.04E-06	30YrCance	*	1.27E-07
25	ALL	468430	3769967	1.09E-07	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
25	ALL	468430	3769967	6.51E-05	91087	T-2,6-diiso	2.00E-09	30YrCance	*	2.00E-09
25	ALL	468430	3769967	4.64E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	0.020624	9901	DieselExhP	1.78E-05	30YrCance	*	1.78E-05
26	ALL	468330	3769992	6.09E-05	106990	1,3-Butadi	2.88E-08	30YrCance	*	2.88E-08
26	ALL	468330	3769992	3.78E-05	75070	Acetaldehy	2.97E-10	30YrCance	*	2.97E-10
26	ALL	468330	3769992	5.11E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	3.40E-06	7440382	Arsenic	4.14E-07	30YrCance	*	3.21E-08
26	ALL	468330	3769992	0.004423	71432	Benzene	3.48E-07	30YrCance	*	3.48E-07
26	ALL	468330	3769992	3.02E-07	7440417	Beryllium	2.00E-09	30YrCance	*	2.00E-09
26	ALL	468330	3769992	0.000659	7440439	Cadmium	7.77E-06	30YrCance	*	7.77E-06
26	ALL	468330	3769992	1.25E-06	18540299	Cr(VI)	5.48E-07	30YrCance	*	5.02E-07
26	ALL	468330	3769992	1.30E-05	100414	Ethyl Benz	8.89E-11	30YrCance	*	8.89E-11
26	ALL	468330	3769992	0.209554	50000	Formaldeh	3.46E-06	30YrCance	*	3.46E-06
26	ALL	468330	3769992	7.67E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	9.15E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	4.35E-05	7439921	Lead	2.89E-08	30YrCance	*	1.44E-09
26	ALL	468330	3769992	1.33E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	8.85E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	0.0222	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	1.13E-06	91203	Naphthale	1.07E-10	30YrCance	*	1.07E-10
26	ALL	468330	3769992	5.56E-05	1151	PAHs-w/o	3.29E-06	30YrCance	*	1.04E-07
26	ALL	468330	3769992	8.85E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
26	ALL	468330	3769992	5.30E-05	91087	T-2,6-diiso	1.62E-09	30YrCance	*	1.62E-09
26	ALL	468330	3769992	3.78E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	0.020282	9901	DieselExhP	1.75E-05	30YrCance	*	1.75E-05
27	ALL	468355	3769992	6.23E-05	106990	1,3-Butadi	2.94E-08	30YrCance	*	2.94E-08
27	ALL	468355	3769992	3.86E-05	75070	Acetaldehy	3.04E-10	30YrCance	*	3.04E-10
27	ALL	468355	3769992	5.22E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	3.47E-06	7440382	Arsenic	4.23E-07	30YrCance	*	3.28E-08
27	ALL	468355	3769992	0.004521	71432	Benzene	3.56E-07	30YrCance	*	3.56E-07
27	ALL	468355	3769992	3.09E-07	7440417	Beryllium	2.04E-09	30YrCance	*	2.04E-09
27	ALL	468355	3769992	0.000673	7440439	Cadmium	7.94E-06	30YrCance	*	7.94E-06
27	ALL	468355	3769992	1.28E-06	18540299	Cr(VI)	5.60E-07	30YrCance	*	5.13E-07
27	ALL	468355	3769992	1.33E-05	100414	Ethyl Benz	9.08E-11	30YrCance	*	9.08E-11
27	ALL	468355	3769992	0.214195	50000	Formaldeh	3.54E-06	30YrCance	*	3.54E-06
27	ALL	468355	3769992	7.84E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	9.35E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	4.45E-05	7439921	Lead	2.96E-08	30YrCance	*	1.47E-09
27	ALL	468355	3769992	1.36E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	9.05E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	0.022692	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	1.16E-06	91203	Naphthale	1.09E-10	30YrCance	*	1.09E-10
27	ALL	468355	3769992	5.68E-05	1151	PAHs-w/o	3.36E-06	30YrCance	*	1.06E-07
27	ALL	468355	3769992	9.05E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
27	ALL	468355	3769992	5.41E-05	91087	T-2,6-diiso	1.66E-09	30YrCance	*	1.66E-09
27	ALL	468355	3769992	3.86E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	0.019907	9901	DieselExhP	1.72E-05	30YrCance	*	1.72E-05
28	ALL	468380	3769992	6.38E-05	106990	1,3-Butadi	3.01E-08	30YrCance	*	3.01E-08
28	ALL	468380	3769992	3.95E-05	75070	Acetaldehy	3.11E-10	30YrCance	*	3.11E-10
28	ALL	468380	3769992	5.34E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	3.56E-06	7440382	Arsenic	4.33E-07	30YrCance	*	3.36E-08
28	ALL	468380	3769992	0.00463	71432	Benzene	3.64E-07	30YrCance	*	3.64E-07
28	ALL	468380	3769992	3.16E-07	7440417	Beryllium	2.09E-09	30YrCance	*	2.09E-09
28	ALL	468380	3769992	0.000689	7440439	Cadmium	8.13E-06	30YrCance	*	8.13E-06
28	ALL	468380	3769992	1.31E-06	18540299	Cr(VI)	5.73E-07	30YrCance	*	5.26E-07
28	ALL	468380	3769992	1.36E-05	100414	Ethyl Benz	9.30E-11	30YrCance	*	9.30E-11
28	ALL	468380	3769992	0.21934	50000	Formaldeh	3.62E-06	30YrCance	*	3.62E-06
28	ALL	468380	3769992	8.03E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	9.58E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	4.56E-05	7439921	Lead	3.03E-08	30YrCance	*	1.51E-09
28	ALL	468380	3769992	1.39E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	9.27E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	0.023237	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	1.19E-06	91203	Naphthale	1.12E-10	30YrCance	*	1.12E-10
28	ALL	468380	3769992	5.82E-05	1151	PAHs-w/o	3.44E-06	30YrCance	*	1.08E-07
28	ALL	468380	3769992	9.27E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
28	ALL	468380	3769992	5.54E-05	91087	T-2,6-diiso	1.70E-09	30YrCance	*	1.70E-09
28	ALL	468380	3769992	3.95E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
29	ALL	468330	3770017	0.01835	9901	DieselExhP	1.59E-05	30YrCance	*	1.59E-05
29	ALL	468330	3770017	5.73E-05	106990	1,3-Butadi	2.70E-08	30YrCance	*	2.70E-08
29	ALL	468330	3770017	3.55E-05	75070	Acetaldehy	2.79E-10	30YrCance	*	2.79E-10
29	ALL	468330	3770017	4.80E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
29	ALL	468330	3770017	3.19E-06	7440382	Arsenic	3.89E-07	30YrCance	*	3.01E-08
29	ALL	468330	3770017	0.004156	71432	Benzene	3.27E-07	30YrCance	*	3.27E-07
29	ALL	468330	3770017	2.84E-07	7440417	Beryllium	1.88E-09	30YrCance	*	1.88E-09
29	ALL	468330	3770017	0.000619	7440439	Cadmium	7.30E-06	30YrCance	*	7.30E-06
29	ALL	468330	3770017	1.18E-06	18540299	Cr(VI)	5.15E-07	30YrCance	*	4.72E-07
29	ALL	468330	3770017	1.22E-05	100414	Ethyl Benz	8.35E-11	30YrCance	*	8.35E-11
29	ALL	468330	3770017	0.196889	50000	Formaldeh	3.25E-06	30YrCance	*	3.25E-06
29	ALL	468330	3770017	7.21E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
29	ALL	468330	3770017	8.60E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00

29	ALL	468330	3770017	4.09E-05	7439921	Lead	2.72E-08	30YrCance	*	1.35E-09
29	ALL	468330	3770017	1.25E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
29	ALL	468330	3770017	8.32E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
29	ALL	468330	3770017	0.020858	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
29	ALL	468330	3770017	1.06E-06	91203	Naphthale	1.00E-10	30YrCance	*	1.00E-10
29	ALL	468330	3770017	5.22E-05	1151	PAHs-w/o	3.09E-06	30YrCance	*	9.73E-08
29	ALL	468330	3770017	8.32E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
29	ALL	468330	3770017	4.98E-05	91087	T-2,6-diiso	1.53E-09	30YrCance	*	1.53E-09
29	ALL	468330	3770017	3.55E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	0.017896	9901	DieselExhP	1.55E-05	30YrCance	*	1.55E-05
30	ALL	468355	3770017	5.86E-05	106990	1,3-Butadi	2.77E-08	30YrCance	*	2.77E-08
30	ALL	468355	3770017	3.63E-05	75070	Acetaldehy	2.86E-10	30YrCance	*	2.86E-10
30	ALL	468355	3770017	4.91E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	3.27E-06	7440382	Arsenic	3.98E-07	30YrCance	*	3.08E-08
30	ALL	468355	3770017	0.004254	71432	Benzene	3.35E-07	30YrCance	*	3.35E-07
30	ALL	468355	3770017	2.91E-07	7440417	Beryllium	1.92E-09	30YrCance	*	1.92E-09
30	ALL	468355	3770017	0.000633	7440439	Cadmium	7.47E-06	30YrCance	*	7.47E-06
30	ALL	468355	3770017	1.20E-06	18540299	Cr(VI)	5.27E-07	30YrCance	*	4.83E-07
30	ALL	468355	3770017	1.25E-05	100414	Ethyl Benz	8.55E-11	30YrCance	*	8.55E-11
30	ALL	468355	3770017	0.201532	50000	Formaldeh	3.33E-06	30YrCance	*	3.33E-06
30	ALL	468355	3770017	7.38E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	8.80E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	4.19E-05	7439921	Lead	2.78E-08	30YrCance	*	1.38E-09
30	ALL	468355	3770017	1.28E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	8.51E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	0.02135	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	1.09E-06	91203	Naphthale	1.03E-10	30YrCance	*	1.03E-10
30	ALL	468355	3770017	5.35E-05	1151	PAHs-w/o	3.16E-06	30YrCance	*	9.96E-08
30	ALL	468355	3770017	8.51E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
30	ALL	468355	3770017	5.09E-05	91087	T-2,6-diiso	1.56E-09	30YrCance	*	1.56E-09
30	ALL	468355	3770017	3.63E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	0.017695	9901	DieselExhP	1.53E-05	30YrCance	*	1.53E-05
31	ALL	468380	3770017	6.04E-05	106990	1,3-Butadi	2.85E-08	30YrCance	*	2.85E-08
31	ALL	468380	3770017	3.74E-05	75070	Acetaldehy	2.94E-10	30YrCance	*	2.94E-10
31	ALL	468380	3770017	5.06E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	3.36E-06	7440382	Arsenic	4.10E-07	30YrCance	*	3.18E-08
31	ALL	468380	3770017	0.004381	71432	Benzene	3.45E-07	30YrCance	*	3.45E-07
31	ALL	468380	3770017	2.99E-07	7440417	Beryllium	1.98E-09	30YrCance	*	1.98E-09
31	ALL	468380	3770017	0.000652	7440439	Cadmium	7.70E-06	30YrCance	*	7.70E-06
31	ALL	468380	3770017	1.24E-06	18540299	Cr(VI)	5.43E-07	30YrCance	*	4.97E-07
31	ALL	468380	3770017	1.29E-05	100414	Ethyl Benz	8.80E-11	30YrCance	*	8.80E-11
31	ALL	468380	3770017	0.207552	50000	Formaldeh	3.43E-06	30YrCance	*	3.43E-06
31	ALL	468380	3770017	7.60E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	9.06E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	4.31E-05	7439921	Lead	2.87E-08	30YrCance	*	1.42E-09
31	ALL	468380	3770017	1.32E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	8.77E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	0.021988	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	1.12E-06	91203	Naphthale	1.06E-10	30YrCance	*	1.06E-10
31	ALL	468380	3770017	5.51E-05	1151	PAHs-w/o	3.26E-06	30YrCance	*	1.03E-07
31	ALL	468380	3770017	8.77E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
31	ALL	468380	3770017	5.25E-05	91087	T-2,6-diiso	1.61E-09	30YrCance	*	1.61E-09
31	ALL	468380	3770017	3.74E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	0.016445	9901	DieselExhP	1.42E-05	30YrCance	*	1.42E-05
32	ALL	468330	3770042	5.40E-05	106990	1,3-Butadi	2.55E-08	30YrCance	*	2.55E-08
32	ALL	468330	3770042	3.35E-05	75070	Acetaldehy	2.63E-10	30YrCance	*	2.63E-10
32	ALL	468330	3770042	4.53E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	3.01E-06	7440382	Arsenic	3.67E-07	30YrCance	*	2.84E-08
32	ALL	468330	3770042	0.003921	71432	Benzene	3.08E-07	30YrCance	*	3.08E-07
32	ALL	468330	3770042	2.68E-07	7440417	Beryllium	1.77E-09	30YrCance	*	1.77E-09
32	ALL	468330	3770042	0.000584	7440439	Cadmium	6.89E-06	30YrCance	*	6.89E-06
32	ALL	468330	3770042	1.11E-06	18540299	Cr(VI)	4.86E-07	30YrCance	*	4.45E-07
32	ALL	468330	3770042	1.15E-05	100414	Ethyl Benz	7.88E-11	30YrCance	*	7.88E-11
32	ALL	468330	3770042	0.185771	50000	Formaldeh	3.07E-06	30YrCance	*	3.07E-06
32	ALL	468330	3770042	6.80E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	8.11E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	3.86E-05	7439921	Lead	2.57E-08	30YrCance	*	1.28E-09
32	ALL	468330	3770042	1.18E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	7.85E-08	7439976	Mercury	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	0.019681	7664417	NH3	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	1.00E-06	91203	Naphthale	9.48E-11	30YrCance	*	9.48E-11
32	ALL	468330	3770042	4.93E-05	1151	PAHs-w/o	2.92E-06	30YrCance	*	9.18E-08
32	ALL	468330	3770042	7.85E-08	7782492	Selenium	0.00E+00	30YrCance	*	0.00E+00
32	ALL	468330	3770042	4.70E-05	91087	T-2,6-diiso	1.44E-09	30YrCance	*	1.44E-09
32	ALL	468330	3770042	3.35E-05	108383	m-Xylene	0.00E+00	30YrCance	*	0.00E+00
33	ALL	468355	3770042	0.016073	9901	DieselExhP	1.39E-05	30YrCance	*	1.39E-05
33	ALL	468355	3770042	5.51E-05	106990	1,3-Butadi	2.60E-08	30YrCance	*	2.60E-08
33	ALL	468355	3770042	3.42E-05	75070	Acetaldehy	2.69E-10	30YrCance	*	2.69E-10
33	ALL	468355	3770042	4.62E-06	107028	Acrolein	0.00E+00	30YrCance	*	0.00E+00
33	ALL	468355	3770042	3.07E-06	7440382	Arsenic	3.74E-07	30YrCance	*	2.90E-08
33	ALL	468355	3770042	0.004003	71432	Benzene	3.15E-07	30YrCance	*	3.15E-07
33	ALL	468355	3770042	2.74E-07	7440417	Beryllium	1.81E-09	30YrCance	*	1.81E-09
33	ALL	468355	3770042	0.000596	7440439	Cadmium	7.03E-06	30YrCance	*	7.03E-06
33	ALL	468355	3770042	1.13E-06	18540299	Cr(VI)	4.96E-07	30YrCance	*	4.54E-07
33	ALL	468355	3770042	1.17E-05	100414	Ethyl Benz	8.04E-11	30YrCance	*	8.04E-11
33	ALL	468355	3770042	0.189617	50000	Formaldeh	3.13E-06	30YrCance	*	3.13E-06
33	ALL	468355	3770042	6.94E-06	7647010	HCl	0.00E+00	30YrCance	*	0.00E+00
33	ALL	468355	3770042	8.28E-06	110543	Hexane	0.00E+00	30YrCance	*	0.00E+00
33	ALL	468355	3770042	3.94E-05	7439921	Lead	2.62E-08	30YrCance	*	1.30E-09
33	ALL	468355	3770042	1.20E-07	7439965	Manganes	0.00E+00	30YrCance	*	0.00E+00

33	ALL	468355	3770042	8.01E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
33	ALL	468355	3770042	0.020088	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
33	ALL	468355	3770042	1.02E-06	91203	Naphthaler	9.67E-11	30YrCancer	*	9.67E-11
33	ALL	468355	3770042	5.03E-05	1151	PAHs-w/o	2.98E-06	30YrCancer	*	9.37E-08
33	ALL	468355	3770042	8.01E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
33	ALL	468355	3770042	4.79E-05	91087	T-2,6-diiso	1.47E-09	30YrCancer	*	1.47E-09
33	ALL	468355	3770042	3.42E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	0.015737	9901	DieselExhP	1.36E-05	30YrCancer	*	1.36E-05
34	ALL	468380	3770042	5.68E-05	106990	1,3-Butadie	2.68E-08	30YrCancer	*	2.68E-08
34	ALL	468380	3770042	3.52E-05	75070	Acetaldehy	2.77E-10	30YrCancer	*	2.77E-10
34	ALL	468380	3770042	4.76E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	3.16E-06	7440382	Arsenic	3.86E-07	30YrCancer	*	2.99E-08
34	ALL	468380	3770042	0.004121	71432	Benzene	3.24E-07	30YrCancer	*	3.24E-07
34	ALL	468380	3770042	2.82E-07	7440417	Beryllium	1.86E-09	30YrCancer	*	1.86E-09
34	ALL	468380	3770042	0.000614	7440439	Cadmium	7.24E-06	30YrCancer	*	7.24E-06
34	ALL	468380	3770042	1.17E-06	18540299	Cr(VI)	5.10E-07	30YrCancer	*	4.68E-07
34	ALL	468380	3770042	1.21E-05	100414	Ethyl Benze	8.28E-11	30YrCancer	*	8.28E-11
34	ALL	468380	3770042	0.195234	50000	Formaldeh	3.22E-06	30YrCancer	*	3.22E-06
34	ALL	468380	3770042	7.15E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	8.52E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	4.06E-05	7439921	Lead	2.70E-08	30YrCancer	*	1.34E-09
34	ALL	468380	3770042	1.24E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	8.25E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	0.020683	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	1.06E-06	91203	Naphthaler	9.96E-11	30YrCancer	*	9.96E-11
34	ALL	468380	3770042	5.18E-05	1151	PAHs-w/o	3.06E-06	30YrCancer	*	9.65E-08
34	ALL	468380	3770042	8.25E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
34	ALL	468380	3770042	4.94E-05	91087	T-2,6-diiso	1.51E-09	30YrCancer	*	1.51E-09
34	ALL	468380	3770042	3.52E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	0.014862	9901	DieselExhP	1.29E-05	30YrCancer	*	1.29E-05
35	ALL	468330	3770067	5.14E-05	106990	1,3-Butadie	2.42E-08	30YrCancer	*	2.42E-08
35	ALL	468330	3770067	3.18E-05	75070	Acetaldehy	2.50E-10	30YrCancer	*	2.50E-10
35	ALL	468330	3770067	4.30E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	2.86E-06	7440382	Arsenic	3.49E-07	30YrCancer	*	2.70E-08
35	ALL	468330	3770067	0.003727	71432	Benzene	2.93E-07	30YrCancer	*	2.93E-07
35	ALL	468330	3770067	2.55E-07	7440417	Beryllium	1.68E-09	30YrCancer	*	1.68E-09
35	ALL	468330	3770067	0.000555	7440439	Cadmium	6.55E-06	30YrCancer	*	6.55E-06
35	ALL	468330	3770067	1.05E-06	18540299	Cr(VI)	4.62E-07	30YrCancer	*	4.23E-07
35	ALL	468330	3770067	1.09E-05	100414	Ethyl Benze	7.49E-11	30YrCancer	*	7.49E-11
35	ALL	468330	3770067	0.176587	50000	Formaldeh	2.92E-06	30YrCancer	*	2.92E-06
35	ALL	468330	3770067	6.47E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	7.71E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	3.67E-05	7439921	Lead	2.44E-08	30YrCancer	*	1.21E-09
35	ALL	468330	3770067	1.12E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	7.46E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	0.018708	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	9.55E-07	91203	Naphthaler	9.01E-11	30YrCancer	*	9.01E-11
35	ALL	468330	3770067	4.69E-05	1151	PAHs-w/o	2.77E-06	30YrCancer	*	8.73E-08
35	ALL	468330	3770067	7.46E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
35	ALL	468330	3770067	4.46E-05	91087	T-2,6-diiso	1.37E-09	30YrCancer	*	1.37E-09
35	ALL	468330	3770067	3.18E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	0.014503	9901	DieselExhP	1.25E-05	30YrCancer	*	1.25E-05
36	ALL	468355	3770067	5.22E-05	106990	1,3-Butadie	2.46E-08	30YrCancer	*	2.46E-08
36	ALL	468355	3770067	3.24E-05	75070	Acetaldehy	2.55E-10	30YrCancer	*	2.55E-10
36	ALL	468355	3770067	4.37E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	2.91E-06	7440382	Arsenic	3.55E-07	30YrCancer	*	2.75E-08
36	ALL	468355	3770067	0.00379	71432	Benzene	2.98E-07	30YrCancer	*	2.98E-07
36	ALL	468355	3770067	2.59E-07	7440417	Beryllium	1.71E-09	30YrCancer	*	1.71E-09
36	ALL	468355	3770067	0.000564	7440439	Cadmium	6.66E-06	30YrCancer	*	6.66E-06
36	ALL	468355	3770067	1.07E-06	18540299	Cr(VI)	4.69E-07	30YrCancer	*	4.30E-07
36	ALL	468355	3770067	1.11E-05	100414	Ethyl Benze	7.61E-11	30YrCancer	*	7.61E-11
36	ALL	468355	3770067	0.179546	50000	Formaldeh	2.97E-06	30YrCancer	*	2.97E-06
36	ALL	468355	3770067	6.57E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	7.84E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	3.73E-05	7439921	Lead	2.48E-08	30YrCancer	*	1.23E-09
36	ALL	468355	3770067	1.14E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	7.59E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	0.019021	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	9.71E-07	91203	Naphthaler	9.16E-11	30YrCancer	*	9.16E-11
36	ALL	468355	3770067	4.76E-05	1151	PAHs-w/o	2.82E-06	30YrCancer	*	8.87E-08
36	ALL	468355	3770067	7.59E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
36	ALL	468355	3770067	4.54E-05	91087	T-2,6-diiso	1.39E-09	30YrCancer	*	1.39E-09
36	ALL	468355	3770067	3.24E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
37	ALL	468380	3770067	0.014221	9901	DieselExhP	1.23E-05	30YrCancer	*	1.23E-05
37	ALL	468380	3770067	5.34E-05	106990	1,3-Butadie	2.52E-08	30YrCancer	*	2.52E-08
37	ALL	468380	3770067	3.31E-05	75070	Acetaldehy	2.60E-10	30YrCancer	*	2.60E-10
37	ALL	468380	3770067	4.47E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
37	ALL	468380	3770067	2.98E-06	7440382	Arsenic	3.63E-07	30YrCancer	*	2.81E-08
37	ALL	468380	3770067	0.003875	71432	Benzene	3.05E-07	30YrCancer	*	3.05E-07
37	ALL	468380	3770067	2.65E-07	7440417	Beryllium	1.75E-09	30YrCancer	*	1.75E-09
37	ALL	468380	3770067	0.000577	7440439	Cadmium	6.81E-06	30YrCancer	*	6.81E-06
37	ALL	468380	3770067	1.10E-06	18540299	Cr(VI)	4.80E-07	30YrCancer	*	4.40E-07
37	ALL	468380	3770067	1.14E-05	100414	Ethyl Benze	7.78E-11	30YrCancer	*	7.78E-11
37	ALL	468380	3770067	0.183599	50000	Formaldeh	3.03E-06	30YrCancer	*	3.03E-06
37	ALL	468380	3770067	6.72E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
37	ALL	468380	3770067	8.02E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
37	ALL	468380	3770067	3.81E-05	7439921	Lead	2.54E-08	30YrCancer	*	1.26E-09
37	ALL	468380	3770067	1.16E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
37	ALL	468380	3770067	7.76E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
37	ALL	468380	3770067	0.019451	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00

37	ALL	468380	3770067	9.92E-07	91203	Naphthaler	9.37E-11	30YrCancer	*	9.37E-11
37	ALL	468380	3770067	4.87E-05	1151	PAHs-w/o	2.88E-06	30YrCancer	*	9.07E-08
37	ALL	468380	3770067	7.76E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
37	ALL	468380	3770067	4.64E-05	91087	T-2,6-diiso	1.42E-09	30YrCancer	*	1.42E-09
37	ALL	468380	3770067	3.31E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	0.01351	9901	DieselExhP	1.17E-05	30YrCancer	*	1.17E-05
38	ALL	468330	3770092	4.89E-05	106990	1,3-Butadie	2.31E-08	30YrCancer	*	2.31E-08
38	ALL	468330	3770092	3.03E-05	75070	Acetaldehy	2.38E-10	30YrCancer	*	2.38E-10
38	ALL	468330	3770092	4.09E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	2.72E-06	7440382	Arsenic	3.32E-07	30YrCancer	*	2.57E-08
38	ALL	468330	3770092	0.003547	71432	Benzene	2.79E-07	30YrCancer	*	2.79E-07
38	ALL	468330	3770092	2.42E-07	7440417	Beryllium	1.60E-09	30YrCancer	*	1.60E-09
38	ALL	468330	3770092	0.000528	7440439	Cadmium	6.23E-06	30YrCancer	*	6.23E-06
38	ALL	468330	3770092	1.00E-06	18540299	Cr(VI)	4.39E-07	30YrCancer	*	4.03E-07
38	ALL	468330	3770092	1.04E-05	100414	Ethyl Benze	7.13E-11	30YrCancer	*	7.13E-11
38	ALL	468330	3770092	0.168048	50000	Formaldeh	2.78E-06	30YrCancer	*	2.78E-06
38	ALL	468330	3770092	6.15E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	7.34E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	3.49E-05	7439921	Lead	2.32E-08	30YrCancer	*	1.15E-09
38	ALL	468330	3770092	1.06E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	7.10E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	0.017803	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	9.08E-07	91203	Naphthaler	8.57E-11	30YrCancer	*	8.57E-11
38	ALL	468330	3770092	4.46E-05	1151	PAHs-w/o	2.64E-06	30YrCancer	*	8.30E-08
38	ALL	468330	3770092	7.10E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
38	ALL	468330	3770092	4.25E-05	91087	T-2,6-diiso	1.30E-09	30YrCancer	*	1.30E-09
38	ALL	468330	3770092	3.03E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	0.013164	9901	DieselExhP	1.14E-05	30YrCancer	*	1.14E-05
39	ALL	468355	3770092	4.96E-05	106990	1,3-Butadie	2.34E-08	30YrCancer	*	2.34E-08
39	ALL	468355	3770092	3.08E-05	75070	Acetaldehy	2.42E-10	30YrCancer	*	2.42E-10
39	ALL	468355	3770092	4.16E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	2.77E-06	7440382	Arsenic	3.37E-07	30YrCancer	*	2.61E-08
39	ALL	468355	3770092	0.003602	71432	Benzene	2.83E-07	30YrCancer	*	2.83E-07
39	ALL	468355	3770092	2.46E-07	7440417	Beryllium	1.63E-09	30YrCancer	*	1.63E-09
39	ALL	468355	3770092	0.000536	7440439	Cadmium	6.33E-06	30YrCancer	*	6.33E-06
39	ALL	468355	3770092	1.02E-06	18540299	Cr(VI)	4.46E-07	30YrCancer	*	4.09E-07
39	ALL	468355	3770092	1.06E-05	100414	Ethyl Benze	7.24E-11	30YrCancer	*	7.24E-11
39	ALL	468355	3770092	0.170661	50000	Formaldeh	2.82E-06	30YrCancer	*	2.82E-06
39	ALL	468355	3770092	6.25E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	7.45E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	3.55E-05	7439921	Lead	2.36E-08	30YrCancer	*	1.17E-09
39	ALL	468355	3770092	1.08E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	7.21E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	0.01808	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	9.23E-07	91203	Naphthaler	8.71E-11	30YrCancer	*	8.71E-11
39	ALL	468355	3770092	4.53E-05	1151	PAHs-w/o	2.68E-06	30YrCancer	*	8.43E-08
39	ALL	468355	3770092	7.21E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
39	ALL	468355	3770092	4.31E-05	91087	T-2,6-diiso	1.32E-09	30YrCancer	*	1.32E-09
39	ALL	468355	3770092	3.08E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	0.0129	9901	DieselExhP	1.12E-05	30YrCancer	*	1.12E-05
40	ALL	468380	3770092	5.05E-05	106990	1,3-Butadie	2.38E-08	30YrCancer	*	2.38E-08
40	ALL	468380	3770092	3.13E-05	75070	Acetaldehy	2.46E-10	30YrCancer	*	2.46E-10
40	ALL	468380	3770092	4.23E-06	107028	Acrolein	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	2.81E-06	7440382	Arsenic	3.43E-07	30YrCancer	*	2.65E-08
40	ALL	468380	3770092	0.003662	71432	Benzene	2.88E-07	30YrCancer	*	2.88E-07
40	ALL	468380	3770092	2.50E-07	7440417	Beryllium	1.65E-09	30YrCancer	*	1.65E-09
40	ALL	468380	3770092	0.000545	7440439	Cadmium	6.43E-06	30YrCancer	*	6.43E-06
40	ALL	468380	3770092	1.04E-06	18540299	Cr(VI)	4.54E-07	30YrCancer	*	4.16E-07
40	ALL	468380	3770092	1.07E-05	100414	Ethyl Benze	7.36E-11	30YrCancer	*	7.36E-11
40	ALL	468380	3770092	0.173484	50000	Formaldeh	2.87E-06	30YrCancer	*	2.87E-06
40	ALL	468380	3770092	6.35E-06	7647010	HCl	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	7.57E-06	110543	Hexane	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	3.60E-05	7439921	Lead	2.40E-08	30YrCancer	*	1.19E-09
40	ALL	468380	3770092	1.10E-07	7439965	Manganese	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	7.33E-08	7439976	Mercury	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	0.018379	7664417	NH3	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	9.38E-07	91203	Naphthaler	8.85E-11	30YrCancer	*	8.85E-11
40	ALL	468380	3770092	4.60E-05	1151	PAHs-w/o	2.72E-06	30YrCancer	*	8.57E-08
40	ALL	468380	3770092	7.33E-08	7782492	Selenium	0.00E+00	30YrCancer	*	0.00E+00
40	ALL	468380	3770092	4.39E-05	91087	T-2,6-diiso	1.35E-09	30YrCancer	*	1.35E-09
40	ALL	468380	3770092	3.13E-05	108383	m-Xylene	0.00E+00	30YrCancer	*	0.00E+00

Table B-5

Total Cancer Risk Summary

Summary of Total Cancer Risk			Total
1	3	24	6.79E-05
2	25	46	6.71E-05
3	47	68	6.69E-05
4	69	90	6.74E-05
5	91	112	6.81E-05
6	113	134	5.49E-05
7	135	156	5.45E-05
8	157	178	5.46E-05
9	179	200	5.55E-05
10	201	222	5.64E-05
11	223	244	4.69E-05
12	245	266	4.69E-05
13	267	288	4.71E-05
14	289	310	4.77E-05
15	311	332	4.86E-05
16	333	354	4.13E-05
17	355	376	4.14E-05
18	377	398	4.15E-05
19	399	420	4.20E-05
20	421	442	4.30E-05
21	443	464	3.71E-05
22	465	486	3.72E-05
23	487	508	3.73E-05
24	509	530	3.77E-05
25	531	552	3.85E-05
26	553	574	3.37E-05
27	575	596	3.38E-05
28	597	618	3.39E-05
29	619	640	3.08E-05
30	641	662	3.08E-05
31	663	684	3.10E-05
32	685	706	2.83E-05
33	707	728	2.83E-05
34	729	750	2.84E-05
35	751	772	2.62E-05
36	773	794	2.62E-05
37	795	816	2.62E-05
38	817	838	2.44E-05
39	839	860	2.43E-05
40	861	882	2.43E-05

D.2 - Technical Memorandum

TECHNICAL MEMORANDUM

Las Terrazas Residential Project
Cypress Avenue and Valley Boulevard
Colton, California

Prepared For

AMCAL Multi-Housing, Inc.
Attention: Jay Ross
30141 Agoura Road, Suite 100
Agoura Hills, California 91301
Phone: 818-706-0694 ext. 128
Fax: 818-889-9158

Prepared By

Dr. Valorie L. Thompson
Scientific Resources Associated

On the behalf of
Eilar Associates, Inc.
Acoustical & Environmental Consulting
210 South Juniper Street, Suite 100
Escondido, California 92025
www.eilarassociates.com
Phone: 760-738-5570
Fax: 760-738-5227

Job #B60117A1

January 27, 2016

Scientific Resources Associated
1328 Kaimalino Lane
San Diego, CA 92109

Memorandum

To:	Eilar and Associates	From:	Valorie Thompson
Re:	Las Terrazas Residential Project Health Risk Assessment Results	Date:	January 27, 2016

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

This Technical Memorandum provides an evaluation of health risk assessment results for the outdoor recreational areas proposed for the Las Terrazas Residential Project.

As shown in Figure 1, the project is proposing to construct a multi-family residential development with day care center and recreational areas, including tot lots, community pool, and dog park area.

At the request of the project applicant, SRA has calculated the potential health risks at the outdoor recreation areas identified on the project plot plan. The risks were calculated using the AERMOD model and the HARP2 model, which is the ARB's currently approved risk assessment model for evaluating toxic air contaminants. The approach to the analysis is described in detail in the *Air Quality and Greenhouse Gas Analysis* prepared by SRA for the project in October 2015.

The HARP2 risk assessment results are based on the OEHHA-recommended risk scenario that addresses residential exposure. Under OEHHA guidance, the residential scenario assumes that an individual would be present in the exposure location 24 hours per day, 350 days per year, for 30 years. The exposure scenario includes age sensitivity factors that calculate the risks during childhood exposure. The residential scenario is highly conservative for a recreational exposure scenario that would be appropriate for the tot lots and outdoor recreational space. To adjust for recreational exposure, it was assumed that the tot lots and outdoor space could be used for as long as 4 hours per day, 250 days per year. Table 1 presents a summary of the estimated risk under both the residential exposure scenario and adjusted for a recreational exposure scenario.

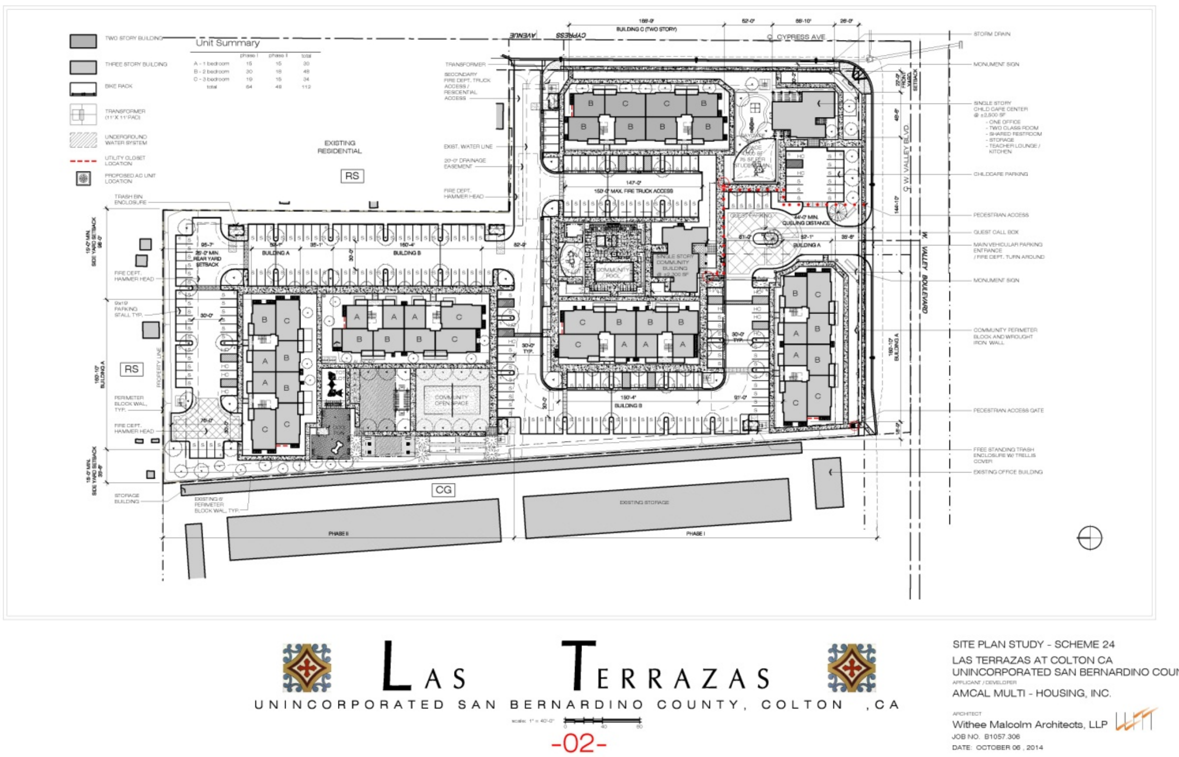
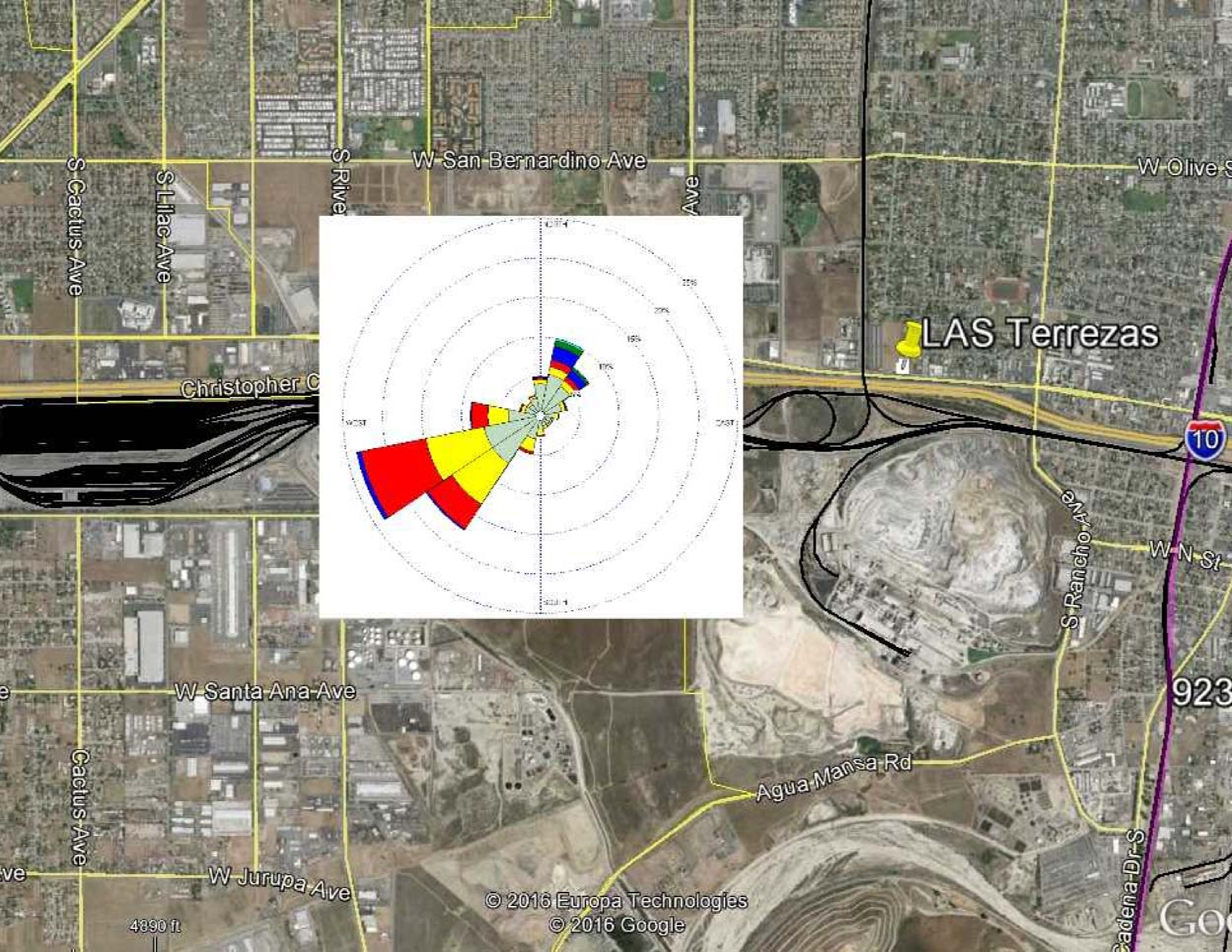


Figure 1. Las Terrazas Apartment Project

Table 1 **Estimated Health Risks at Outdoor Recreational Areas**					
UTME	**UTMN**	**Receptor No.**	**Description**	**Cancer Risk Residential Exposure Scenario**	**Cancer Risk Recreational Exposure Scenario**
468405	3769892	9	Tot lot outside day care center	55.5 in a million	6.6 in a million
468380	3769917	13	Community pool	47.1 in a million	5.6 in a million
468380	3769942	18	Tot lot outside pool	41.5 in a million	4.94 in a million
468330	3769992	26	Community open space	33.7 in a million	4.01 in a million
468330	3770017	29	Tot lot/dog park	30.8 in a million	3.67 in a million

D.3 - Air Quality-Greenhouse Gas-Health Risk Assessment Supporting Documentation



W San Bernardino Ave
W Olive St
S Cactus Ave
S Lilac Ave
S Rive
Ave
LAS Terrezas
Christopher C
10
W N St
S Rancho Ave
923
W Santa Ana Ave
Agua Mansa Rd
Cactus Ave
W Jurupa Ave
Cadena Dr S
4890 ft
NORTH
SOUTH
WEST
EAST
5%
10%
15%
20%
25%
© 2016 Europa Technologies
© 2016 Google

Pilot Study of High Performance Air Filtration for Classrooms Applications

Draft report: October 2009

Prepared by:

South Coast Air Quality Management District (AQMD)
21865 Copley Dr, Diamond Bar, CA 91765

IQAir North America
10440 Ontiveros Place, Santa Fe Springs, CA 90670

ABSTRACT

A pilot study was conducted between April and December 2008 to investigate the effectiveness of three different air purification systems in reducing the exposure of children to air contaminants inside nine classrooms at three Southern California schools (three classrooms per school). Two of them, Del Amo Elementary and Dominguez Elementary, are part of the Los Angeles Unified School District (LAUSD), while the third school, Hudson Elementary, is part of the Long Beach Unified School District (LBUSD). Continuous and integrated measurements were conducted to monitor the indoor and outdoor concentrations of the following species: ultrafine particles (UFP), particulate matter mass (both $PM_{2.5}$ and PM_{10}), black carbon (BC), and volatile organic compounds (VOCs). An HVAC-based high-performance panel filter (HP-PF), a register-based air purifier (RS), and a standalone system (SA) were tested alone and in different combinations for their ability to remove the monitored pollutants from the indoor air.

Overall, the coupling between a register system and a high-performance panel filter (RS + HP-PF) was the most effective solution for reducing the indoor concentrations of BC, UFP, and $PM_{2.5}$, with study average removal efficiencies varying from 87 to 96%. When using a HP-PF alone, reductions close to 90% were also obtained. Due to re-suspension of dust and other relatively large particles from common indoor activities such as walking and cleaning, the removal performance of PM_{10} was lower than that of other particle measurements (68% when using a RS + HP-PF combination). In all cases, air quality conditions were improved substantially with respect to the corresponding baseline (pre-existing) conditions, when removal efficiencies for the different particulate pollutants varied between 20% and 50%. Data obtained from the analysis of canister samples collected at Dominguez elementary showed that the total VOC removal performance of the register system (RS) was 28%. These values were substantially higher for the standalone unit (SA) operated with and without the use of the HVAC system (58 and 86%, respectively). Because gas-absorbing media may be subject to saturation after experiencing high short-term concentrations, the effectiveness, lifetime, costs, benefits, and maintenance of the gas removal systems tested in this pilot study must be further assessed before conclusions and recommendations can be made.

TABLE OF CONTENTS

INTRODUCTION

Background

Numerous epidemiological and toxicological studies have found positive associations between exposure to atmospheric particulate matter (PM) and adverse health effects (Pope and Dockery, 2006; Environmental Protection Agency Integrated Science Assessments, 2009). Although air quality standards have been established for outdoor ambient environments, a significant portion of human exposures to PM occurs indoors, where people spend around 85-90% of their time. Hence, it is important to understand and reduce the sources of both indoor and outdoor PM. Indoor PM consists of outdoor particles that have infiltrated indoors, particles emitted indoors (primary), and particles formed indoors (secondary) from precursors emitted both indoors and outdoors.

Children are regarded as particularly susceptible to potential health hazards related to PM exposure, which include asthma, lung inflammation, allergies and other types of respiratory and cardiovascular problems. School-aged children spend approximately 30% of their day in classrooms. For this reason, minimizing the concentration of PM (as well as that of other air contaminants) inside classrooms is important, especially at schools located in close proximity to roadways and other substantial sources of air pollution. One approach is the installation of panel filters inside the Heating, Ventilating, and Air Conditioning (HVAC) system. Common medium performance filters with a Minimum Performance Reporting Value (MERV) of 7 (those installed in most commercial buildings) remove only a small fraction of the particles with aerodynamic diameters lower than 0.3 µm, although higher removal efficiencies are generally achieved for larger particles. Diesel particulate matter, which is considered an air toxic, generally consists of particles less than 0.3 µm. New evidence also suggests that ultrafine particles, less than 0.1 µm by definition, have harmful health effects beyond those caused by particle mass.

Filtration in classrooms presents some unique challenges. The older HVAC systems that exist in older schools were not designed with air filtration in mind. The classroom is a noise sensitive environment, so filtration systems must meet strict decibel limits when in operation. Classrooms often have high ventilation rates with doors and windows that are frequently open to outside air. Finally, classrooms are large, densely occupied spaces with a lot of activity that can lead to indoor generation of particles and other pollutants.

Objectives and Study Design

The objective of this pilot study was to investigate the effectiveness of three different air purification systems/solutions in reducing the exposure of children to outdoor-infiltrated and indoor-generated air contaminants inside nine classrooms at three Southern California schools. To this end, the South Coast Air Quality Management District (SCAQMD; 21865 Copley Dr, Diamond Bar, CA 91765) worked in close collaboration with IQAir (IQAir North America, 10440 Ontiveros Place, Santa Fe Springs, CA 90670), a company that specializes in air purification solutions, and Thermal Comfort Systems (Thermal Comfort Systems Inc., 8038 Andasol Ave., Northridge, CA 91325), an HVAC contractor. Of particular interest was the removal of various sizes and types of particulate matter, especially the smaller sizes associated with diesel engine exhaust. Solutions for removing gaseous air contaminants that may be air toxics or cause odors were also examined. The types of pollutants for which the performance of the installed systems were tested are described below:

- Ultra-fine particles (UFPs; particles with an aerodynamic diameter less than 0.1 µm): UFP are primarily produced from the combustion of fossil fuels (e.g. motor-vehicle emissions). Recent health studies suggest that UFPs are more toxic than fine particles, possibly due to their chemical composition and their ability to penetrate cell walls, enter the blood stream, and translocate to organs throughout the body. UFP are currently unregulated in the United States.

- Fine PM ($PM_{2.5}$; 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, forest fires, agricultural 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 National Ambient Air Quality Standards (NAAQS).

- PM_{10} (particles with an aerodynamic diameter less than 10 µm): PM_{10} includes all $PM_{2.5}$ particles, but also larger 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. Environmental Protection Agency (U.S. EPA) criteria pollutant and also has associated National Ambient Air Quality Standards (NAAQS).

- Black Carbon (BC; sometimes referred to as soot; related closely to elemental carbon): BC is a component of PM and is formed through the incomplete combustion of fossil fuels and biomass, and is emitted from both natural and anthropogenic sources. Most atmospheric BC is in the fine or ultra-fine particle size ranges. The majority of 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 Study, 2008).

- Volatile Organic Compounds (VOCs): 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

Schools and Classrooms Characteristics

Three elementary schools (all located in Southern Los Angeles County in the Carson-Long Beach area) were selected for this pilot study. Two of them, Del Amo Elementary and Dominguez Elementary, are part of the Los Angeles Unified School District (LAUSD), while the third school, Hudson Elementary, is part of the Long Beach Unified School District (LBUSD). All three schools are in close proximity to at least three large refineries and several heavily trafficked highways and freeways including the I-110, I-405, I-710, and CA-103 (Figure 1). The Los Angeles and Long Beach Port complexes and the Union Pacific Railroad Intermodal Container Transfer Facility (UPRR ICTF) are other major emissions sources in the area. The presence of these important emissions sources has lead to local concerns about the air quality in the surrounding communities.

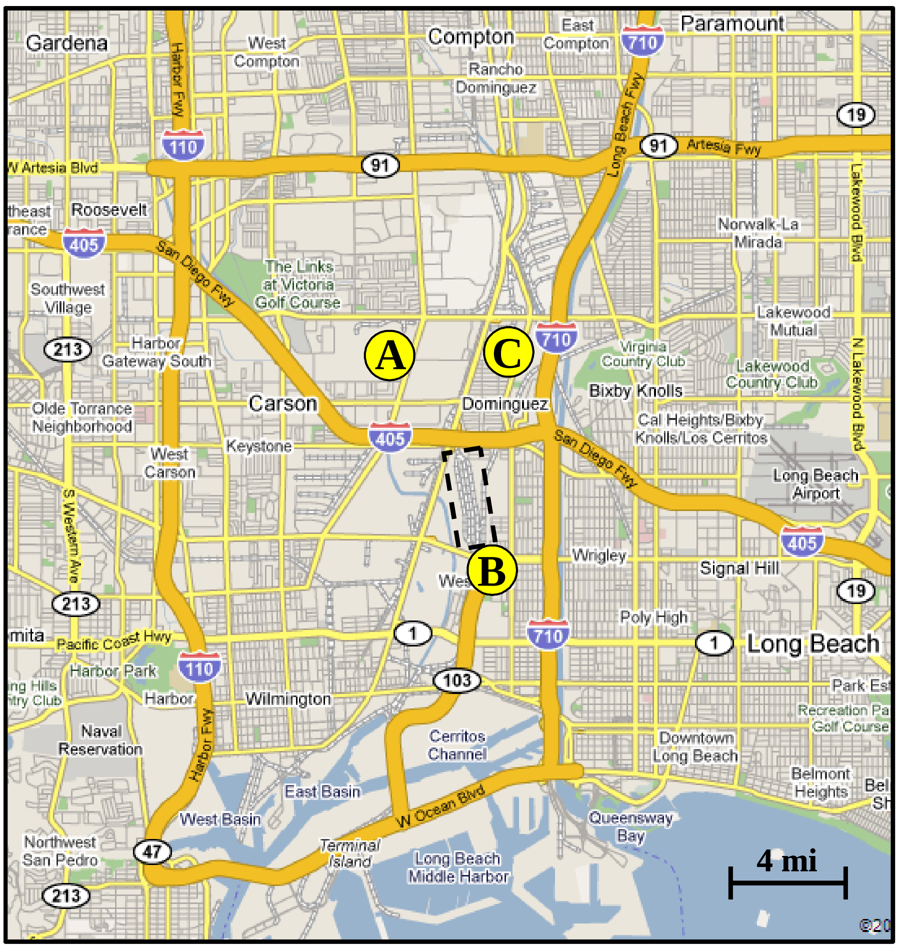


Figure 1. Map of the study area as obtained from Google Earth (Google Inc. 1400 Amphitheatre Pkwy, Mountain View, CA 94043). The yellow circles indicate the locations of the three elementary schools participating in this pilot study: Del Amo (A), Hudson (B), and Dominguez (C). The Union Pacific Railroad Intermodal Container Transfer Facility is marked by the black rectangle

At each of the three elementary schools, three classrooms with similar structural characteristics and ventilation conditions were selected to provide reproducible test conditions for the various air purification systems deployed. All classrooms (varying between 7533 and 9196 ft^3 in size) already included forced-air HVAC systems, although windows and doors were regularly used for additional ventilation. The most relevant characteristics of all nine classrooms are listed in Table 1, along with their respective identification numbers.

Table 1. Structural characteristics and ventilation conditions of the nine classrooms selected for this pilot study

	SCHOOL								
	DEL AMO			HUDSON			DOMINGUEZ		
Classroom ID	DA-6	DA-7	DA-8	H-11	H-15	H-52	DZ-7	DZ-9	DZ-11
Total Number of Occupants	18	19	22	21	11	17	28	28	29
Room Size (ft)	38×24×10	38×24×10	38×24×10	30×30×9	30×30×9	31×27×9	38×22×11	38×22×11	38×22×11
Room Volume (ft^3)	9120	9120	9120	8100	8100	7533	9196	9196	9196
HVAC System Type	DW-M*	DW-M*	DW-M*	DM-ZR**	DM-ZR**	DR***	DR***	DR***	DR***
HVAC Panel Filter Type	2" Pleated	2" Pleated	2" Pleated	2" Pleated	2" Pleated	2" Fiberglass	1" Pleated	1" Pleated	1" Pleated
Filter Rating	MERV 7	MERV 7	MERV 7	MERV 7	MERV 7	Unclassified	MERV 7	MERV 7	MERV 7
HVAC Operation	Manual	Manual	Manual	Automatic	Automatic	Manual	Manual	Manual	Manual
Number of Supply Vents	1	1	1	1	1	4	3	3	3
Supplied Airflow# (cfm)	1200	1200	1250	840	903	1236	1642	1681	1772
Air Exchange Rate	7.9	7.9	8.2	6.2	6.7	9.8	10.7	11.0	11.5

*DW-M = Ducted Wall-Mount
**DM-ZR = Ducted Multi-Zone Rooftop
***DR = Ducted Rooftop
#With existing panel filter

Prior to beginning this study, none of the selected classrooms featured any specific air purification device other than one or more medium performance panel filters (MERV 7) installed inside the respective HVAC systems. The typical replacement interval for these air filters is approximately three months according to schools schedules. The primary purpose of this panel filter is to remove coarser particles and dust to protect the HVAC system's heating and cooling coils. These filters generally provide little or no removal of smaller particles or gaseous pollutants.

Air Purification Solutions

Three different air purification solutions were tested for their ability to remove UFP, $PM_{2.5}$, PM_{10}, BC and, where possible, VOCs from the air stream:

a) an HVAC-based high-performance panel filter (**HP-PF**),

b) a register-based air purifier (here referred to as register system or **RS**), and

c) a standalone system (**SA**).

All air purification solutions were provided, installed, and maintained by IQAir, and their primary features are summarized in Table 2.

Table 2. Summary of the primary features of the three air purification devices adopted for this pilot study: high-performance panel filter (HP-PF), register system (RS), and standalone system (SA)

	High-performance Panel Filter (PF)	Register Sysyem (RS)	Standalone System (SA)
High UFP and $PM_{2.5}$ Filtration Efficiency	√	√	√
High Gas Phase Filtration Efficiency	0	√	√
Low Pressure Drop / High Air Flow	√	√	√
Low Noise	√	√	√
Low Maintenance	√	√	√
High Classroom Compatibility	√	√	√
No HVAC System Retrofit	√	0	√
Minimal Impact on Classroom Space	√	√	√
Low Power Consumption	N/A	N/A	√
Tamper-Resistant Design	N/A	N/A	√

√ = featured
0 = not featured

High-performance panel filter (HP-PF)

In most classrooms, the existing medium performance panel filters were replaced with one or more HP-PFs as shown to in Figure 2.

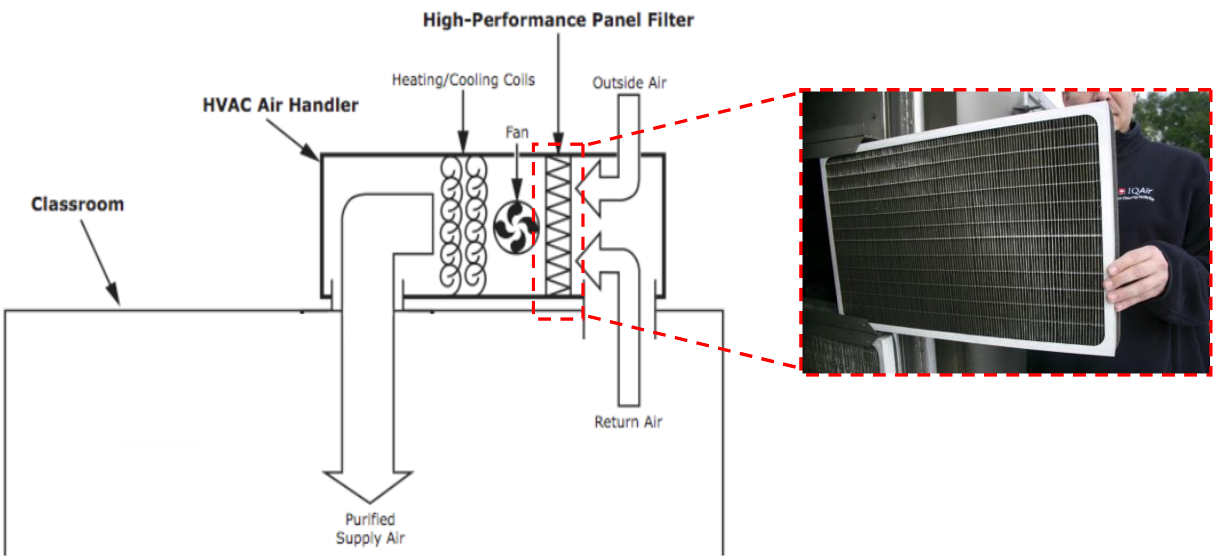


Figure 2. Schematic of a typical HVAC system. The picture on the right-hand side shows a typical high-performance panel filter (HP-PF) after several months of usage

Compared to standard/conventional medium performance MERV filters, the high-performance panel filters used for this pilot study are twice as thick (2" in depth) and have a much larger filter surface area (five to nine times larger). Due to the increased surface area and the special filter material used, they generally have similar air resistance properties as conventional filters and, thus, do not act to reduce the air flow through the HVAC system. Also, due to the increased surface area and specific design, these media have the potential to last longer than conventional filters before replacement is required. Because these filters are manufactured using a proprietary "nano-fiber" technology, their ability to remove UFPs and BC from the air stream is also higher. Table 3 shows a comparison between the characteristics of several conventional MERV filters available for residential and commercial applications and the HP-PF employed in this pilot study.

Table 3. Comparison between the main characteristics of several conventional MERV filters and the high-performance panel filters (HP-PF) tested in this study

Panel Filter Type	Filter Rating	Filter Efficiency (%)[1]		Pressure Drop (in w.g.)[2]	Media Area (ft²)	Filter Life (months)	Filter Cost ($)	Annual Filter Cost ($)	Annual Maintenance Cost ($)[3]	Total Annual Cost ($)
		at 0.3 µm	at 1.0 µm							
CONVENTIONAL PANEL FILTERS										
Low Efficiency 2" Fiberglass	(unrated)	1	10	0.28	4.0	3	3 to 5	12 to 20	50	62 to 70
Medium Efficiency 1" Pleated	MERV 7	3	25	0.48	7.5	3	5 to 7	20 to 28	50	70 to 78
Medium Efficiency 2" Pleated	MERV 7	5	35	0.30	11.8	3	7 to 10	28 to 40	50	78 to 90
High Efficiency 2" Pleated	MERV 11	15	58	0.39	17.8	3	13 to 20	52 to 80	50	102 to 130
High Efficiency 2" Pleated	MERV 13	30	85	0.41	21.1	3	25 to 40	100 to 160	50	150 to 210
High Efficiency 2" Mini-Pleat	MERV 16	90	99	2.00	55.0	3	80	320	50	370
PILOT STUDY HIGH-PERFORMANCE PANEL FILTER										
High-performance 2" Mini-Pleat	MERV 16	93	99	0.38	60.0	6 to 12	120	120 to 240	13 to 25	133 to 245

Data are based on a nominal 24" × 24" filter size

[1]Typical minimum efficiency at rated face velocity of 492 fpm

[2]Typical pressure drop of a new filter; based on a face velocity of 492 fpm

[3]Based on an estimated maintenance time of 15 min per filter change (at $50/hr)

Register system (RS)

This device is installed directly on the HVAC register, where the air supply enters the room. The unit is equipped with a "nano-technology" filter media for the removal of PM and high-capacity gas phase filter cartridges to eliminate certain gaseous pollutants from the air stream (e.g. VOCs) (Figure 3). This particular design allows for a longer contact time between the filtration media and the gaseous pollutants than would be permitted by using an activated carbon panel filter in the HVAC system. Nevertheless, the RS does not reduce the overall HVAC system airflow if installed by a trained specialist.

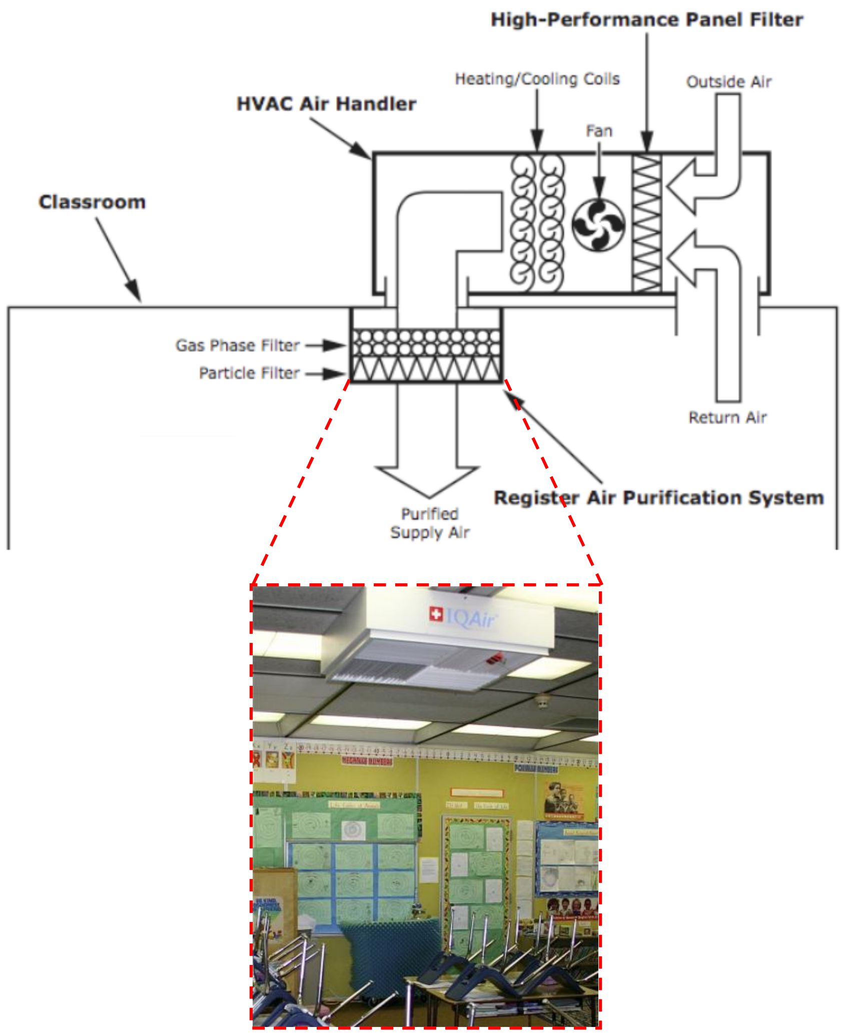


Figure 3. Schematic of the register system (RS) as installed in one of the study classrooms. A high-performance panel filter (HP-PF) may also be installed in the HVAC air handler to provide additional particle filtration

Standalone system (SA)

A standalone system (SA) is a self-contained air cleaning device that operates independently of a classroom's HVAC system. This air filtration system is 6 feet tall and has a footprint of about 4 ft^2 (Figure 4). The SA is tamper proof, runs on a standard power circuit, and is built with an energy efficient fan, located inside a specially designed box for ultra quiet operation (<45 db(A) at high airflow). Indoor air enters from the lower part of the system (about 6 inches off the ground) and passes, sequentially, through a large "nano-technology" filter media, for the removal of PM, and 12 high-capacity gas phase filter cartridges, for removal of the gaseous pollutants commonly found indoors (VOCs) (Figure 4).

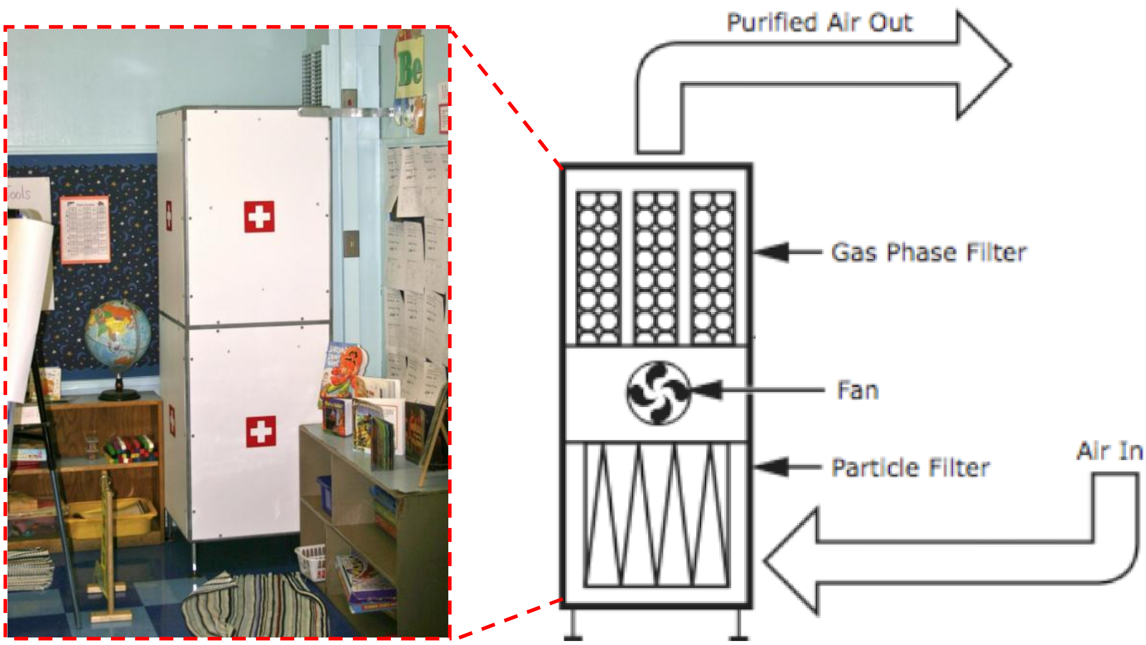


Figure 4. Schematic of the standalone system (SA) as installed in one of the classrooms

The main characteristics of the SA tested in this pilot study have been summarized in Table 4 and compared to those of other typical "residential" and "commercial" standalone units available on the market. A major design consideration for the SA was low noise. Many school districts have set a 45db(A) noise threshold for new in classroom equipment. At this noise level, available residential and commercial air purification devices offer less than two air changes per hour (ACH) in a typical classroom. This SA unit offers more than five ACH.

Table 4. Comparison between the main features of the standalone system used for this pilot study and those of other commercially available standalone air purifiers

	Residential Air Purifier	**Commercial Standalone**	**Pilot Study Standalone**
Particle Filtration Technology	Electronic / Media	Electronic / Media	Media
Removal Efficiency at 0.3 µm (%)	40 to 99	60 to 99	> 99
Maximum Airflow (cfm)	150 to 400	400 to 1200	1200
Airflow at 45 dB(A) (cfm)	25 to 100	100 to 200	800
Gas-phase Filtration Media (lb)	0.5 to 18	10 to 80	100
Price ($)	200 to 1,000	1,500 to 12,000	8,500
Price / CFM at 45 db(A) ($)	8 to 10	15 to 60	11
Classroom ACH at 45 db(A)*	0.2 to 0.7	0.7 to 1.3	5.3

*Air Changes per Hour (ACH) based on a 9000 ft^3 room

In-classroom configurations

Different combinations of the standalone system, HVAC-based high-performance panel filter, and register-based air purifier were used inside the studied classrooms to evaluate the performance of these air filtration devices:

1. High-performance panel filter alone: **HP-PF**
2. Register-based air purifier alone (RS). It should be noted that in some cases a conventional / medium performance panel filter (PF) was already installed inside the HVAC system prior to the beginning of the study: **RS+PF**
3. Register-based air purifier in conjunction with a high-performance panel filter: **RS + HP-PF**
4. Standalone system in classrooms with no HVAC running: **SA**
5. Standalone system in classrooms with a HVAC running, in which case a conventional / medium performance panel filter (PF) was already installed inside the HVAC system prior to the beginning of the study: **SA + PF**
6. Standalone system in conjunction with a high-performance panel filter: **SA + HP-PF**

A schematic representation of these six configurations is shown below (Figure 5).

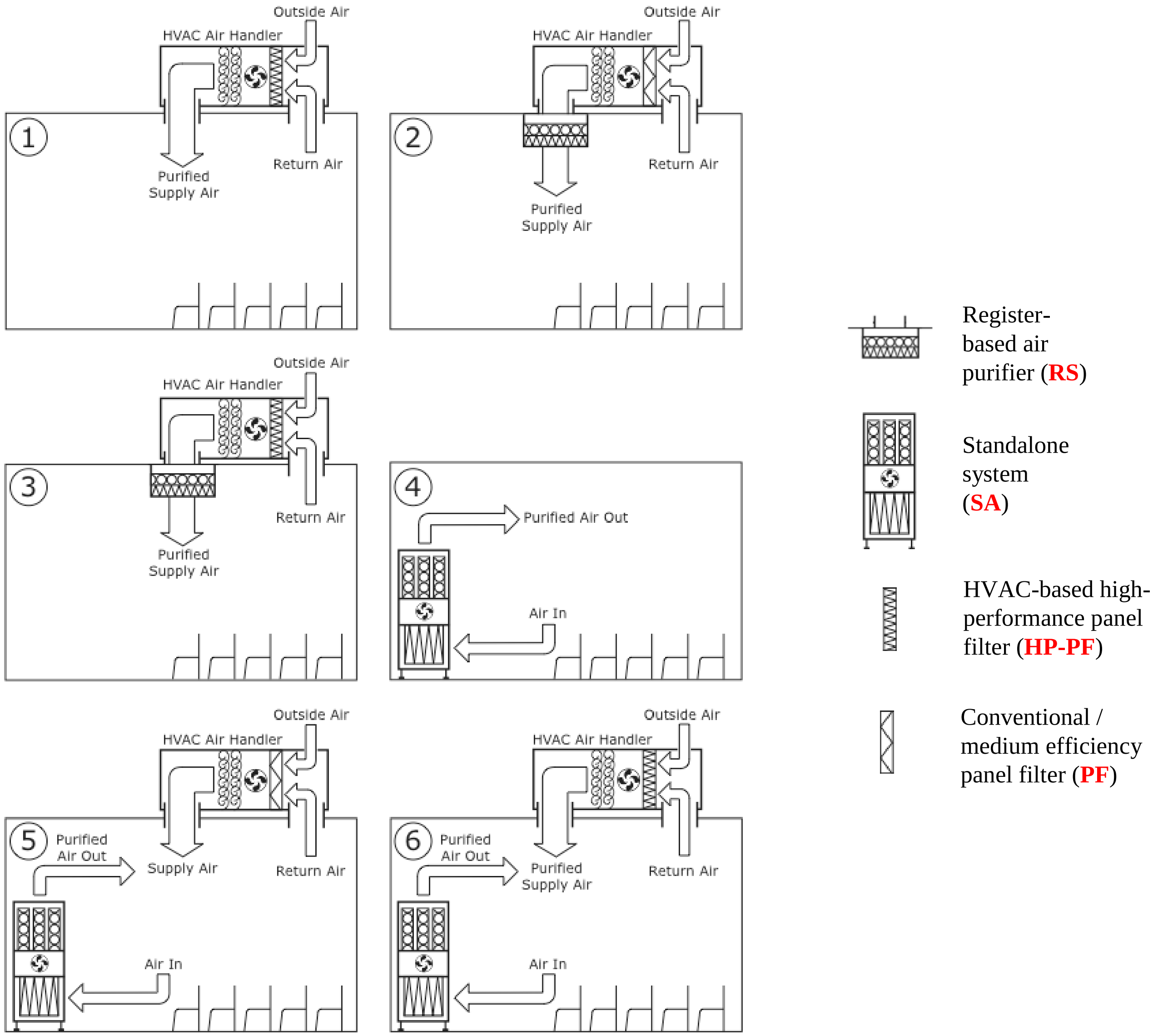


Figure 5. Schematic representation of the six air purification solutions tested in this pilot study

Indoor and outdoor measurements

Four mobile air quality monitoring stations were used to measure the indoor and outdoor concentrations of the targeted air pollutants. Each of these stations was comprised of a mobile cart supporting the following instruments (Figure 6):

- A portable Aethalometer (model AE42, Magee Scientific, 2800 Adeline St., Berkeley CA 94703) to provide continuous measurements of BC concentrations (ng/m^3)
- A water-based condensation particle counter (CPC model 3781, TSI, 500 Cardigan Road, Shoreview, MN 55126) to provide continuous measurements of the particle number concentration ($\#/cm^3$), an indicator of UFPs
- A laser particle counter (IQAir ParticleScan Pro): for determining the number concentration ($\#/cm^3$) of particles down to 0.3 μm in diameter. Since the $PM_{2.5}$ particle mass concentration in urban areas tends to be dominated by particles in the 0.3 – 1.0 μm range, this instrument provides a rough estimate of the $PM_{2.5}$ mass.
- A laser-based particle mass monitor (Aerocet 531 Aerosol Particulate Profiler, MetOne; 1600 Washington Blvd., Grants Pass, Oregon 97526): to provide continuous measurements of the mass concentration ($\mu g/m^3$) of both $PM_{2.5}$ and PM_{10}
- A low volume filter sampler (SKC Leland Legacy Sample Pump with SKC DPS Impactor, 863 Valley View Road Eighty Four, PA 15330): to collect time-integrated filter-based PM_{10} samples. Samples were collected at 10L/min on 47mm Teflon filters for the duration of a typical school day. These substrates were weighed before and after collection using a microbalance, and the PM_{10} concentration ($\mu g/m^3$) was calculated by dividing the difference in PM_{10} mass by the corresponding sampling volume. These gravimetric measurements were considered as primary indicators of the PM_{10} mass.
- 6L EPA TO-15 SUMMA canisters: to collect time-integrated air samples over the course of a typical school day. Samples were then analyzed by gas chromatography-mass spectrometry (GC-MS) to measure the concentrations of 61 specific VOCs (ppbv).

Figure 6. One of the four mobile stations used to monitor the indoor and outdoor concentrations of the targeted air pollutants

At each school, one air quality monitoring cart was set-up outside to sample outdoor air. The remaining three stations were placed indoors, one in each classroom, near one of the walls and just a few meters away from the students. Measurements were made away from all air conditioning vents to better represent mixed indoor air quality conditions as experienced by students and teachers. All sensors and inlets were approximately three feet above the floor, or about the height of a child's head when seated. The effectiveness of each of the tested air purification solutions was then evaluated by comparing the indoor concentrations of the targeted air pollutants to the corresponding outdoor levels. Baseline measurements were taken before installing any of the air purification solutions to estimate the pre-existing removal efficiencies of the classrooms before modification. Measurements that were found to be inaccurate or unrepresentative due to meteorological conditions (e.g. rain), improper cart placement, or instrument malfunction were not considered in the data analysis.

Before and after school hours, the four measurement stations were collocated in a storage room and the continuous instruments were run "side-by-side" to provide quality assurance of the measurements, to estimate the precision characteristics, and to identify any potential problems. Table 5 shows the specific air purification solutions that were tested inside each of the nine classrooms, along with the dates when all baseline and actual measurements were taken.

Table 5. Summary of the air purification solutions tested in each of the nine classrooms. The dates when all baseline and actual measurements were taken are also included

School / Class ID	Configurations Used			
	04 / 07-11 / 08	*04 / 14-18 / 08*	*04 / 21-25 / 08*	*04 / 28 / 08 to 05 / 02 / 08*
Del Amo / DA-6	Baseline	SA + PF	SA + PF	SA + HP-PF
Del Amo / DA-7	Baseline	RS	RS	RS
Del Amo / DA-8	Baseline	HP-PF	HP-PF	HP-PF
	05 / 12-16 / 08	*05 / 19-23 / 08*	*05 / 26-30 / 08*	*06 / 02-06 / 08*
Hudson / H-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-15	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-52	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
	11 / 18-26 / 08	*12 / 01-05 / 08*	*12 / 08-12 / 08*	*12 / 15-19 / 08*
Dominguez / DZ-7	Baseline	SA / SA + PF	SA + HP-PF	SA + HP-PF
Dominguez / DZ-9	Baseline	HP-PF	HP-PF	HP-PF
Dominguez / DZ-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

The three schools were tested one at a time from April to December 2008 for a total of over 150 valid measurement days across all schools and classrooms. The period of sampling was during regularly scheduled school hours, with minor adjustments for school schedule changes.

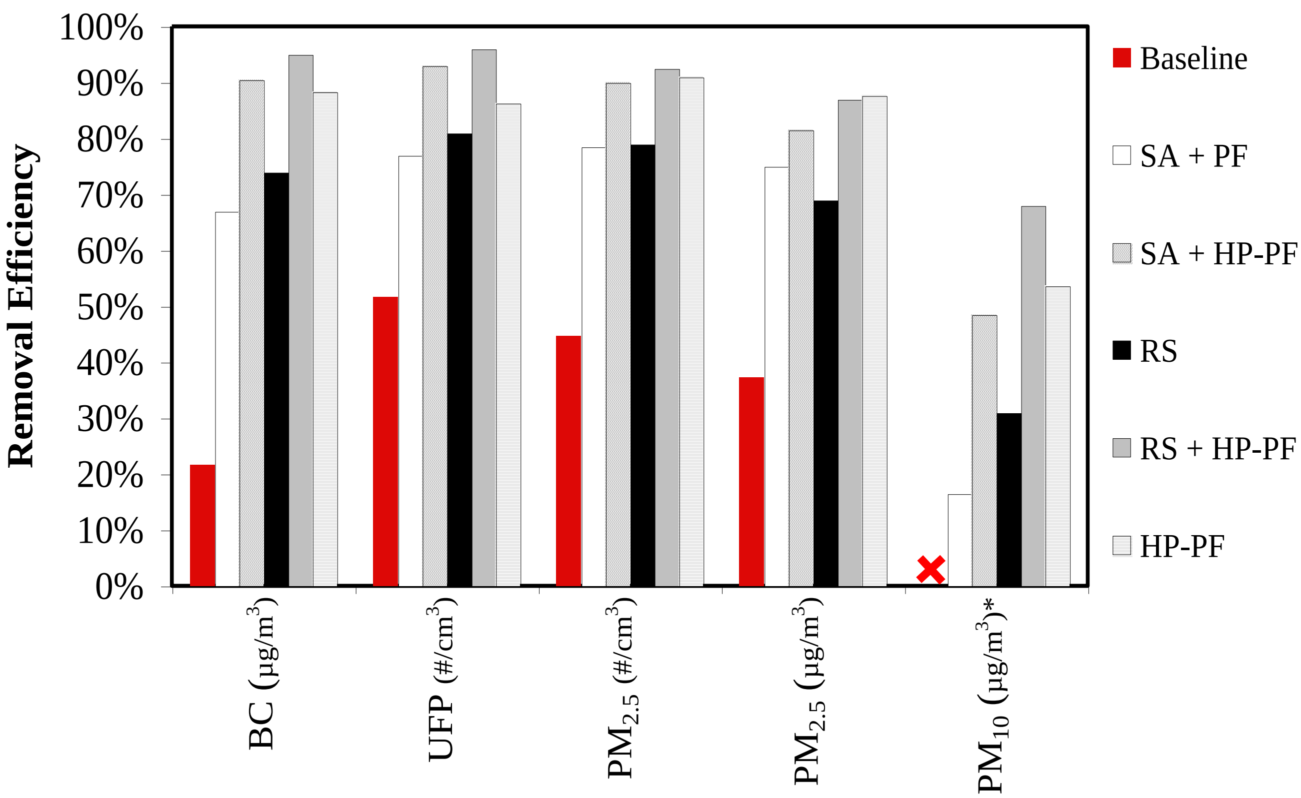
RESULTS AND DISCUSSION

Removal of PM and other particle species

Figure 7a summarizes the study average particle removal efficiencies (here defined as the percentage reduction in the indoor concentration of a particular pollutant relative to its concurrent outdoor concentration) achieved by the six air purification solutions. Indoor and outdoor mass and particle number concentrations were averaged over the duration of a typical school day and across all days, classrooms and schools. The corresponding study average particle removal efficiencies for each elementary school are shown in Figures 7b, 7c, and 7d for Del Amo, Hudson and Dominguez, respectively. Daily and weekly average indoor and outdoor concentrations of BC, UFP, $PM_{2.5}$ and PM_{10} at all schools and classrooms are provided in APPENDIX A, along with the corresponding average indoor/outdoor ratios and removal efficiencies.

Overall, the combination of a register system and a high-performance panel filter (RS + HP-PF) was the most effective solution for reducing the indoor concentrations of BC, UFP, and $PM_{2.5}$ (both mass and particle count), with average removal efficiencies varying from 87 to 96% (Figure 7a). Replacing a conventional HVAC-based panel filter (PF) with a HP-PF resulted in a substantial reduction in the indoor levels of all particulate pollutants inside all classrooms, especially when this high-performance panel filter was operated in conjunction with other air filtration devices. When using the HP-PF alone, the study average removal efficiencies were also close to 90% (88, 86, 91, and 88%, for BC, UFP, $PM_{2.5}$ count, and $PM_{2.5}$ mass, respectively). These average values are significantly higher than baseline (pre-existing) conditions, when removal efficiencies for the different pollutants were only about 20-50%.

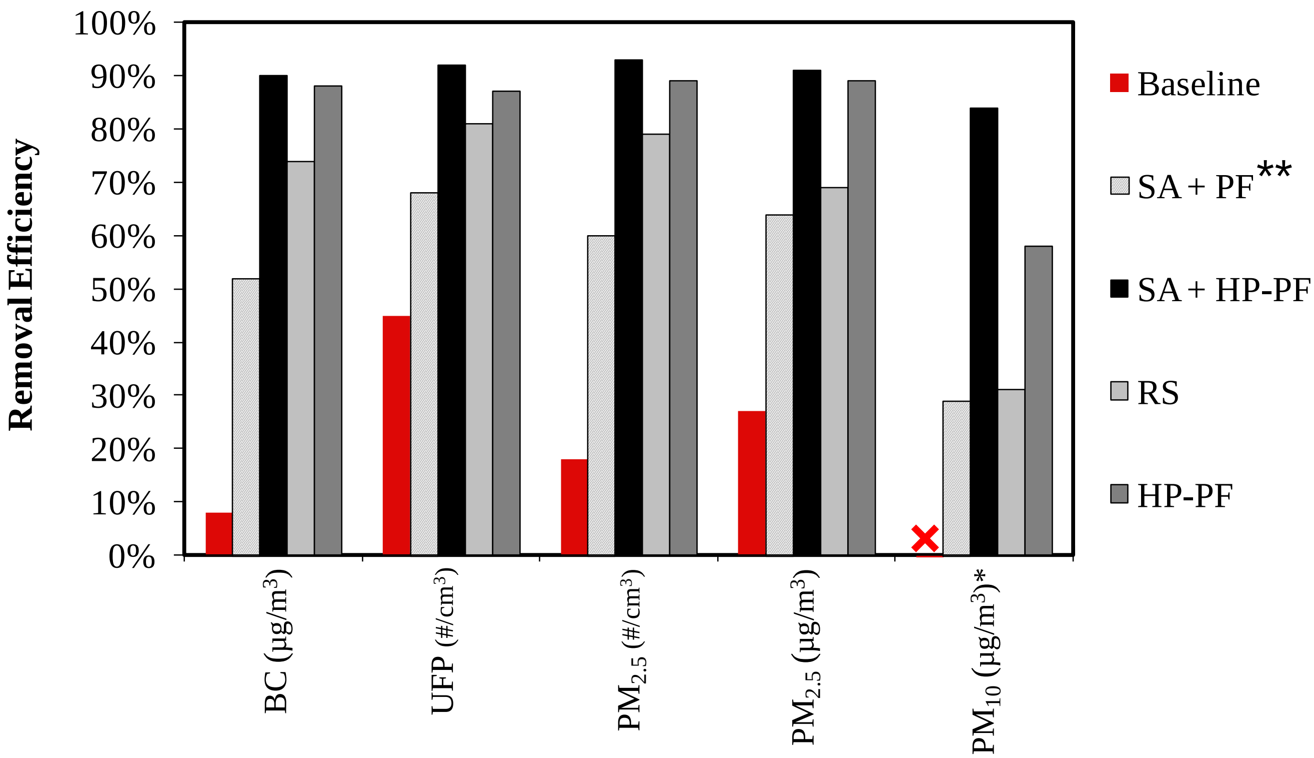
a) **ALL CLASSROOMS AT ALL SCHOOLS**



* From gravimetric / filter measurements

✕ The PM_{10} concentration was higher indoors than outdoors due to indoor sources

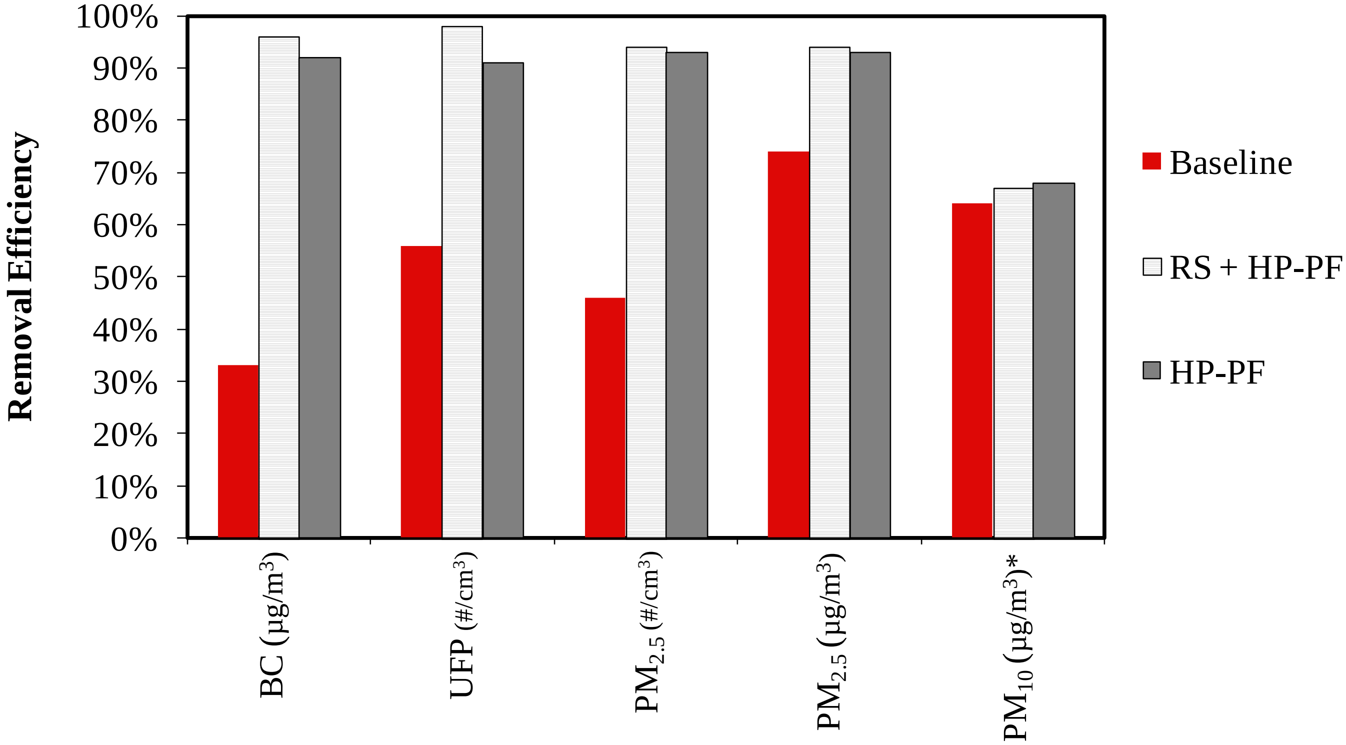
b) **DEL AMO ELEMENTARY SCHOOL**



* From gravimetric / filter measurements ** With HVAC

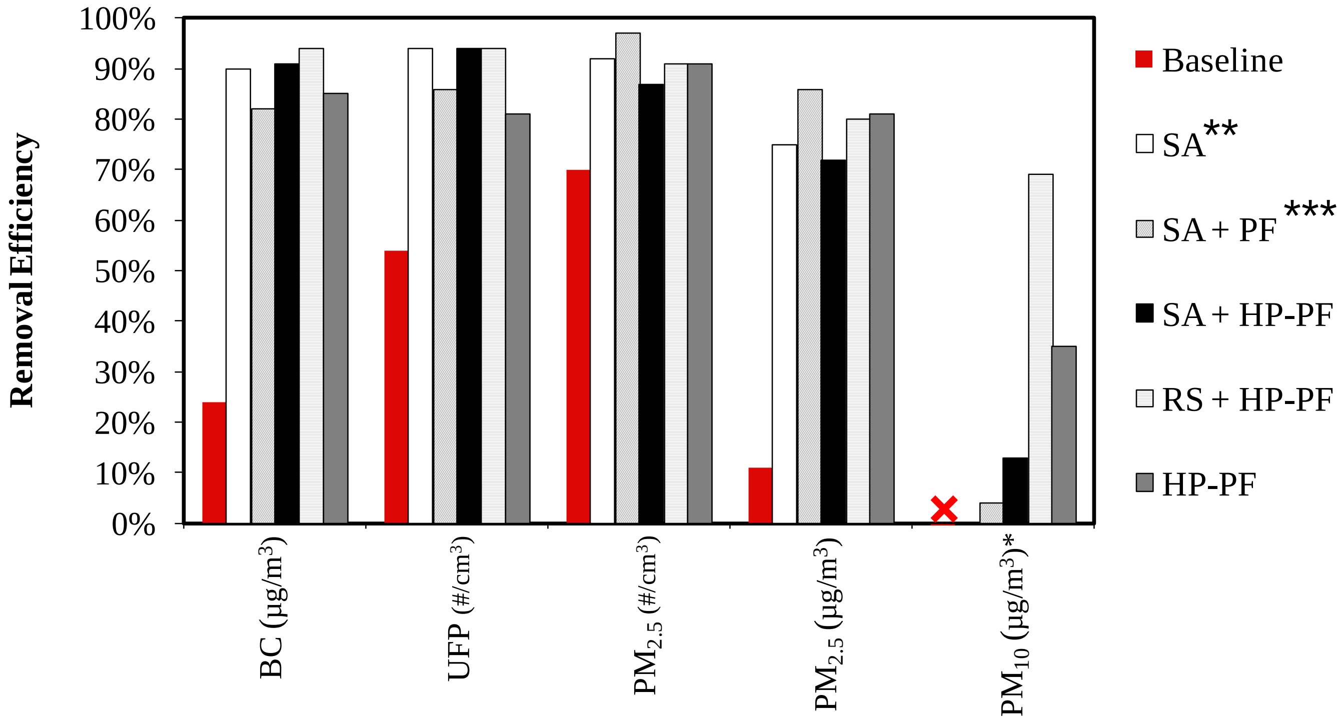
✕ The PM_{10} concentration was higher indoors than outdoors due to indoor sources

c) **HUDSON ELEMENTARY SCHOOL**



* From gravimetric / filter measurements

d) **DOMINGUEZ ELEMENTARY SCHOOL**



* From gravimetric / filter measurements ** Without HVAC *** With HVAC

✕ The PM_{10} concentration was higher indoors than outdoors because of indoor sources

Figure 7. Particle removal efficiencies (%) achieved by the six air purification solutions. Bars indicate data averaged a) at all schools and in all classrooms, b) at Del Amo, c) at Hudson, and d) at Dominguez

In all cases, air quality conditions were improved substantially with respect to the corresponding baseline measurements. The intra-classroom variability of the measured removal efficiencies was low, as indicated by the low standard deviations given in Table 6a. This reflects the fact that all air purification solutions were highly effective at all schools and in all classrooms, as confirmed by the particle removal performance data for each of the three elementary schools in Tables 6b (Del Amo), 6c (Hudson) and 6d (Dominguez).

The stand-alone system (SA) is well suited for indoor environments not equipped with an HVAC. In order to simulate conditions similar to those encountered in older classrooms not equipped with a forced air climate control device, the HVAC in room DZ-7 (at Dominguez) was intentionally turned off for part of the study. When the SA unit was running with the HVAC off, removal efficiencies were close to 90% for BC, UFP and $PM_{2.5}$ (count) (Table 6d). For BC and UFP, these percentages were slightly lower when the HVAC was running since more of the smaller particles (mostly unfiltered by the existing conventional panel filter) were entering the classrooms from outdoors. Overall, our results confirmed that conventional HVAC panel filters are not particularly effective in removing UFP, although they can be effective in removing coarser particles.

Table 6. Particle removal efficiencies (%) achieved by the six air purification solutions. Data represent averages a) at all schools and in all classrooms, b) at Del Amo, c) at Hudson, and d) at Dominguez

a) ALL CLASSROOMS AND ALL SCHOOLS

	Study days (#)	BC (%)	UFP (%)	$PM_{2.5}$ count (%)	$PM_{2.5}$ mass (%)	PM_{10} gravimetric mass (%)[1]	PM_{10} mass monitor (%)[2]
Baseline	48	22 ± 13	52 ± 17	45 ± 14	37 ± 26	-67 ± 156	13 ± 36
SA + PF**	14	67 ± 6	77 ± 6	79 ± 5	75 ± 5	17 ± 71	59 ± 9
SA + HP-PF	11	91 ± 6	93 ± 4	90 ± 3	82 ± 12	49 ± 16	53 ± 33
RS + PF	15	74 ± 20	81 ± 10	79 ± 17	69 ± 24	31 ± 55	22 ± 46
RS + HP-PF	35	95 ± 2	96 ± 3	93 ± 5	87 ± 11	68 ± 11	42 ± 28
HP-PF	35	88 ± 5	86 ± 7	91 ± 4	88 ± 8	54 ± 25	53 ± 31

b) DEL AMO ELEMENTARY SCHOOL

	Study days (#)	BC (%)	UFP (%)	$PM_{2.5}$ count (%)	$PM_{2.5}$ mass (%)	PM_{10} gravimetric mass (%)[1]	PM_{10} mass monitor (%)[2]
Baseline	15	8 ± 9	45 ± 16	18 ± 20	27 ± 17	-224 ± 278	26 ± 26
SA*	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
SA + PF**	10	52 ± 7	68 ± 6	60 ± 7	64 ± 5	29 ± 102	51 ± 9
SA + HP-PF	5	90 ± 5	92 ± 3	93 ± 1	91 ± 4	84 ± 11	74 ± 11
RS + PF	15	74 ± 20	81 ± 10	79 ± 17	69 ± 24	31 ± 55	22 ± 46
RS + HP-PF	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
HP-PF	15	88 ± 4	87 ± 4	89 ± 5	89 ± 5	58 ± 28	62 ± 13

c) HUDSON ELEMENTARY SCHOOL

	Study days (#)	BC (%)	UFP (%)	$PM_{2.5}$ count (%)	$PM_{2.5}$ mass (%)	PM_{10} gravimetric mass (%)[1]	PM_{10} mass monitor (%)[2]
Baseline	15	33 ± 9	56 ± 18	46 ± 11	74 ± 5	64 ± 28	54 ± 23
SA*	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
SA + PF**	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
SA + HP-PF	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
RS + PF	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
RS + HP-PF	27	96 ± 2	98 ± 2	94 ± 4	94 ± 5	67 ± 8	51 ± 30
HP-PF	15	92 ± 2	91 ± 4	93 ± 2	93 ± 4	68 ± 19	59 ± 33

d) DOMINGUEZ ELEMENTARY SCHOOL

	Study days (#)	BC (%)	UFP (%)	$PM_{2.5}$ count (%)	$PM_{2.5}$ mass (%)	PM_{10} gravimetric mass (%)[1]	PM_{10} mass monitor (%)[2]
Baseline	18	24 ± 21	54 ± 16	70 ± 11	11 ± 55	-40 ± 161	-42 ± 60
SA*	3	90 ± 4	94 ± 2	92 ± 6	75 ± 10	0 ± 34	31 ± 42
SA + PF**	4	82 ± 5	86 ± 5	97 ± 2	86 ± 4	4 ± 40	66 ± 8
SA + HP-PF	6	91 ± 6	94 ± 4	87 ± 5	72 ± 20	13 ± 20	32 ± 55
RS + PF	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
RS + HP-PF	8	94 ± 2	94 ± 3	91 ± 6	80 ± 17	69 ± 14	33 ± 25
HP-PF	18	85 ± 8	81 ± 13	91 ± 5	81 ± 16	35 ± 28	39 ± 48

Note: Negative removal efficiencies indicate the presence of an indoor source of PM_{10}

[1]From gravimetric / filter measurements

[2]Using a particle mass monitor

*The HVAC system was turned off

**Operated in conjunction with a standard (MERV 7) panel filter installed in the HVAC system

It should be noted that the negative removal efficiencies associated with several baseline PM_{10} measurements indicate conditions where indoor concentrations were higher than the corresponding outdoor levels. This is likely due to re-suspension of dust and other relatively large particles caused by in-classroom activities such as walking and cleaning. Due to the presence of these indoor sources, the removal performance of PM_{10} was lower than that of other particle measurements.

Figure 8 illustrates the effect of indoor activities on in-classroom PM_{10} levels at Hudson Elementary School (Room H-15) on May 21, 2008. On this day removal efficiencies approached 100% before the school day started and during lunchtime (when students and staff members were outside the classroom) and were substantially lower when classes were in session.

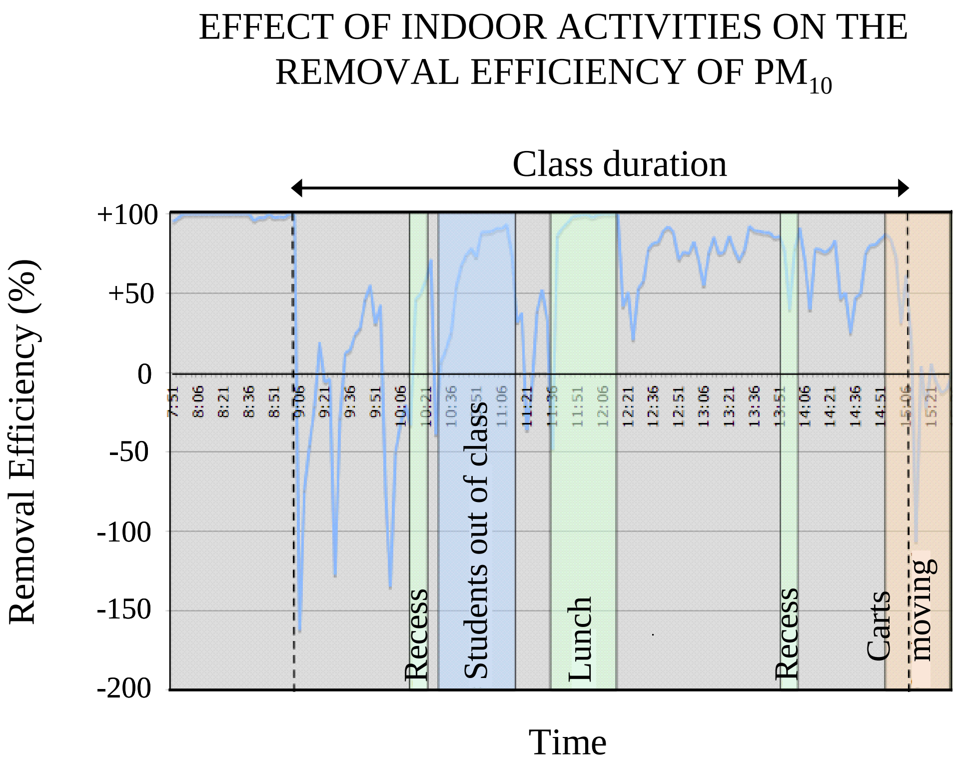


Figure 8. Effect of indoor activities on the removal performance of PM_{10} at Hudson elementary school (Room H-15) on May 21, 2008

Activities occurring immediately outside the school boundaries were observed to influence the indoor concentrations of some pollutants and, thus, their corresponding removal efficiencies. Figure 9 shows the effect of increased motor-vehicle emissions due to the morning drop-off of students (grey areas) on the outdoor concentrations of BC, and the associated spikes in indoor BC levels occurring just before the beginning of the school day, when the classroom doors were left open. Overall, these indoor peaks caused a relatively small decrease in the calculated removal performance when averaged over the course of the entire school day.

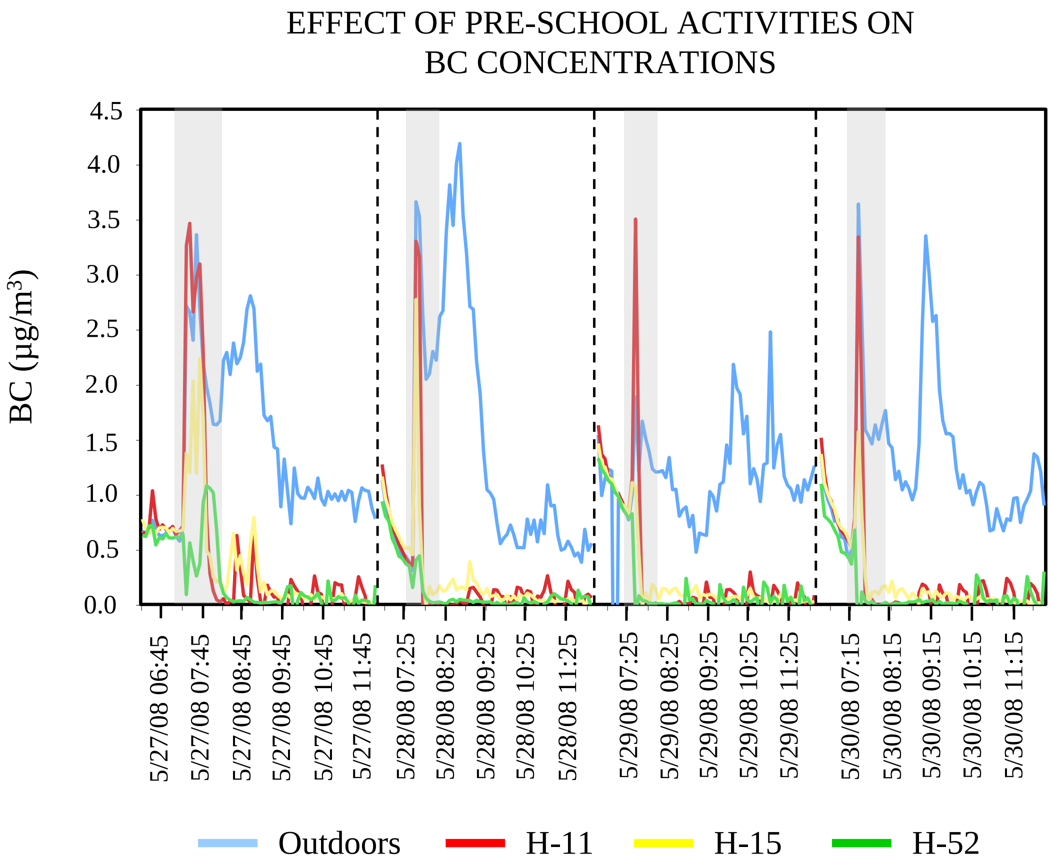


Figure 9. Effect of before school activities on BC concentrations. Grey areas show an increase in both indoor and outdoor levels due to morning drop-off traffic

Impact on the HVAC system airflow

As discussed earlier, the high-performance panel filters (HP-PF) used for this pilot study are thicker than standard/conventional medium performance MERV filters. However, due to their increased surface area and proprietary "nano-fiber" design, they generally have similar air resistance properties as conventional filters and, thus, do not reduce the airflow through the HVAC system.

As shown in Table 7, replacing a conventional panel filter (PF; typically 1" in depth) with a thicker high-performance panel filter (HP-PF; 2" deep) did not alter the measured airflow in any of the studied classrooms. Adding a register system without upgrading to a high-performance panel filter (see the RS-PF configuration data below) reduced the HVAC system airflow by an average of 9%. This small reduction is due to the increased pressure drop resulting from the addition of a gas-phase filtration media. Using a register system while also upgrading to a high-performance panel filter (RS + HP-PF configuration in Table 7) altered the airflow by only 1-3%. At Hudson elementary school, installation of the register system in classrooms H-11 and H-15 required a widening of the connection to the supply duct. This caused an airflow increase between 17 and 24%.

Table 7. Effect of a high-performance panel filter (HP-PF) and/or a register system (RS) on the HVAC system airflow

	DEL AMO ELEMENTARY SCHOOL					
	DA-6		**DA-7**		**DA-8**	
	Airflow (cfm)	Change (%)	Airflow (cfm)	Change (%)	Airflow (cfm)	Change (%)
Baseline	1200		1200		1250	
HP-PF	1210	1	N/A	N/A	1250	0
RS + PF	N/A	N/A	1090	-9	N/A	N/A

	HUDSON ELEMENTARY SCHOOL					
	H-11		**H-15**		**H-52**	
	Airflow (cfm)	Change (%)	Airflow (cfm)	Change (%)	Airflow (cfm)	Change (%)
Baseline	840		903		1236	
HP-PF	844	0	913	1	1246	1
RS + HP-PF	1039	24	1054	17	1194	-3

	DOMINGUEZ ELEMENTARY SCHOOL					
	DZ-7		**DZ-9**		**DZ-11**	
	Airflow (cfm)	Change (%)	Airflow (cfm)	Change (%)	Airflow (cfm)	Change (%)
Baseline	1642		1681		1722	
HP-PF	1661	1	1664	-1	1771	3
RS + HP-PF	N/A	N/A	N/A	N/A	1742	1

Removal of VOCs

Although canister samples were collected at all schools and classrooms, and all samples were analyzed for VOCs, the data recovery at Del Amo and Hudson was insufficient to guarantee an adequate interpretation of the results. The detection limits of the analysis method used at those schools were not low enough to quantify most of the VOCs of interest. After the analysis methods were modified to correct for this problem, reliable VOC data were obtained for Dominguez elementary. Therefore, only VOC data from Dominguez are discussed in this section. Table 8 summarizes the removal efficiencies for:

- Total VOCs: expressed as the sum of 61 individual compounds and 53 unspeciated organic compounds
- Ethanol: a chemical emitted from both indoor and outdoor evaporative sources
- Benzene: a species mostly emitted from gasoline-powered vehicles. This compound was used here as an indicator of VOCs of outdoor origin

Daily average concentrations of individual VOCs measured at Dominguez elementary school (i.e. DZ-7, DZ-9, and DZ-11) are given in APPENDIX B.

Table 8. Average removal efficiencies of total VOCs, ethanol, and benzene at Dominguez elementary school

	DOMINGUEZ ELEMENTARY SCHOOL			
	Study Days (#)	Total VOCs (%)[1]	Ethanol (%)	Benzene (%)
Baseline	18	-114 ± 731	-1230 ± 982	-11 ± 22
SA (HVAC off)*	3	15 ± 132	-349 ± 276	52 ± 35
SA + PF (HVAC on)**	4	19 ± 198	-587 ± 903	58 ± 33
SA + HP-PF	6	-6 ± 280	-929 ± 853	73 ± 11
RS	N/A	N/A ± N/A	N/A ± N/A	N/A ± N/A
RS + HP-PF	8	-3 ± 345	-534 ± 502	58 ± 49
HP-PF	18	-64 ± 404	-1111 ± 1164	1 ± 38

[1]Sum of 61 known VOCs and 53 unspeciated organic compounds

*Operated with the HVAC system turned off

**Operated with the HVAC system turned on

Large standard deviations reflect the wide concentration ranges for the different chemicals. As expected, existing and high-performance panel filters (PF and HP-PF, respectively) had virtually no effect on the VOC levels measured indoors, since these air filtration media did not include gas removal capabilities. The standalone system (SA) demonstrated a 52 to 73% removal performance for benzene.

At all three schools, the indoor concentrations of ethanol were consistently the highest among all measured VOCs and higher than outdoor levels. This organic compound is a common solvent used in whiteboard markers, detergents and other cleaning products, and has several potential indoor sources. The negative removal efficiencies shown in Table 8 indicate that the indoor concentrations of some VOCs were often higher than the corresponding outdoor levels. Our findings are in line with those from previous research studies (Jia et al., 2007; Bruno et al., 2008), and confirm that several measured indoor VOCs are mostly of indoor origin. For this reason, a direct comparison of indoor and outdoor total VOC concentrations is not appropriate when significant indoor sources exist.

Therefore, classroom DZ-9, whose air conditioning system was equipped with a HP-PF and no gas phase filtration device, was used as the "baseline" (rather than the outdoor monitoring site) to better evaluate the actual effectiveness of the standalone unit (SA) and the register system (RS) installed in classrooms DZ-7 and DZ-11, respectively (Table 9). When compared to the control classroom (DZ-9), the removal efficiencies for total VOCs in classrooms DZ-7 and DZ-11 showed a reduction in gaseous pollutants with respect to baseline conditions.

Table 9. Average removal efficiencies of total VOCs with respect to a control classroom (DZ-9) not equipped with any gas phase filtration device. All data refer to measurements taken at Dominguez elementary school

DOMINGUEZ ELEMENTARY SCHOOL (removal efficiency with respect to classroom DZ-9)			
	Classroom Comparison[1]	Study Days (#)	Total VOCs (%)[2]
Baseline	DZ-7 & DZ-11 vs DZ-9	14	-31 ± 367
RS	DZ-11 vs DZ-9	10	-3 ± 521
SA (HVAC off)*	DZ-7 vs DZ-9	2	55 ± 50
SA + PF (HVAC on)**	DZ-7 vs DZ-9	8	27 ± 198

[1]DZ-9 = "control classroom" (HP-PF but no gas-phase filtration)
[2]Sum of 61 known VOCs and 53 unspeciated organic compounds
*Operated with the HVAC system turned off
**Operated with the HVAC system turned on

Removal efficiencies corresponding to baseline measurements indicate that the total VOC concentration inside the two test rooms (DZ-7 and DZ-11) were, on average, 31% higher than that in the control classroom (DZ-9), probably because of differences in indoor activities (e.g. cleaning). Assuming this difference persisted throughout the entire duration of the study, the actual VOC removal performance of the register system (RS) was about 28% (-3% + 31%). Similarly, when normalizing for the initial conditions in the control classroom, the removal efficiencies of the standalone (SA) unit operated with and without the use of the HVAC system were about 58% (27% + 31%) and 86% (55% + 31%), respectively.

Overall, these solutions demonstrated some ability to reduce VOCs indoors, although not as consistently or effectively as the particle filtration. This may be due to the presence of one or more indoor sources of gaseous pollutants. The removal performance of gas-absorbing media (as opposed to filtration substrates) is dependent on media history and may be subject to saturation after experiencing high short-term concentrations or after longer-term use. Therefore, the lifetime, cost, benefits, and maintenance of the gas removal media must be further assessed before conclusions and recommendations can be made.

ACKNOWLEDGEMENTS

This pilot study was funded through the use of mitigation fees collected by the South Coast Air Quality Management District (SCAQMD) under Rule 1172 for VOC releases by local refineries. AQMD is the air pollution control agency for all of Orange County and urban portions of Los Angeles, Riverside and San Bernardino counties, the smoggiest region of the United States. IQAir North America, Inc., a leading specialist in air filtration solutions for homes, hospitals and schools, and Thermal Comfort Systems, specialist in HVAC system design, were selected by SCAQMD through a competitive bid process to provide for the design, engineering and installation of the air filtration devices used for this work.

REFERENCES

Bruno, P., Caselli, M., De Gennaro, G., Iacobellis, S., and Tutino, M. (2008) “Monitoring of volatile organic compounds in non-residential indoor environments”, Indoor Air, 18 (3): 250-256

Environmental Protection Agency Integrated Science Assessments (External Review Draft; 2009). http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=201805

Jia, C., Batterman, S. and Godwin, C. (2007) “VOCs in industrial, urban and suburban neighborhoods, Part 1: Indoor and outdoor concentrations, variation, and risk drivers”, Atmospheric Environment, 42 (9): 2083-2100

MATES III Study, 2008 (http://www.aqmd.gov/prdas/matesIII/matesIII.html)

Pope, C. A., and Dockery, D. W. (2006) "Health effects of fine particulate air pollution: Lines that connect", Journal of the Air & Waste Management Association, 56: 709-742

APPENDIX A. Daily and weekly average indoor and outdoor concentrations of black carbon (BC), ultra-fine particles (UFP), fine particulate matter ($PM_{2.5}$) and coarse PM (PM_{10}) at all schools and classrooms. The corresponding average indoor / outdoor ratios and removal efficiencies are also included. Missing data (mostly due to instrument malfunction) and periods affected by rain have been highlighted in yellow. The air purification solutions adopted in each classroom have been summarized below each Table

Del Amo Elementary School - Black Carbon

Date	Average Outdoor Concentration (ng/m^3)	Average Indoor Concentration (ng/m^3)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DA-6	DA-7	DA-8	DA-6	DA-7	DA-8	DA-6	DA-7	DA-8
4/7/2008	1,611	1,392	1,490	1,465	0.86	0.92	0.91	14%	8%	9%
4/8/2008	948	902	1,094	887	0.95	1.15	0.94	5%	-15%	6%
4/9/2008	1,119	1,166	1,147	1,044	1.04	1.03	0.93	-4%	-3%	7%
4/10/2008	1,692	1,518	1,495	1,500	0.90	0.88	0.89	10%	12%	11%
4/11/2008	4,451	3,547	3,665	3,651	0.80	0.82	0.82	20%	18%	18%
Average (Week 1)	1,964	1,705	1,778	1,709	0.91	0.96	0.90	**9%**	**4%**	**10%**
Standard Deviation	1,426	1,056	1,071	1,117	0.09	0.13	0.05	**9%**	**13%**	**5%**
4/14/2008	3,688	1,802	383	410	0.49	0.10	0.11	51%	90%	89%
4/15/2008	1,128	595	851	93	0.53	0.75	0.08	47%	25%	92%
4/16/2008	1,353	824	703	333	0.61	0.52	0.25	39%	48%	75%
4/17/2008	4,392	2,301	1,656	435	0.52	0.38	0.10	48%	62%	90%
4/18/2008	3,387	1,752	1,061	254	0.52	0.31	0.07	48%	69%	93%
Average (Week 2)	2,789	1,455	931	305	0.53	0.41	0.12	**47%**	**59%**	**88%**
Standard Deviation	1,462	718	475	138	0.04	0.24	0.07	**4%**	**24%**	**7%**
4/21/2008	1,409	537	171	105	0.38	0.12	0.07	62%	88%	93%
4/22/2008	2,396	1,097	414	265	0.46	0.17	0.11	54%	83%	89%
4/23/2008	1,180	498	226	125	0.42	0.19	0.11	58%	81%	89%
4/24/2008	1,691	734	362	193	0.43	0.21	0.11	57%	79%	89%
4/25/2008	3,261	1,377	455	278	0.42	0.14	0.09	58%	86%	91%
Average (Week 3)	1,987	848	326	193	0.42	0.17	0.10	**58%**	**83%**	**90%**
Standard Deviation	846	379	122	79	0.03	0.04	0.02	**3%**	**4%**	**2%**
4/28/2008	3,789	209	349	375	0.06	0.09	0.10	94%	91%	90%
4/29/2008	1,908	135	269	279	0.07	0.14	0.15	93%	86%	85%
4/30/2008	1,077	104	108	127	0.10	0.10	0.12	90%	90%	88%
5/1/2008	1,055	191	156	160	0.18	0.15	0.15	82%	85%	85%
5/2/2008	3,338	292	1,899	505	0.09	0.57	0.15	91%	43%	85%
Average (Week 4)	2,233	186	556	289	0.10	0.21	0.13	**90%**	**79%**	**87%**
Standard Deviation	1,272	73	756	156	0.05	0.20	0.02	**5%**	**20%**	**2%**

School / Class ID	**Configurations Used**			
	04 / 07-11 / 08	*04 / 14-18 / 08*	*04 / 21-25 / 08*	*04 / 28 / 08 to 05 / 02 / 08*
Del Amo / DA-6	Baseline	SA + PF	SA + PF	SA + HP-PF
Del Amo / DA-7	Baseline	RS	RS	RS
Del Amo / DA-8	Baseline	HP-PF	HP-PF	HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Del Amo Elementary School - Ultra Fine Particles

Date	Average Outdoor Concentration (particles/cm^3)	Average Indoor Concentration (particles/cm^3)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DA-6	DA-7	DA-8	DA-6	DA-7	DA-8	DA-6	DA-7	DA-8
4/7/2008	34,674		25,215			0.73			27%	
4/8/2008	39,291	15,555	17,984	14,386	0.40	0.46	0.37	60%	54%	63%
4/9/2008	19,124	11,354	18,384	12,960	0.59	0.96	0.68	41%	4%	32%
4/10/2008	41,814	19,800	21,327	19,463	0.47	0.51	0.47	53%	49%	53%
4/11/2008	42,613	19,833	22,452	19,935	0.47	0.53	0.47	53%	47%	53%
Average (Week 1)	35,503	16,635	21,072	16,686	0.48	0.64	0.49	**52%**	**36%**	**51%**
Standard Deviation	9,665	4,054	2,996	3,533	0.08	0.21	0.13	**8%**	**21%**	**13%**
4/14/2008	53,086	16,017	6,724	7,303	0.30	0.13	0.14	70%	87%	86%
4/15/2008		7,878	8,865	10,233						
4/16/2008	35,591	14,757	14,140	8,932	0.41	0.40	0.25	59%	60%	75%
4/17/2008	55,384	13,945	12,367	5,628	0.25	0.22	0.10	75%	78%	90%
4/18/2008	35,185	14,434	11,992	4,979	0.41	0.34	0.14	59%	66%	86%
Average (Week 2)	44,812	13,406	10,818	7,415	0.34	0.27	0.16	**66%**	**73%**	**84%**
Standard Deviation	10,923	3,184	2,974	2,201	0.08	0.12	0.06	**8%**	**12%**	**6%**
4/21/2008	57,526	20,259	6,007	5,267	0.35	0.10	0.09	65%	90%	91%
4/22/2008	46,241	13,552	8,158	7,011	0.29	0.18	0.15	71%	82%	85%
4/23/2008	34,366	9,741	5,891	3,039	0.28	0.17	0.09	72%	83%	91%
4/24/2008	38,854	10,831	7,090	5,171	0.28	0.18	0.13	72%	82%	87%
4/25/2008	33,004	8,965	4,695	2,794	0.27	0.14	0.08	73%	86%	92%
Average (Week 3)	41,998	12,670	6,368	4,656	0.30	0.16	0.11	**70%**	**84%**	**89%**
Standard Deviation	10,101	4,585	1,312	1,751	0.03	0.03	0.03	**3%**	**3%**	**3%**
4/28/2008	40,429	2,179	4,967	5,287	0.05	0.12	0.13	95%	88%	87%
4/29/2008	57,136	3,963	7,457	7,819	0.07	0.13	0.14	93%	87%	86%
4/30/2008	30,692	1,909	2,347	3,136	0.06	0.08	0.10	94%	92%	90%
5/1/2008	37,507	4,076	4,677	3,640	0.11	0.12	0.10	89%	88%	90%
5/2/2008	34,214	3,845	12,424	4,961	0.11	0.36	0.14	89%	64%	86%
Average (Week 4)	39,996	3,194	6,374	4,968	0.08	0.16	0.12	**92%**	**84%**	**88%**
Standard Deviation	10,249	1,058	3,836	1,827	0.03	0.11	0.02	**3%**	**11%**	**2%**

School / Class ID	Configurations Used			
	04 / 07-11 / 08	*04 / 14-18 / 08*	*04 / 21-25 / 08*	*04 / 28 / 08 to 05 / 02 / 08*
Del Amo / DA-6	Baseline	SA + PF	SA + PF	SA + HP-PF
Del Amo / DA-7	Baseline	RS	RS	RS
Del Amo / DA-8	Baseline	HP-PF	HP-PF	HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Del Amo Elementary School - $PM_{2.5}$ (count)

Date	Average Outdoor Concentration (particles/ft³)	Average Indoor Concentration (particles/ft³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DA-6	DA-7	DA-8	DA-6	DA-7	DA-8	DA-6	DA-7	DA-8
4/7/2008		1,425,737								
4/8/2008	1,129,234	860,458	818,779	859,380	0.76	0.73	0.76	24%	27%	24%
4/9/2008	606,772		589,396	761,753		0.97	1.26		3%	-26%
4/10/2008	878,513		621,944	654,570		0.71	0.75		29%	25%
4/11/2008	1,657,318	1,007,993	1,686,712	1,092,355	0.61	1.02	0.66	39%	-2%	34%
Average (Week 1)	1,067,959	1,098,063	929,208	842,014	0.69	0.86	0.86	**31%**	**14%**	**14%**
Standard Deviation	447,095	293,205	515,070	186,681	0.11	0.16	0.27	**11%**	**16%**	**27%**
4/14/2008	1,510,925	608,865	153,470	164,656	0.40	0.10	0.11	60%	90%	89%
4/15/2008	1,448,473	675,560	901,449	87,792	0.47	0.62	0.06	53%	38%	94%
4/16/2008	1,448,590	823,550	755,949	363,943	0.57	0.52	0.25	43%	48%	75%
4/17/2008	2,375,182	935,700	625,960	216,222	0.39	0.26	0.09	61%	74%	91%
4/18/2008	3,303,699	1,068,499	835,426	206,160	0.32	0.25	0.06	68%	75%	94%
Average (Week 2)	2,017,374	822,435	654,451	207,755	0.43	0.35	0.11	**57%**	**65%**	**89%**
Standard Deviation	819,499	187,458	298,268	100,893	0.09	0.21	0.08	**9%**	**21%**	**8%**
4/21/2008	1,117,692	445,613	132,034	89,866	0.40	0.12	0.08	60%	88%	92%
4/22/2008	1,962,746	721,027	258,062	184,328	0.37	0.13	0.09	63%	87%	91%
4/23/2008	1,677,902	639,840	235,809	136,928	0.38	0.14	0.08	62%	86%	92%
4/24/2008	1,606,064	565,163	258,425	167,180	0.35	0.16	0.10	65%	84%	90%
4/25/2008	1,649,781	558,423	189,268	127,409	0.34	0.11	0.08	66%	89%	92%
Average (Week 3)	1,602,837	586,013	214,719	141,142	0.37	0.13	0.09	**63%**	**87%**	**91%**
Standard Deviation	305,266	102,511	54,125	36,669	0.02	0.02	0.01	**2%**	**2%**	**1%**
4/28/2008	1,284,388	94,732	159,555	165,842	0.07	0.12	0.13	93%	88%	87%
4/29/2008	2,011,522	121,487	205,529	272,593	0.06	0.10	0.14	94%	90%	86%
4/30/2008	1,367,829	108,012	120,466	153,098	0.08	0.09	0.11	92%	91%	89%
5/1/2008			143,394	155,073						
5/2/2008			791,947	275,170						
Average (Week 4)	1,554,580	108,077	284,178	204,355	0.07	0.10	0.13	**93%**	**90%**	**87%**
Standard Deviation	397,917	13,378	285,555	63,660	0.01	0.02	0.01	**1%**	**2%**	**1%**

School / Class ID	Configurations Used			
	04 / 07-11 / 08	*04 / 14-18 / 08*	*04 / 21-25 / 08*	*04 / 28 / 08 to 05 / 02 / 08*
Del Amo / DA-6	Baseline	SA + PF	SA + PF	SA + HP-PF
Del Amo / DA-7	Baseline	RS	RS	RS
Del Amo / DA-8	Baseline	HP-PF	HP-PF	HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Del Amo Elementary School - $PM_{2.5}$ (mass)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DA-6	DA-7	DA-8	DA-6	DA-7	DA-8	DA-6	DA-7	DA-8
4/7/2008	8.74	10.50	6.68	6.51	1.20	0.76	74%	-20%	24%	26%
4/8/2008	14.25		10.54	7.04		0.74	0.49		26%	51%
4/9/2008	8.61	5.07	6.43	6.05	0.59	0.75	0.70	41%	25%	30%
4/10/2008	7.48	6.53	5.73	4.55	0.87	0.77	0.61	13%	23%	39%
4/11/2008	7.24	3.89	5.94	4.73	0.54	0.82	0.65	46%	18%	35%
Average (Week 1)	9.27	6.50	7.06	5.77	0.80	0.77	0.64	**20%**	**23%**	**36%**
Standard Deviation	2.86	2.88	1.98	1.10	0.31	0.03	0.10	**31%**	**3%**	**10%**
4/14/2008	10.14	3.61	1.93	0.90	0.36	0.19	0.09	64%	81%	91%
4/15/2008	15.06	4.75	12.40	1.15	0.32	0.82	0.08	68%	18%	92%
4/16/2008	12.49	5.44	9.75	3.31	0.44	0.78	0.26	56%	22%	74%
4/17/2008	10.60		5.21	0.62		0.49	0.06		51%	94%
4/18/2008	8.25	3.76	3.68	1.05	0.46	0.45	0.13	54%	55%	87%
Average (Week 2)	11.31	4.39	6.59	1.41	0.39	0.55	0.12	**61%**	**45%**	**88%**
Standard Deviation	2.58	0.86	4.35	1.08	0.07	0.26	0.08	**7%**	**26%**	**8%**
4/21/2008	10.99	3.56	2.28	0.81	0.32	0.21	0.07	68%	79%	93%
4/22/2008	11.03	3.65	1.82	1.31	0.33	0.17	0.12	67%	83%	88%
4/23/2008	8.59	2.81	2.54	1.18	0.33	0.30	0.14	67%	70%	86%
4/24/2008	12.72	4.27	2.74	1.70	0.34	0.22	0.13	66%	78%	87%
4/25/2008	7.09	2.44	1.31	0.52	0.34	0.19	0.07	66%	81%	93%
Average (Week 3)	10.08	3.35	2.14	1.10	0.33	0.21	0.11	**67%**	**79%**	**89%**
Standard Deviation	2.23	0.73	0.58	0.45	0.01	0.05	0.03	**1%**	**5%**	**3%**
4/28/2008	5.61	0.69	1.05	0.34	0.12	0.19	0.06	88%	81%	94%
4/29/2008	17.88	0.87	1.61	1.79	0.05	0.09	0.10	95%	91%	90%
4/30/2008	14.50	1.35	1.25	1.87	0.09	0.09	0.13	91%	91%	87%
5/1/2008	12.95	1.78	1.17	1.62	0.14	0.09	0.13	86%	91%	88%
5/2/2008	14.08	0.75	5.79	2.10	0.05	0.41	0.15	95%	59%	85%
Average (Week 4)	13.00	1.09	2.17	1.55	0.09	0.17	0.11	**91%**	**83%**	**89%**
Standard Deviation	4.52	0.46	2.03	0.69	0.04	0.14	0.03	**4%**	**14%**	**3%**

School / Class ID	Configurations Used			
	04 / 07-11 / 08	*04 / 14-18 / 08*	*04 / 21-25 / 08*	*04 / 28 / 08 to 05 / 02 / 08*
Del Amo / DA-6	Baseline	SA + PF	SA + PF	SA + HP-PF
Del Amo / DA-7	Baseline	RS	RS	RS
Del Amo / DA-8	Baseline	HP-PF	HP-PF	HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Del Amo Elementary School - PM_{10} (from particle mass monitor measurements)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DA-6	DA-7	DA-8	DA-6	DA-7	DA-8	DA-6	DA-7	DA-8
4/7/2008	35.78	35.22	28.42	21.97	0.98	0.79	61%	2%	21%	39%
4/8/2008	45.40		55.07	23.04		1.21	0.51		-21%	49%
4/9/2008	28.99	20.88	24.58	23.40	0.72	0.85	0.81	28%	15%	19%
4/10/2008	29.55	34.72	22.50	18.44	1.18	0.76	0.62	-18%	24%	38%
4/11/2008	41.44	11.06	25.65	20.46	0.27	0.62	0.49	73%	38%	51%
Average (Week 1)	36.23	25.47	31.25	21.46	0.79	0.85	0.61	**21%**	**15%**	**39%**
Standard Deviation	7.22	11.68	13.49	2.04	0.39	0.22	0.13	**39%**	**22%**	**13%**
4/14/2008	37.29	16.79	31.87	11.31	0.45	0.85	0.30	55%	15%	70%
4/15/2008	49.49	18.09	81.10	17.11	0.37	1.64	0.35	63%	-64%	65%
4/16/2008	43.89	27.44	75.71	22.75	0.63	1.72	0.52	37%	-72%	48%
4/17/2008	43.78		48.13	11.29		1.10	0.26		-10%	74%
4/18/2008	33.84	19.71	38.90	16.90	0.58	1.15	0.50	42%	-15%	50%
Average (Week 2)	41.66	20.51	55.14	15.87	0.51	1.29	0.38	**49%**	**-29%**	**62%**
Standard Deviation	6.14	4.77	22.09	4.79	0.12	0.37	0.12	**12%**	**37%**	**12%**
4/21/2008	45.13	17.94	31.35	14.58	0.40	0.69	0.32	60%	31%	68%
4/22/2008	39.96	23.99	20.92	18.86	0.60	0.52	0.47	40%	48%	53%
4/23/2008	33.54	14.53	32.46	18.54	0.43	0.97	0.55	57%	3%	45%
4/24/2008	40.68	21.02	26.43	21.74	0.52	0.65	0.53	48%	35%	47%
4/25/2008	35.52	15.42	18.02	10.66	0.43	0.51	0.30	57%	49%	70%
Average (Week 3)	38.96	18.58	25.83	16.88	0.48	0.67	0.44	**52%**	**33%**	**56%**
Standard Deviation	4.56	3.94	6.33	4.31	0.08	0.19	0.12	**8%**	**19%**	**12%**
4/28/2008	5.61	0.69	1.05	0.34	0.12	0.19	0.06	88%	81%	94%
4/29/2008	49.89	12.13	17.43	13.57	0.24	0.35	0.27	76%	65%	73%
4/30/2008	55.49	19.75	18.17	23.04	0.36	0.33	0.42	64%	67%	58%
5/1/2008	44.69	17.16	17.06	21.40	0.38	0.38	0.48	62%	62%	52%
5/2/2008	52.56	9.90	32.02	19.66	0.19	0.61	0.37	81%	39%	63%
Average (Week 4)	41.65	11.93	17.14	15.60	0.26	0.37	0.32	**74%**	**63%**	**68%**
Standard Deviation	20.53	7.40	10.97	9.25	0.11	0.15	0.16	**11%**	**15%**	**16%**

School / Class ID	Configurations Used			
	04 / 07-11 / 08	*04 / 14-18 / 08*	*04 / 21-25 / 08*	*04 / 28 / 08 to 05 / 02 / 08*
Del Amo / DA-6	Baseline	SA + PF	SA + PF	SA + HP-PF
Del Amo / DA-7	Baseline	RS	RS	RS
Del Amo / DA-8	Baseline	HP-PF	HP-PF	HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Del Amo Elementary School - PM_{10} (from filter-based measurements)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DA-6	DA-7	DA-8	DA-6	DA-7	DA-8	DA-6	DA-7	DA-8
4/7/2008	11	72	44	80	6.55	4.00	727%	-555%	-300%	-627%
4/8/2008	15		72	22		4.80	1.47		-380%	-47%
4/9/2008		66	60	11						
4/10/2008		53	29	65						
4/11/2008	64	47	29	43	0.73	0.45	0.67	27%	55%	33%
Average (Week 1)	30	60	47	44	3.64	3.08	3.14	**-264%**	**-208%**	**-214%**
Standard Deviation	30	12	19	29	4.11	2.31	3.60	**411%**	**231%**	**360%**
4/14/2008	83	87	150	11	1.05	1.81	0.13	-5%	-81%	87%
4/15/2008	61	25	76	52	0.41	1.25	0.85	59%	-25%	15%
4/16/2008	84	41	71	42	0.49	0.85	0.50	51%	15%	50%
4/17/2008	85	20	61	32	0.24	0.72	0.38	76%	28%	62%
4/18/2008	73	11	29	53	0.15	0.40	0.73	85%	60%	27%
Average (Week 2)	77	37	77	38	0.47	1.00	0.52	**53%**	**0%**	**48%**
Standard Deviation	10	30	45	17	0.35	0.54	0.28	**35%**	**54%**	**28%**
4/21/2008	100	71	31	11	0.71	0.31	0.11	29%	69%	89%
4/22/2008	14	49	26	14	3.50	1.86	1.00	-250%	-86%	0%
4/23/2008	110	11	46	21	0.10	0.42	0.19	90%	58%	81%
4/24/2008	61	20	33	43	0.33	0.54	0.70	67%	46%	30%
4/25/2008	73	12	29	21	0.16	0.40	0.29	84%	60%	71%
Average (Week 3)	72	33	33	22	0.96	0.70	0.46	**4%**	**30%**	**54%**
Standard Deviation	38	26	8	13	1.44	0.65	0.38	**144%**	**65%**	**38%**
4/28/2008	88	11	59	30	0.13	0.67	0.34	88%	33%	66%
4/29/2008	780	14	25	36	0.02	0.03	0.05	98%	97%	95%
4/30/2008	67	12	12	22	0.18	0.18	0.33	82%	82%	67%
5/1/2008	63	21	42	28	0.33	0.67	0.44	67%	33%	56%
5/2/2008	86	12	28	28	0.14	0.33	0.33	86%	67%	67%
Average (Week 4)	217	14	33	29	0.16	0.37	0.30	**84%**	**63%**	**70%**
Standard Deviation	315	4	18	5	0.11	0.29	0.15	**11%**	**29%**	**15%**

School / Class ID	Configurations Used			
	04 / 07-11 / 08	*04 / 14-18 / 08*	*04 / 21-25 / 08*	*04 / 28 / 08 to 05 / 02 / 08*
Del Amo / DA-6	Baseline	SA + PF	SA + PF	SA + HP-PF
Del Amo / DA-7	Baseline	RS	RS	RS
Del Amo / DA-8	Baseline	HP-PF	HP-PF	HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Hudson Elementary School - Black Carbon

Date	Average Outdoor Concentration (ng/m³)	Average Indoor Concentration (ng/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		H-11	H-15	H-52	H-11	H-15	H-52	H-11	H-15	H-52
5/12/2008	889	557	643	666	0.63	0.72	0.75	37%	28%	25%
5/13/2008	1,765	983	1,155	1,208	0.56	0.65	0.68	44%	35%	32%
5/14/2008	1,906	1,031	1,297	1,616	0.54	0.68	0.85	46%	32%	15%
5/15/2008	3,632	2,026	2,597	2,903	0.56	0.72	0.80	44%	28%	20%
5/16/2008	3,756	2,163	2,486	2,771	0.58	0.66	0.74	42%	34%	26%
Average (Week 1)	2,390	1,352	1,636	1,833	0.57	0.69	0.76	**43%**	**31%**	**24%**
Standard Deviation	1,253	704	863	978	0.03	0.03	0.06	**3%**	**3%**	**6%**
5/19/2008	2,007	78	97	194	0.04	0.05	0.10	96%	95%	90%
5/20/2008	1,066	74	71	96	0.07	0.07	0.09	93%	93%	91%
5/21/2008	1,344	104	75	111	0.08	0.06	0.08	92%	94%	92%
5/22/2008	903	95	67	82	0.11	0.07	0.09	89%	93%	91%
5/23/2008	731	68	71	73	0.09	0.10	0.10	91%	90%	90%
Average (Week 2)	1,210	84	76	111	0.08	0.07	0.09	**92%**	**93%**	**91%**
Standard Deviation	499	15	12	49	0.03	0.02	0.01	**3%**	**2%**	**1%**
5/26/2008										
5/27/2008	1,028	63	72	26	0.06	0.07	0.03	94%	93%	97%
5/28/2008	778	59	58	19	0.08	0.07	0.02	92%	93%	98%
5/29/2008	1,098	37	53	23	0.03	0.05	0.02	97%	95%	98%
5/30/2008	1,140	35	41	27	0.03	0.04	0.02	97%	96%	98%
Average (Week 3)	1,011	48	56	24	0.05	0.06	0.02	**95%**	**94%**	**98%**
Standard Deviation	162	15	13	4	0.02	0.02	0.00	**2%**	**2%**	**0%**
6/2/2008	1,128		45	36		0.04	0.03		96%	97%
6/3/2008	1,495	50	69	33	0.03	0.05	0.02	97%	95%	98%
6/4/2008	1,106	55	63	18	0.05	0.06	0.02	95%	94%	98%
6/5/2008	1,320	60	58	65	0.05	0.04	0.05	95%	96%	95%
6/6/2008	2,046	51	52	38	0.03	0.03	0.02	97%	97%	98%
Average (Week 4)	1,419	54	57	38	0.04	0.04	0.03	**96%**	**96%**	**97%**
Standard Deviation	384	5	9	17	0.01	0.01	0.01	**1%**	**1%**	**1%**

School / Class ID	Configurations Used			
	05 / 12-16 / 08	*05 / 19-23 / 08*	*05 / 26-30 / 08*	*06 / 02-06 / 08*
Hudson / H-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-15	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-52	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Hudson Elementary School - Ultra Fine Particles

Date	Average Outdoor Concentration (particles/cm^3)	Average Indoor Concentration (particles/cm^3)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		H-11	H-15	H-52	H-11	H-15	H-52	H-11	H-15	H-52
5/12/2008	14,643	4,083	5,190	8,433	0.28	0.35	0.58	72%	65%	42%
5/13/2008	40,865	10,619	9,421	19,956	0.26	0.23	0.49	74%	77%	51%
5/14/2008	47,145	11,563	14,730	19,466	0.25	0.31	0.41	75%	69%	59%
5/15/2008	44,862	18,397	27,694	29,422	0.41	0.62	0.66	59%	38%	34%
5/16/2008	38,322	10,435	24,291	29,818	0.27	0.63	0.78	73%	37%	22%
Average (Week 1)	37,167	11,019	16,265	21,419	0.29	0.43	0.58	**71%**	**57%**	**42%**
Standard Deviation	13,049	5,083	9,577	8,792	0.07	0.18	0.14	**7%**	**18%**	**14%**
5/19/2008	38,368	1,835	2,732	5,456	0.05	0.07	0.14	95%	93%	86%
5/20/2008	17,442	755	2,099	2,033	0.04	0.12	0.12	96%	88%	88%
5/21/2008	80,163	6,255	4,714	10,681	0.08	0.06	0.13	92%	94%	87%
5/22/2008	27,886	1,381	1,291	3,353	0.05	0.05	0.12	95%	95%	88%
5/23/2008	20,524	1,792	1,367	3,214	0.09	0.07	0.16	91%	93%	84%
Average (Week 2)	36,877	2,404	2,440	4,947	0.06	0.07	0.13	**94%**	**93%**	**87%**
Standard Deviation	25,505	2,197	1,401	3,434	0.02	0.03	0.02	**2%**	**3%**	**2%**
5/26/2008										
5/27/2008	50,891	763	1,295	793	0.01	0.03	0.02	99%	97%	98%
5/28/2008	36,964	452	458	594	0.01	0.01	0.02	99%	99%	98%
5/29/2008	40,035	367	435	572	0.01	0.01	0.01	99%	99%	99%
5/30/2008	57,760	456	566	1,006	0.01	0.01	0.02	99%	99%	98%
Average (Week 3)	46,413	510	689	741	0.01	0.01	0.02	**99%**	**99%**	**98%**
Standard Deviation	9,639	174	408	203	0.00	0.01	0.00	**0%**	**1%**	**0%**
6/2/2008	35,495		430	426		0.01	0.01		99%	99%
6/3/2008	32,336		700	432		0.02	0.01		98%	99%
6/4/2008	18,941	1,656	393	346	0.09	0.02	0.02	91%	98%	98%
6/5/2008	39,083	53	570	3,727	0.00	0.01	0.10	100%	99%	90%
6/6/2008	43,572	609	607	950	0.01	0.01	0.02	99%	99%	98%
Average (Week 4)	33,885	773	540	1,176	0.03	0.02	0.03	**97%**	**98%**	**97%**
Standard Deviation	9,343	814	127	1,446	0.05	0.00	0.04	**5%**	**0%**	**4%**

School / Class ID	Configurations Used			
	05 / 12-16 / 08	*05 / 19-23 / 08*	*05 / 26-30 / 08*	*06 / 02-06 / 08*
Hudson / H-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-15	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-52	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Hudson Elementary School - $PM_{2.5}$ (count)

Date	Average Outdoor Concentration (particles/ft^3)	Average Indoor Concentration (particles/ft^3)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		H-11	H-15	H-52	H-11	H-15	H-52	H-11	H-15	H-52
5/12/2008	1,109,627	576,204	511,734	718,130	0.52	0.46	0.65	48%	54%	35%
5/13/2008	1,850,803	757,977	897,986	1,156,730	0.41	0.49	0.62	59%	51%	38%
5/14/2008	1,760,128	682,498	838,534	1,199,580	0.39	0.48	0.68	61%	52%	32%
5/15/2008	1,839,611	767,375	1,011,002	1,191,460	0.42	0.55	0.65	58%	45%	35%
5/16/2008	1,128,564	525,461	723,482	781,768	0.47	0.64	0.69	53%	36%	31%
Average (Week 1)	1,537,747	661,903	796,548	1,009,534	0.44	0.52	0.66	**56%**	**48%**	**34%**
Standard Deviation	383,828	108,096	190,066	238,576	0.05	0.07	0.03	**5%**	**7%**	**3%**
5/19/2008	660,607	44,930	61,168	59,352	0.07	0.09	0.09	93%	91%	91%
5/20/2008	1,477,586	68,443	70,820	131,786	0.05	0.05	0.09	95%	95%	91%
5/21/2008	1,613,826	103,883	73,924	125,633	0.06	0.05	0.08	94%	95%	92%
5/22/2008	1,530,791	106,300	69,737	94,795	0.07	0.05	0.06	93%	95%	94%
5/23/2008	987,855	77,470	71,330	70,589	0.08	0.07	0.07	92%	93%	93%
Average (Week 2)	1,254,133	80,205	69,396	96,431	0.07	0.06	0.08	**93%**	**94%**	**92%**
Standard Deviation	412,015	25,650	4,850	32,203	0.01	0.02	0.01	**1%**	**2%**	**1%**
5/26/2008										
5/27/2008	440,181	52,467	51,042	26,303	0.12	0.12	0.06	88%	88%	94%
5/28/2008	362,533	66,769	46,541	18,906	0.18	0.13	0.05	82%	87%	95%
5/29/2008	369,467	33,173	50,616	17,735	0.09	0.14	0.05	91%	86%	95%
5/30/2008	529,995	35,119	28,628	23,916	0.07	0.05	0.05	93%	95%	95%
Average (Week 3)	425,544	46,882	44,207	21,715	0.11	0.11	0.05	**89%**	**89%**	**95%**
Standard Deviation	77,973	15,843	10,582	4,067	0.05	0.04	0.01	**5%**	**4%**	**1%**
6/2/2008	1,472,339		38,432	36,347		0.03	0.02		97%	98%
6/3/2008	2,102,152	56,800	81,009	39,991	0.03	0.04	0.02	97%	96%	98%
6/4/2008	1,346,575	64,055	66,975	19,669	0.05	0.05	0.01	95%	95%	99%
6/5/2008	1,167,940	77,692	56,657	29,352	0.07	0.05	0.03	93%	95%	97%
6/6/2008	998,499	67,890	40,091	24,490	0.07	0.04	0.02	93%	96%	98%
Average (Week 4)	1,417,501	66,609	56,633	29,970	0.05	0.04	0.02	**95%**	**96%**	**98%**
Standard Deviation	422,678	8,703	18,070	8,331	0.02	0.01	0.00	**2%**	**1%**	**0%**

School / Class ID	Configurations Used			
	05 / 12-16 / 08	*05 / 19-23 / 08*	*05 / 26-30 / 08*	*06 / 02-06 / 08*
Hudson / H-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-15	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-52	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Hudson Elementary School - $PM_{2.5}$ (mass)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		H-11	H-15	H-52	H-11	H-15	H-52	H-11	H-15	H-52
5/12/2008	8.19	2.68	2.55	1.82	0.33	0.31	0.22	67%	69%	78%
5/13/2008	13.38	3.36	3.62	3.02	0.25	0.27	0.23	75%	73%	77%
5/14/2008	14.65	2.55	3.74	4.09	0.17	0.25	0.28	83%	75%	72%
5/15/2008	20.11	3.60	5.52	4.92	0.18	0.27	0.24	82%	73%	76%
5/16/2008	14.66	3.13	4.81	4.41	0.21	0.33	0.30	79%	67%	70%
Average (Week 1)	14.20	3.06	4.05	3.65	0.23	0.29	0.25	**77%**	**71%**	**75%**
Standard Deviation	4.25	0.45	1.15	1.23	0.06	0.03	0.03	**6%**	**3%**	**3%**
5/19/2008	7.86	0.56	0.84	0.04	0.07	0.11	0.01	93%	89%	99%
5/20/2008	6.19	1.00	0.82	0.28	0.16	0.13	0.05	84%	87%	95%
5/21/2008	14.18	1.37	0.79	0.28	0.10	0.06	0.02	90%	94%	98%
5/22/2008	29.03	2.09	1.00	0.93	0.07	0.03	0.03	93%	97%	97%
5/23/2008	17.46	1.32	1.20	0.29	0.08	0.07	0.02	92%	93%	98%
Average (Week 2)	14.95	1.27	0.93	0.37	0.10	0.08	0.02	**90%**	**92%**	**98%**
Standard Deviation	9.11	0.56	0.17	0.33	0.04	0.04	0.02	**4%**	**4%**	**2%**
5/26/2008										
5/27/2008	3.12	0.92	0.91	0.10	0.30	0.29	0.03	70%	71%	97%
5/28/2008	2.34	1.48	0.88		0.63	0.38		37%	62%	
5/29/2008	3.36	0.47	0.84	0.07	0.14	0.25	0.02	86%	75%	98%
5/30/2008	4.65	0.54	0.59	0.17	0.12	0.13	0.04	88%	87%	96%
Average (Week 3)	3.37	0.86	0.81	1.64	0.30	0.26	0.03	**70%**	**74%**	**97%**
Standard Deviation	0.96	0.46	0.15	3.05	0.24	0.10	0.01	**24%**	**10%**	**1%**
6/2/2008	12.73		0.49	0.45		0.04	0.04		96%	96%
6/3/2008	15.40	1.09	1.07	0.31	0.07	0.07	0.02	93%	93%	98%
6/4/2008	9.62	1.43	1.10	0.00	0.15	0.11	0.00	85%	89%	100%
6/5/2008	12.63	1.72	1.16	0.22	0.14	0.09	0.02	86%	91%	98%
6/6/2008	16.85	1.25	0.79	0.17	0.07	0.05	0.01	93%	95%	99%
Average (Week 4)	13.45	1.38	0.92	0.23	0.11	0.07	0.02	**89%**	**93%**	**98%**
Standard Deviation	2.80	0.27	0.28	0.17	0.04	0.03	0.01	**4%**	**3%**	**1%**

School / Class ID	Configurations Used			
	05 / 12-16 / 08	*05 / 19-23 / 08*	*05 / 26-30 / 08*	*06 / 02-06 / 08*
Hudson / H-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-15	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-52	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Hudson Elementary School - PM_{10} (from particle mass monitor measurements)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		H-11	H-15	H-52	H-11	H-15	H-52	H-11	H-15	H-52
5/12/2008	34.99	35.13	29.94	9.35	1.00	0.86	0.27	0%	14%	73%
5/13/2008	72.87	36.97	35.03	14.02	0.51	0.48	0.19	49%	52%	81%
5/14/2008	57.56	23.93	32.32	13.91	0.42	0.56	0.24	58%	44%	76%
5/15/2008	73.56	33.55	33.75	11.95	0.46	0.46	0.16	54%	54%	84%
5/16/2008	65.32	28.13	36.48	18.64	0.43	0.56	0.29	57%	44%	71%
Average (Week 1)	60.86	31.54	33.50	13.57	0.56	0.58	0.23	**44%**	**42%**	**77%**
Standard Deviation	15.86	5.38	2.52	3.41	0.25	0.16	0.05	**25%**	**16%**	**5%**
5/19/2008	44.62	22.67	31.37	3.21	0.51	0.70	0.07	49%	30%	93%
5/20/2008	29.90	32.03	32.45	7.32	1.07	1.09	0.24	-7%	-9%	76%
5/21/2008	99.04	30.71	30.14	5.48	0.31	0.30	0.06	69%	70%	94%
5/22/2008	97.14	48.80	26.72	6.28	0.50	0.28	0.06	50%	72%	94%
5/23/2008	62.98	28.55	30.00	3.31	0.45	0.48	0.05	55%	52%	95%
Average (Week 2)	66.74	32.55	30.14	5.12	0.57	0.57	0.10	**43%**	**43%**	**90%**
Standard Deviation	30.94	9.77	2.15	1.82	0.29	0.34	0.08	**29%**	**34%**	**8%**
5/26/2008										
5/27/2008	21.70	31.71	35.38	3.04	1.46	1.63	0.14	-46%	-63%	86%
5/28/2008	18.66	37.53	29.44		2.01	1.58		-101%	-58%	
5/29/2008	24.67	20.97	32.20	3.62	0.85	1.31	0.15	15%	-31%	85%
5/30/2008	28.26	22.01	18.07	6.19	0.78	0.64	0.22	22%	36%	78%
Average (Week 3)	23.32	28.06	28.77	5.26	1.28	1.29	0.17	**-28%**	**-29%**	**83%**
Standard Deviation	4.10	7.96	7.54	2.38	0.58	0.46	0.04	**58%**	**46%**	**4%**
6/2/2008	47.55		23.85	10.14		0.50	0.21		50%	79%
6/3/2008	55.46	33.55	38.16	8.32	0.61	0.69	0.15	39%	31%	85%
6/4/2008	42.76	37.37	37.82	3.91	0.87	0.88	0.09	13%	12%	91%
6/5/2008	48.79	40.38	34.67	7.35	0.83	0.71	0.15	17%	29%	85%
6/6/2008	58.51	34.10	23.89	6.60	0.58	0.41	0.11	42%	59%	89%
Average (Week 4)	50.61	36.35	31.68	7.27	0.72	0.64	0.14	**28%**	**36%**	**86%**
Standard Deviation	6.33	3.17	7.26	2.30	0.15	0.19	0.05	**15%**	**19%**	**5%**

School / Class ID	Configurations Used			
	05 / 12-16 / 08	*05 / 19-23 / 08*	*05 / 26-30 / 08*	*06 / 02-06 / 08*
Hudson / H-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-15	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-52	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Hudson Elementary School - PM_{10} (from filter-based measurements)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		H-11	H-15	H-52	H-11	H-15	H-52	H-11	H-15	H-52
5/12/2008	120	68		92	0.57		0.77	43%		23%
5/13/2008	110	46	20		0.42	0.18		58%	82%	
5/14/2008		45	43	24						
5/15/2008	130		42	26	0.00		0.20	100%		80%
5/16/2008		26		27						
Average (Week 1)	120	46	35	42	0.33	0.18	0.48	**67%**	**82%**	**52%**
Standard Deviation	10	17	13	33	0.29		0.40	**29%**		**40%**
5/19/2008	120	35		24	0.29		0.20	71%		80%
5/20/2008	78	29		61	0.37		0.78	63%		22%
5/21/2008	60	11		28	0.18		0.47	82%		53%
5/22/2008	130	39		29	0.30		0.22	70%		78%
5/23/2008	99	20		15	0.20		0.15	80%		85%
Average (Week 2)	97	27	46	31	0.27		0.36	**73%**		**64%**
Standard Deviation	29	11	19	17	0.08		0.26	**8%**		**26%**
5/26/2008										
5/27/2008	210	31		53	0.15		0.25	85%		75%
5/28/2008	120	34		23	0.28		0.19	72%		81%
5/29/2008	99	11		35	0.11		0.35	89%		65%
5/30/2008	87	20		19	0.23		0.22	77%		78%
Average (Week 3)	129	24	90	33	0.19		0.25	**81%**		**75%**
Standard Deviation	56	11	34	15	0.08		0.07	**8%**		**7%**
6/2/2008	120			41			0.34			66%
6/3/2008	110	30		30	0.27		0.27	73%		73%
6/4/2008	82	27		41	0.33		0.50	67%		50%
6/5/2008	100	35		36	0.35		0.36	65%		64%
6/6/2008	120	27		39	0.23		0.33	78%		68%
Average (Week 4)	106	30		37	0.29		0.36	**71%**		**64%**
Standard Deviation	16	4		5	0.06		0.08	**6%**		**8%**

School / Class ID	Configurations Used			
	05 / 12-16 / 08	*05 / 19-23 / 08*	*05 / 26-30 / 08*	*06 / 02-06 / 08*
Hudson / H-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-15	Baseline	HP-PF	RS + HP-PF	RS + HP-PF
Hudson / H-52	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Dominguez Elementary School - Black Carbon

Date	Average Outdoor Concentration (ng/m^3)	Average Indoor Concentration (ng/m^3)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11
11/17/2008										
11/18/2008	5,137	2,149	4,384	5,096	0.42	0.85	0.99	58%	15%	1%
11/19/2008	8,787	3,951	5,935	6,332	0.45	0.68	0.72	55%	32%	28%
11/20/2008	9,243	3,932	7,292	6,616	0.43	0.79	0.72	57%	21%	28%
11/21/2008	11,210	6,967	8,270	8,928	0.62	0.74	0.80	38%	26%	20%
Average (Week 1)	8,594	4,250	6,470	6,743	0.48	0.76	0.81	**52%**	**24%**	**19%**
Standard Deviation	2,533	1,999	1,688	1,599	0.10	0.08	0.13	**10%**	**8%**	**13%**
11/24/2008	4,474	2,918	4,828	4,903	0.65	1.08	1.10	35%	-8%	-10%
11/25/2008	5,234	4,005	4,944	5,166	0.77	0.94	0.99	23%	6%	1%
11/26/2008										
11/27/2008										
11/28/2008										
Average (Week 2)	4,854	3,462	4,886	5,035	0.71	1.01	1.04	**29%**	**-1%**	**-4%**
Standard Deviation	538	768	82	186	0.08	0.10	0.08	**8%**	**10%**	**8%**
12/1/2008	8,642	2,023	2,996	2,744	0.23	0.35	0.32	77%	65%	68%
12/2/2008	2,434	268	217	187	0.11	0.09	0.08	89%	91%	92%
12/3/2008	4,351	557	1,024	444	0.13	0.24	0.10	87%	76%	90%
12/4/2008	3,953	819	354	267	0.21	0.09	0.07	79%	91%	93%
12/5/2008	5,734	766	856	346	0.13	0.15	0.06	87%	85%	94%
Average (Week 3)	5,023	887	1,089	798	0.16	0.18	0.12	**84%**	**82%**	**88%**
Standard Deviation	2,340	671	1,117	1,092	0.05	0.11	0.11	**5%**	**11%**	**11%**
12/8/2008	2,112	290	269	105	0.14	0.13	0.05	86%	87%	95%
12/9/2008	5,452	549	816	311	0.10	0.15	0.06	90%	85%	94%
12/10/2008	2,819	136	351	249	0.05	0.12	0.09	95%	88%	91%
12/11/2008	9,169	515	892	222	0.06	0.10	0.02	94%	90%	98%
12/12/2008	4,670	342	687	444	0.07	0.15	0.10	93%	85%	90%
Average (Week 4)	4,844	366	603	266	0.08	0.13	0.06	**92%**	**87%**	**94%**
Standard Deviation	2,769	169	279	124	0.04	0.02	0.03	**4%**	**2%**	**3%**
12/15/2008										
12/16/2008	3,274	209	432	187	0.06	0.13	0.06	94%	87%	94%
12/17/2008										
12/18/2008	1,976	397	325	109	0.20	0.16	0.05	80%	84%	95%
12/19/2008	4,558	320	904	234	0.07	0.20	0.05	93%	80%	95%
Average (Week 5)	3,269	308	554	177	0.11	0.16	0.05	**89%**	**84%**	**95%**
Standard Deviation	1,291	95	308	63	0.08	0.03	0.00	**8%**	**3%**	**0%**

School / Class ID	Configurations Used			
	11 / 18-26 / 08	*12 / 01-05 / 08*	*12 / 08-12 / 08*	*12 / 15-19 / 08*
Dominguez / DZ-7	Baseline	SA / SA + PF	SA + HP-PF	SA + HP-PF
Dominguez / DZ-9	Baseline	HP-PF	HP-PF	HP-PF
Dominguez / DZ-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Dominguez Elementary School - Ultra Fine Particles

Date	Average Outdoor Concentration (particles/cm^3)	Average Indoor Concentration (particles/cm^3)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11
11/17/2008										
11/18/2008	25,476	5,422	12,344	12,550	0.21	0.48	0.49	79%	52%	51%
11/19/2008	42,651	9,488	19,540	24,676	0.22	0.46	0.58	78%	54%	42%
11/20/2008	39,794	10,924	24,111	21,528	0.27	0.61	0.54	73%	39%	46%
11/21/2008	38,976	12,874	18,814	22,150	0.33	0.48	0.57	67%	52%	43%
Average (Week 1)	36,724	9,677	18,702	20,226	0.26	0.51	0.55	**74%**	**49%**	**45%**
Standard Deviation	7,663	3,158	4,844	5,295	0.05	0.07	0.04	**5%**	**7%**	**4%**
11/24/2008	34,386	8,720	18,565	24,049	0.25	0.54	0.70	75%	46%	30%
11/25/2008	31,838	10,383	17,528	23,812	0.33	0.55	0.75	67%	45%	25%
11/26/2008										
11/27/2008										
11/28/2008										
Average (Week 2)	33,112	9,552	18,047	23,930	0.29	0.55	0.72	**71%**	**45%**	**28%**
Standard Deviation	1,802	1,176	733	168	0.05	0.01	0.03	**5%**	**1%**	**3%**
12/1/2008	41,439	8,349	9,891	13,190	0.20	0.24	0.32	80%	76%	68%
12/2/2008	17,370	1,000	1,962	1,613	0.06	0.11	0.09	94%	89%	91%
12/3/2008	16,420	1,805	3,508	2,413	0.11	0.21	0.15	89%	79%	85%
12/4/2008	16,970	2,768	2,214	1,469	0.16	0.13	0.09	84%	87%	91%
12/5/2008	29,061	2,522	5,130	2,277	0.09	0.18	0.08	91%	82%	92%
Average (Week 3)	24,252	3,289	4,541	4,192	0.12	0.17	0.14	**88%**	**83%**	**86%**
Standard Deviation	10,957	2,911	3,244	5,046	0.06	0.05	0.10	**6%**	**5%**	**10%**
12/8/2008	16,048	1,148	9,995	440	0.07	0.62	0.03	93%	38%	97%
12/9/2008	34,610	2,241	4,785	1,755	0.06	0.14	0.05	94%	86%	95%
12/10/2008	32,657	817	5,299	2,790	0.03	0.16	0.09	97%	84%	91%
12/11/2008	29,250	1,146	3,203	812	0.04	0.11	0.03	96%	89%	97%
12/12/2008	23,839	1,262	4,040	2,750	0.05	0.17	0.12	95%	83%	88%
Average (Week 4)	27,281	1,323	5,464	1,709	0.05	0.24	0.06	**95%**	**76%**	**94%**
Standard Deviation	7,492	539	2,653	1,080	0.02	0.22	0.04	**2%**	**22%**	**4%**
12/15/2008										
12/16/2008	26,441	1,066	4,072	1,209	0.04	0.15	0.05	96%	85%	95%
12/17/2008										
12/18/2008	23,513	3,355	2,871	1,283	0.14	0.12	0.05	86%	88%	95%
12/19/2008	28,783	1,247	7,747	2,101	0.04	0.27	0.07	96%	73%	93%
Average (Week 5)	26,246	1,889	4,897	1,531	0.08	0.18	0.06	**92%**	**82%**	**94%**
Standard Deviation	2,641	1,272	2,540	495	0.06	0.08	0.01	**6%**	**8%**	**1%**

School / Class ID	Configurations Used			
	11 / 18-26 / 08	*12 / 01-05 / 08*	*12 / 08-12 / 08*	*12 / 15-19 / 08*
Dominguez / DZ-7	Baseline	SA / SA + PF	SA + HP-PF	SA + HP-PF
Dominguez / DZ-9	Baseline	HP-PF	HP-PF	HP-PF
Dominguez / DZ-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Dominguez Elementary School - $PM_{2.5}$ (count)

Date	Average Outdoor Concentration (particles/ft³)	Average Indoor Concentration (particles/ft³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11
11/17/2008										
11/18/2008										
11/19/2008	8,866,226	1,411,242	2,600,108	3,571,960	0.16	0.29	0.40	84%	71%	60%
11/20/2008	8,237,390	1,286,754	3,015,586	2,734,509	0.16	0.37	0.33	84%	63%	67%
11/21/2008	7,625,250	1,471,170	2,634,126	3,393,425	0.19	0.35	0.45	81%	65%	55%
Average (Week 1)	8,242,955	1,389,722	2,749,940	3,233,298	0.17	0.33	0.39	**87%**	**75%**	**71%**
Standard Deviation	620,507	94,073	230,684	441,091	0.02	0.04	0.06	**9%**	**17%**	**20%**
11/24/2008	8,511,436	1,151,144	3,000,744	3,943,011	0.14	0.35	0.46	86%	65%	54%
11/25/2008	6,035,358	949,498	1,853,996	2,542,878	0.16	0.31	0.42	84%	69%	58%
11/26/2008										
11/27/2008										
11/28/2008										
Average (Week 2)	7,273,397	1,050,321	2,427,370	3,242,944	0.15	0.33	0.44	**85%**	**67%**	**56%**
Standard Deviation	1,750,852	142,585	810,873	990,043	0.02	0.03	0.03	**2%**	**3%**	**3%**
12/1/2008	7,115,843	375,673	1,197,684	1,210,391	0.05	0.17	0.17	95%	83%	83%
12/2/2008	6,472,443	120,635	344,786	289,496	0.02	0.05	0.04	98%	95%	96%
12/3/2008	10,298,411	190,597	1,628,370	753,983	0.02	0.16	0.07	98%	84%	93%
12/4/2008	10,129,374	294,693	520,489	458,324	0.03	0.05	0.05	97%	95%	95%
12/5/2008	5,018,869	103,392	368,715	228,546	0.02	0.07	0.05	98%	93%	95%
Average (Week 3)	7,806,988	216,998	812,009	588,148	0.03	0.10	0.08	**97%**	**90%**	**92%**
Standard Deviation	2,325,563	116,301	573,363	403,128	0.01	0.06	0.05	**1%**	**6%**	**5%**
12/8/2008	1,539,967	207,455	112,870		0.13	0.07		87%	93%	
12/9/2008	2,540,284	271,444	165,653	85,637	0.11	0.07	0.03	89%	93%	97%
12/10/2008	425,792	74,899	59,053	73,412	0.18	0.14	0.17	82%	86%	83%
12/11/2008	2,040,036	147,307	136,505	62,538	0.07	0.07	0.03	93%	93%	97%
12/12/2008	2,259,506	157,821	151,593	190,241	0.07	0.07	0.08	93%	93%	92%
Average (Week 4)	1,761,117	171,785	125,135	102,957	0.11	0.08	0.08	**89%**	**92%**	**92%**
Standard Deviation	831,458	73,119	41,798	58,950	0.04	0.03	0.07	**4%**	**3%**	**7%**
12/15/2008										
12/16/2008	518,108	83,088	73,452	54,664	0.16	0.14	0.11	84%	86%	89%
12/17/2008										
12/18/2008		148,282	83,984	1,067						
12/19/2008		108,951	203,523	2,678						
Average (Week 5)	518,108	113,440	120,320	19,470	0.16	0.14	0.11	**84%**	**86%**	**89%**
Standard Deviation		32,828	72,249	30,490						

School / Class ID	Configurations Used			
	11 / 18-26 / 08	*12 / 01-05 / 08*	*12 / 08-12 / 08*	*12 / 15-19 / 08*
Dominguez / DZ-7	Baseline	SA / SA + PF	SA + HP-PF	SA + HP-PF
Dominguez / DZ-9	Baseline	HP-PF	HP-PF	HP-PF
Dominguez / DZ-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Dominguez Elementary School - $PM_{2.5}$ (mass)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11
11/17/2008										
11/18/2008	4.11	4.66	3.70	11.47	1.13	0.90	2.79	-13%	10%	-179%
11/19/2008	13.52	9.93	6.52	10.89	0.73	0.48	0.81	27%	52%	19%
11/20/2008	30.59	10.79	14.26	12.27	0.35	0.47	0.40	65%	53%	60%
11/21/2008	16.15	11.71	8.78	11.07	0.72	0.54	0.69	28%	46%	31%
Average (Week 1)	16.09	9.27	8.31	11.43	0.74	0.60	1.17	**26%**	**40%**	**-17%**
Standard Deviation	10.96	3.16	4.48	0.61	0.32	0.20	1.09	**32%**	**20%**	**109%**
11/24/2008	17.12	11.75	12.16	18.94	0.69	0.71	1.11	31%	29%	-11%
11/25/2008	12.77	15.62	11.33	17.13	1.22	0.89	1.34	-22%	11%	-34%
11/26/2008										
11/27/2008										
11/28/2008										
Average (Week 2)	14.95	13.69	11.74	18.04	0.95	0.80	1.22	**5%**	**20%**	**-22%**
Standard Deviation	3.07	2.73	0.58	1.28	0.38	0.13	0.17	**38%**	**13%**	**17%**
12/1/2008	17.46	3.27	5.87	3.81	0.19	0.34	0.22	81%	66%	78%
12/2/2008	9.45	2.08	0.87	0.87	0.22	0.09	0.09	78%	91%	91%
12/3/2008	35.25	3.24	8.29	2.21	0.09	0.24	0.06	91%	76%	94%
12/4/2008	27.93	4.50	1.85	1.27	0.16	0.07	0.05	84%	93%	95%
12/5/2008	13.35	1.84	1.71	1.22	0.14	0.13	0.09	86%	87%	91%
Average (Week 3)	20.69	2.99	3.72	1.87	0.16	0.17	0.10	**84%**	**83%**	**90%**
Standard Deviation	10.67	1.07	3.21	1.19	0.05	0.11	0.07	**5%**	**11%**	**7%**
12/8/2008	5.77	2.08	1.10	0.79	0.36	0.19	0.14	64%	81%	86%
12/9/2008	7.96	2.55	0.87	0.87	0.32	0.11	0.11	68%	89%	89%
12/10/2008	1.80	0.84	1.02	1.10	0.47	0.57	0.61	53%	43%	39%
12/11/2008	5.82	1.01	0.79	0.88	0.17	0.14	0.15	83%	86%	85%
12/12/2008	10.99	0.94	1.35	1.91	0.09	0.12	0.17	91%	88%	83%
Average (Week 4)	6.47	1.49	1.03	1.11	0.28	0.23	0.24	**72%**	**77%**	**76%**
Standard Deviation	3.37	0.78	0.22	0.46	0.15	0.20	0.21	**15%**	**20%**	**21%**
12/15/2008										
12/16/2008	3.31	0.55	0.41	0.57	0.17	0.12	0.17	83%	88%	83%
12/17/2008										
12/18/2008	1.29	0.73	0.75	0.14	0.57	0.58	0.11	43%	42%	89%
12/19/2008	6.18	0.59	1.48	0.68	0.10	0.24	0.11	90%	76%	89%
Average (Week 5)	3.59	0.63	0.88	0.46	0.28	0.31	0.13	**72%**	**69%**	**87%**
Standard Deviation	2.46	0.09	0.55	0.29	0.25	0.24	0.04	**25%**	**24%**	**4%**

School / Class ID	**Configurations Used**			
	11 / 18-26 / 08	*12 / 01-05 / 08*	*12 / 08-12 / 08*	*12 / 15-19 / 08*
Dominguez / DZ-7	Baseline	SA / SA + PF	SA + HP-PF	SA + HP-PF
Dominguez / DZ-9	Baseline	HP-PF	HP-PF	HP-PF
Dominguez / DZ-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Dominguez Elementary School - PM_{10} (from particle mass monitor measurements)

Date	Average Outdoor Concentration (μg/m³)	Average Indoor Concentration (μg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11
11/17/2008										
11/18/2008	51.98	64.34	34.38	91.83	1.24	0.66	1.77	-24%	34%	-77%
11/19/2008	52.85	73.95	47.85	79.93	1.40	0.91	1.51	-40%	9%	-51%
11/20/2008	84.85	62.75	69.89	85.40	0.74	0.82	1.01	26%	18%	-1%
11/21/2008	61.53	69.08	58.16	72.86	1.12	0.95	1.18	-12%	5%	-18%
Average (Week 1)	62.81	67.53	52.57	82.51	1.12	0.83	1.37	**-12%**	**17%**	**-37%**
Standard Deviation	15.32	5.06	15.11	8.06	0.28	0.13	0.34	**28%**	**13%**	**34%**
11/24/2008	50.13	74.55	76.61	135.45	1.49	1.53	2.70	-49%	-53%	-170%
11/25/2008	48.79	98.76	88.63	128.96	2.02	1.82	2.64	-102%	-82%	-164%
11/26/2008										
11/27/2008										
11/28/2008										
Average (Week 2)	49.46	86.66	82.62	132.21	1.76	1.67	2.67	**-76%**	**-67%**	**-167%**
Standard Deviation	0.95	17.12	8.49	4.59	0.38	0.20	0.04	**38%**	**20%**	**4%**
12/1/2008	86.09	27.81	54.38	37.73	0.32	0.63	0.44	68%	37%	56%
12/2/2008	25.06	26.79	16.38	15.78	1.07	0.65	0.63	-7%	35%	37%
12/3/2008	57.34	13.40	43.07	18.36	0.23	0.75	0.32	77%	25%	68%
12/4/2008	52.74	23.08	13.42	12.93	0.44	0.25	0.25	56%	75%	75%
12/5/2008	41.97	14.59	17.31	18.03	0.35	0.41	0.43	65%	59%	57%
Average (Week 3)	52.64	21.13	28.91	20.56	0.48	0.54	0.41	**52%**	**46%**	**59%**
Standard Deviation	22.45	6.76	18.58	9.84	0.34	0.20	0.15	**34%**	**20%**	**15%**
12/8/2008	28.57	21.91	19.27	18.93	0.77	0.67	0.66	23%	33%	34%
12/9/2008	39.04	23.09	11.40	17.01	0.59	0.29	0.44	41%	71%	56%
12/10/2008	21.52	11.43	16.69	18.02	0.53	0.78	0.84	47%	22%	16%
12/11/2008	44.75	11.02	12.31	15.96	0.25	0.28	0.36	75%	72%	64%
12/12/2008	46.70	11.24	18.51	24.48	0.24	0.40	0.52	76%	60%	48%
Average (Week 4)	36.12	15.74	15.63	18.88	0.48	0.48	0.56	**52%**	**52%**	**44%**
Standard Deviation	10.78	6.19	3.59	3.32	0.23	0.23	0.19	**23%**	**23%**	**19%**
12/15/2008										
12/16/2008	15.49	8.83	8.94	14.83	0.57	0.58	0.96	43%	42%	4%
12/17/2008										
12/18/2008	7.99	14.10	19.02	8.39	1.76	2.38	1.05	-76%	-138%	-5%
12/19/2008	27.12	10.76	23.70	14.98	0.40	0.87	0.55	60%	13%	45%
Average (Week 5)	16.87	11.23	17.22	12.73	0.91	1.28	0.85	**9%**	**-28%**	**15%**
Standard Deviation	9.64	2.66	7.54	3.76	0.74	0.97	0.26	**74%**	**97%**	**26%**

School / Class ID	Configurations Used			
	11 / 18-26 / 08	*12 / 01-05 / 08*	*12 / 08-12 / 08*	*12 / 15-19 / 08*
Dominguez / DZ-7	Baseline	SA / SA + PF	SA + HP-PF	SA + HP-PF
Dominguez / DZ-9	Baseline	HP-PF	HP-PF	HP-PF
Dominguez / DZ-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

Dominguez Elementary School - PM_{10} (from filter-based measurements)

Date	Average Outdoor Concentration (µg/m³)	Average Indoor Concentration (µg/m³)			Average Indoor/Outdoor Ratio			Average Removal Efficiency		
		DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11	DZ-7	DZ-9	DZ-11
11/17/2008										
11/18/2008	720	940	740	310	1.31	1.03	0.43	-31%	-3%	57%
11/19/2008	290	100	250	160	0.34	0.86	0.55	66%	14%	45%
11/20/2008	33	220	150	38	6.67	4.55	1.15	-567%	-355%	-15%
11/21/2008	200	120	180	25	0.60	0.90	0.13	40%	10%	88%
Average (Week 1)	311	345	330	133	2.23	1.83	0.56	**-123%**	**-83%**	**44%**
Standard Deviation	293	400	277	133	2.99	1.81	0.43	**299%**	**181%**	**43%**
11/24/2008	180	220	200	180	1.22	1.11	1.00	-22%	-11%	0%
11/25/2008	150	220	140	140	1.47	0.93	0.93	-47%	7%	7%
11/26/2008										
11/27/2008										
11/28/2008										
Average (Week 2)	165	220	170	160	1.34	1.02	0.97	**-34%**	**-2%**	**3%**
Standard Deviation	21	0	42	28	0.17	0.13	0.05	**17%**	**13%**	**5%**
12/1/2008	180	280	180	82	1.56	1.00	0.46	-56%	0%	54%
12/2/2008	130	170	110	40	1.31	0.85	0.31	-31%	15%	69%
12/3/2008	150	110	120	36	0.73	0.80	0.24	27%	20%	76%
12/4/2008	140	120	90	36	0.86	0.64	0.26	14%	36%	74%
12/5/2008	130	91	87	41	0.70	0.67	0.32	30%	33%	68%
Average (Week 3)	146	154	117	47	1.03	0.79	0.32	**-3%**	**21%**	**68%**
Standard Deviation	21	76	38	20	0.38	0.14	0.08	**38%**	**14%**	**8%**
12/8/2008	140	150	120	25	1.07	0.86	0.18	-7%	14%	82%
12/9/2008	130	100	100	30	0.77	0.77	0.23	23%	23%	77%
12/10/2008	91	95	100	34	1.04	1.10	0.37	-4%	-10%	63%
12/11/2008	130	82	77	33	0.63	0.59	0.25	37%	41%	75%
12/12/2008	140	78	36	87	0.56	0.26	0.62	44%	74%	38%
Average (Week 4)	126	101	87	42	0.81	0.71	0.33	**19%**	**29%**	**67%**
Standard Deviation	20	29	32	26	0.23	0.31	0.18	**23%**	**31%**	**18%**
12/15/2008										
12/16/2008	91	84	70	30	0.92	0.77	0.33	8%	23%	67%
12/17/2008										
12/18/2008	71	79	68	17	1.11	0.96	0.24	-11%	4%	76%
12/19/2008	93	75	73	23	0.81	0.78	0.25	19%	22%	75%
Average (Week 5)	85	79	70	23	0.95	0.84	0.27	**5%**	**16%**	**73%**
Standard Deviation	12	5	3	7	0.15	0.10	0.05	**15%**	**10%**	**5%**

School / Class ID	Configurations Used			
	11 / 18-26 / 08	*12 / 01-05 / 08*	*12 / 08-12 / 08*	*12 / 15-19 / 08*
Dominguez / DZ-7	Baseline	SA / SA + PF	SA + HP-PF	SA + HP-PF
Dominguez / DZ-9	Baseline	HP-PF	HP-PF	HP-PF
Dominguez / DZ-11	Baseline	HP-PF	RS + HP-PF	RS + HP-PF

HP-PF = HVAC-based high-performance panel filter
RS = register-based air purifier
SA = stand alone system
PF = conventional / medium efficiency panel filter

APPENDIX B. Daily average concentrations of individual VOCs measured outside Dominguez elementary school and inside three of its classrooms (here referred to as DZ-7, DZ-9, and DZ-11)

Dominguez Elementary School - Outdoor VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/18/08	11/19/08	11/20/08	11/21/08	11/24/08	11/25/08
Propylene	1.0	0.04	7.7	5.7	4.5		4.7	3.2
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.7	0.7	0.7	0.7	0.6	0.6
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.03		0.02		0.02	0.02
Chloromethane	0.5	0.08	0.6	0.7	0.6	0.6	0.6	0.6
Vinyl chloride	0.5	0.04						
Bromomethane	0.5	0.05			0.07			0.03
Ethanol	1.5	0.30	47	36	24	24	15	14
Freon 11(Trichlorofluoromethane)	0.5	0.04			0.3			0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	7.7	5.4	2.1	4.9	2	1.9
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.07	0.06	0.06	0.07	0.06	0.06
Acetone	3.0	0.08	25	23	16	20	17	11
Carbon disulfide	1.0	0.04	0.04	0.06	0.03	0.04	0.04	0.01
Methylene chloride	1.5	0.04	1.2	1	0.6	1.1	0.6	0.4
Methyl-tert-butyl ether(MTBE)	0.5	0.05						
trans-1,2-Dichloroethene	0.5	0.04						
n-Hexane	0.5	0.03	1	1	1.2	1.2	0.5	0.4
1,-Dichloroethane	0.5	0.04						
Vinyl acetate	0.5	0.05						
2-Butanone(MEK)	1.5	0.07	1.8	3	3	1.9	1.8	0.9
cis-1,2-Dichloroethene	0.5	0.05						
Ethyl acetate	0.5	0.07	0.5	0.6	0.2	0.4	0.2	0.2
Chloroform	0.5	0.03		0.08	0.06	0.08	0.03	0.03
Tetrahydrofuran	0.5	0.07		0.2	0.2	0.3	0.3	0.2
1,1,1-Trichloroethane	0.5	0.04				0.02		
Cyclohexane	0.5	0.04	0.7	0.6	0.6	0.7	0.2	0.2
Carbon tetrachloride	0.5	0.04	0.08	0.07	0.07	0.07	0.07	0.06
n-Heptane	0.5	0.04	0.9	0.7	0.7	0.8	0.4	0.3
1,2-Dichlroethane	0.5	0.02						
Benzene	0.5	0.02	1.2	1.2	1	1.4	0.6	0.5
Trichloroethene	0.5	0.04	0.1	0.09	0.05	0.06	0.03	0.05
1,2-Dichloropropane	0.5	0.05						
Bromodichloromethane	0.5	0.04			0.04			
4-Methyl-2-pentanone(MIBK)	0.5	0.06		0.2	0.2	0.2	0.2	0.09
cis-1,3-Dichloropropene	0.5	0.04						
Toluene	0.5	0.05	5.2	4.8	3.8	5.5	2.2	1.8
trans-1,3-Dichloropropene	0.5	0.04						
1,1,2-Trichloroethane	0.5	0.06						
2-Hexanone(MBK)	1.5	0.05		0.2	0.4		0.1	
Tetrachloroethene	0.5	0.04	0.3	0.2	0.09	0.2	0.08	0.08
Dibromochloromethane	0.5	0.06	0.02		0.01			
1,2-Dibromoethane	0.5	0.06						
Chlorobenzene	0.5	0.04						
Ethylbenzene	0.5	0.05	0.7	0.8	0.6	0.8	0.4	0.3
Xylene (para & meta)	1.0	0.10	2.3	2.2	1.9	2.6	1.2	1
Xylene (Ortho)	0.5	0.05	0.9	0.9	0.8	1	0.5	0.4
Styrene	0.5	0.05	1.4	0.7	0.8	0.4	0.9	0.2
Bromoform	0.5	0.05			0.01			
1,1,2,2-Tetrachloroethane	0.5	0.08						
4-Ethyltoluene	0.5	0.06	0.8	0.8	0.6	0.9	0.4	0.3
1,3,5-Trimethylbenzene	0.5	0.05	0.2	0.2		0.3	0.1	0.09
1,2,4-Trimethylbenzene	0.5	0.08	0.8	0.7	0.6	0.9	0.4	0.3
1,3-Dichlorobenzene	0.5	0.06						
1,4-Dichlorobenzene	0.5	0.05	0.09	0.1	0.09		0.07	0.04
Benzyl chloride	0.5	0.06						
1,2-Dichlorobenzene	0.5	0.10			0.01			
1,2,4-Trichlorobenzene	1.0	0.10						
Hexachloro-1,3-butadiene	0.5	0.30	0.03	0.02				

Dominguez Elementary School - Outdoor VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/26/08	12/1/08	12/2/08	12/3/08	12/4/08	12/5/08
Propylene	1.0	0.04		4.6	1.5		1.4	2.6
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	1	0.5	0.5		0.4	0.6
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.02	0.01	0.02	0.05	0.04	0.05
Chloromethane	0.5	0.08	0.6	0.5	0.5	0.5	0.7	0.5
Vinyl chloride	0.5	0.04				0.06		
Bromomethane	0.5	0.05	0.03	0.07		0.07	0.04	
Ethanol	1.5	0.30	21	14	6.4	7	11	13
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.4		0.2	0.2	0.2	0.4
Isopropyl alcohol(2-Propanol)	1.5	0.03	4.8	1.4	1.1	0.6	1.7	1.5
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.07	0.07		0.1	0.07	0.08
Acetone	3.0	0.08	15	18	20	13	17	19
Carbon disulfide	1.0	0.04	0.03	0.03		0.08	0.07	0.1
Methylene chloride	1.5	0.04	0.2	0.4	0.1	0.3	0.4	0.5
Methyl-tert-butyl ether(MTBE)	0.5	0.05					0.04	
trans-1,2-Dichloroethene	0.5	0.04					0.03	
n-Hexane	0.5	0.03	0.2	1.4	0.3	0.3	0.3	0.5
1,-Dichloroethane	0.5	0.04					0.03	
Vinyl acetate	0.5	0.05					0.06	
2-Butanone(MEK)	1.5	0.07	1.6	2.5	5.4	2.3	4.4	1.5
cis-1,2-Dichloroethene	0.5	0.05					0.03	
Ethyl acetate	0.5	0.07					0.2	0.2
Chloroform	0.5	0.03		0.06		0.08	0.05	0.08
Tetrahydrofuran	0.5	0.07						
1,1,1-Trichloroethane	0.5	0.04					0.03	
Cyclohexane	0.5	0.04		0.7		0.2	0.2	0.3
Carbon tetrachloride	0.5	0.04	0.07	0.07	0.07	0.1	0.07	0.06
n-Heptane	0.5	0.04	0.3			0.2	0.2	0.4
1,2-Dichlroethane	0.5	0.02					0.05	
Benzene	0.5	0.02	0.3	1.2	0.2	0.4	0.3	0.8
Trichloroethene	0.5	0.04	0.03	0.05		0.06	0.09	0.05
1,2-Dichloropropane	0.5	0.05					0.04	
Bromodichloromethane	0.5	0.04				0.04	0.04	
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.08	0.08	0.1	0.1	0.2	0.09
cis-1,3-Dichloropropene	0.5	0.04					0.03	
Toluene	0.5	0.05	0.9	4.2	0.6	0.9	1.2	2.4
trans-1,3-Dichloropropene	0.5	0.04				0.03	0.03	0.03
1,1,2-Trichloroethane	0.5	0.06					0.04	
2-Hexanone(MBK)	1.5	0.05	0.3	0.2	0.4	0.3	0.9	0.1
Tetrachloroethene	0.5	0.04	0.02	0.09		0.07	0.07	0.09
Dibromochloromethane	0.5	0.06				0.04	0.02	
1,2-Dibromoethane	0.5	0.06					0.03	
Chlorobenzene	0.5	0.04					0.04	0.03
Ethylbenzene	0.5	0.05	0.2	0.6	0.08	0.2	0.2	0.3
Xylene (para & meta)	1.0	0.10	0.4	1.9	0.2	0.4	0.6	1
Xylene (Ortho)	0.5	0.05	0.2	0.8	0.1	0.2	0.3	0.4
Styrene	0.5	0.05	0.09	0.8	0.06	0.1	0.1	1
Bromoform	0.5	0.05					0.02	
1,1,2,2-Tetrachloroethane	0.5	0.08				0.06	0.06	0.04
4-Ethyltoluene	0.5	0.06	0.2	0.6	0.08	0.1	0.2	0.3
1,3,5-Trimethylbenzene	0.5	0.05	0.05	0.1	0.02	0.06		0.1
1,2,4-Trimethylbenzene	0.5	0.08	0.2	0.6	0.08	0.1	0.2	0.3
1,3-Dichlorobenzene	0.5	0.06				0.04	0.04	0.03
1,4-Dichlorobenzene	0.5	0.05	0.05	0.06		0.05	0.05	0.04
Benzyl chloride	0.5	0.06				0.04	0.05	
1,2-Dichlorobenzene	0.5	0.10	0.02			0.04	0.04	0.03
1,2,4-Trichlorobenzene	1.0	0.10	0.2			0.07	0.06	0.04
Hexachloro-1,3-butadiene	0.5	0.30	0.04			0.05	0.05	0.04

Dominguez Elementary School - Outdoor VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			12/8/08	12/9/08	12/10/08	12/11/08	12/12/08	12/15/08
Propylene	1.0	0.04	1.2		1.6	2.3	2.6	1.1
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.5	0.6	0.5	0.4	0.4	0.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.03	0.03	0.03	0.02	0.03	
Chloromethane	0.5	0.08	0.4	0.04	0.4	0.5	0.4	0.5
Vinyl chloride	0.5	0.04						
Bromomethane	0.5	0.05						
Ethanol	1.5	0.30	3.1	13	6.3	9.4	9.1	14
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.3	0.3	0.3			0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	0.7	3.3	1	1.6		4.6
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.08	0.08	0.08	0.05	0.06	0.05
Acetone	3.0	0.08	4.3	23	9.8	13	11	8
Carbon disulfide	1.0	0.04	0.03	0.05	0.04	0.04	0.04	0.01
Methylene chloride	1.5	0.04	0.2	0.5	0.3	0.5	0.5	
Methyl-tert-butyl ether(MTBE)	0.5	0.05						
trans-1,2-Dichloroethene	0.5	0.04						
n-Hexane	0.5	0.03	0.2	0.8	0.2	0.7	0.8	0.2
1,-Dichloroethane	0.5	0.04						
Vinyl acetate	0.5	0.05						
2-Butanone(MEK)	1.5	0.07	0.4	1.3	0.8	1.8	1.5	0.8
cis-1,2-Dichloroethene	0.5	0.05						
Ethyl acetate	0.5	0.07		0.4		0.1	0.2	
Chloroform	0.5	0.03	0.04	0.07				
Tetrahydrofuran	0.5	0.07		1.4				
1,1,1-Trichloroethane	0.5	0.04						
Cyclohexane	0.5	0.04	0.1	0.5	0.2	0.3	0.4	0.1
Carbon tetrachloride	0.5	0.04	0.08	0.07	0.07	0.05	0.06	0.06
n-Heptane	0.5	0.04	0.1	0.5		0.4	0.4	0.2
1,2-Dichlroethane	0.5	0.02						
Benzene	0.5	0.02	0.3	1.5	0.4	0.6	0.7	0.3
Trichloroethene	0.5	0.04	0.02	0.05	0.02	0.03	0.03	0.02
1,2-Dichloropropane	0.5	0.05						
Bromodichloromethane	0.5	0.04						
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.04	0.1	0.05	0.08	0.2	
cis-1,3-Dichloropropene	0.5	0.04						
Toluene	0.5	0.05	0.7	4.5	1.3	2.2	2.2	0.8
trans-1,3-Dichloropropene	0.5	0.04						
1,1,2-Trichloroethane	0.5	0.06						
2-Hexanone(MBK)	1.5	0.05	0.03		0.1	0.3	0.3	0.1
Tetrachloroethene	0.5	0.04	0.03	0.1	0.04	0.08	0.08	0.04
Dibromochloromethane	0.5	0.06						
1,2-Dibromoethane	0.5	0.06						
Chlorobenzene	0.5	0.04	0.01					
Ethylbenzene	0.5	0.05	0.1	0.6	0.2	0.4	0.4	0.2
Xylene (para & meta)	1.0	0.10	0.3	2.1	0.6	1.1	1.2	0.5
Xylene (Ortho)	0.5	0.05	0.1	0.8	0.2	0.4	0.4	0.2
Styrene	0.5	0.05	0.05	1.7	0.5	0.2	0.3	0.1
Bromoform	0.5	0.05						
1,1,2,2-Tetrachloroethane	0.5	0.08					0.06	
4-Ethyltoluene	0.5	0.06	0.1	0.6	0.2	0.3	0.4	0.2
1,3,5-Trimethylbenzene	0.5	0.05	0.03	0.2	0.05	0.09	0.1	0.05
1,2,4-Trimethylbenzene	0.5	0.08	0.1	0.6	0.2	0.3	0.4	0.2
1,3-Dichlorobenzene	0.5	0.06	0.01				0.03	
1,4-Dichlorobenzene	0.5	0.05	0.02	0.04	0.01	0.04	0.05	0.02
Benzyl chloride	0.5	0.06		0.02				
1,2-Dichlorobenzene	0.5	0.10	0.01			0.01	0.03	
1,2,4-Trichlorobenzene	1.0	0.10	0.02		0.02	0.05	0.08	0.03
Hexachloro-1,3-butadiene	0.5	0.30				0.02		

Dominguez Elementary School - Outdoor VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)			
			12/16/08	12/17/08	12/18/08	12/19/08
Propylene	1.0	0.04	2.4		1.4	2.6
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.4	0.4	0.4	0.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03				
Chloromethane	0.5	0.08	0.5	0.5	0.4	0.4
Vinyl chloride	0.5	0.04				
Bromomethane	0.5	0.05				
Ethanol	1.5	0.30	7.6	1.7	4.3	8.4
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2	0.2	0.2	0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	1.7			1.4
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.06	0.05		
Acetone	3.0	0.08	10	1.2	6.8	13
Carbon disulfide	1.0	0.04			0.02	
Methylene chloride	1.5	0.04	0.3	0.08	0.1	0.3
Methyl-tert-butyl ether(MTBE)	0.5	0.05				
trans-1,2-Dichloroethene	0.5	0.04				
n-Hexane	0.5	0.03	0.3	0.03	0.2	0.3
1,-Dichloroethane	0.5	0.04				
Vinyl acetate	0.5	0.05				
2-Butanone(MEK)	1.5	0.07	0.9	0.1	1.1	1.3
cis-1,2-Dichloroethene	0.5	0.05				
Ethyl acetate	0.5	0.07				
Chloroform	0.5	0.03				
Tetrahydrofuran	0.5	0.07				
1,1,1-Trichloroethane	0.5	0.04				
Cyclohexane	0.5	0.04	0.2		0.1	0.2
Carbon tetrachloride	0.5	0.04	0.06	0.05	0.05	0.05
n-Heptane	0.5	0.04	0.5			0.4
1,2-Dichlroethane	0.5	0.02				
Benzene	0.5	0.02	0.5	0.1	0.3	0.6
Trichloroethene	0.5	0.04	0.02			0.02
1,2-Dichloropropane	0.5	0.05				
Bromodichloromethane	0.5	0.04				
4-Methyl-2-pentanone(MIBK)	0.5	0.06				
cis-1,3-Dichloropropene	0.5	0.04				
Toluene	0.5	0.05	1.4	0.2	0.8	1.8
trans-1,3-Dichloropropene	0.5	0.04				
1,1,2-Trichloroethane	0.5	0.06				
2-Hexanone(MBK)	1.5	0.05	0.1		0.2	0.3
Tetrachloroethene	0.5	0.04	0.06			0.04
Dibromochloromethane	0.5	0.06				
1,2-Dibromoethane	0.5	0.06				
Chlorobenzene	0.5	0.04				
Ethylbenzene	0.5	0.05	0.2	0.03	0.1	0.3
Xylene (para & meta)	1.0	0.10	0.7	0.09	0.4	0.9
Xylene (Ortho)	0.5	0.05	0.3	0.04	0.2	0.4
Styrene	0.5	0.05	0.2		0.04	0.7
Bromoform	0.5	0.05				
1,1,2,2-Tetrachloroethane	0.5	0.08				
4-Ethyltoluene	0.5	0.06	0.2	0.03	0.1	0.3
1,3,5-Trimethylbenzene	0.5	0.05		0.01	0.04	0.08
1,2,4-Trimethylbenzene	0.5	0.08	0.2	0.03	0.1	0.3
1,3-Dichlorobenzene	0.5	0.06				
1,4-Dichlorobenzene	0.5	0.05	0.01		0.01	0.02
Benzyl chloride	0.5	0.06				
1,2-Dichlorobenzene	0.5	0.10				
1,2,4-Trichlorobenzene	1.0	0.10				
Hexachloro-1,3-butadiene	0.5	0.30				

Dominguez Elementary School - Outdoor VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/18/08	11/19/08	11/20/08	11/21/08	11/24/08	11/25/08
2,2,3,3-Tetramethyl butane	N/A	N/A						
2,2,4-Trimethyl pentane	N/A	N/A						
2,2-Dimethyl hexane	N/A	N/A	2.1	2.1	2.1	2.5		
2,3-Dimethyl pentane	N/A	N/A	1.4	1.2	1	1.5		
2,4-Dimethyl hexane	N/A	N/A						
2-Methyl butane	N/A	N/A	7.8	7.9	9.2	9	4.2	3.6
2-Methyl hexane	N/A	N/A	1.2			1.2		
2-Methyl pentane	N/A	N/A	3.2	3.3	3.5	3.9	1.6	1.3
2-Pentene	N/A	N/A						
3-Methyl hexane	N/A	N/A	1.5	1.2	1.1	1.5		
3-Methyl pentane	N/A	N/A	1.7	1.8	2	2.1		
Acetaldehyde	N/A	N/A		1.6	2.1		1.8	
Butanal	N/A	N/A						
Butane	N/A	N/A	5.5	6.8	8.6	6.5	3.5	2.9
Difluorochloromethane	N/A	N/A				5.6		
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A					2.6	
Isobutane	N/A	N/A	4.4	5.1	4.5	4.6	3.1	2.6
Limonene	N/A	N/A						
Methyl cyclohexane	N/A	N/A						
Methyl cyclopentane	N/A	N/A	1.4	1.5	1.8	1.8		
Octamethyl cyclotrisiloxane	N/A	N/A						
Pentane	N/A	N/A	3.5	3.7		4.1	2.3	
Trimethyl silanol	N/A	N/A						

Dominguez Elementary School - Outdoor VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/26/08	12/1/08	12/2/08	12/3/08	12/4/08	12/5/08
2,2,3,3-Tetramethyl butane	N/A	N/A						
2,2,4-Trimethyl pentane	N/A	N/A						1.2
2,2-Dimethyl hexane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A		1				
2,4-Dimethyl hexane	N/A	N/A						
2-Methyl butane	N/A	N/A	2.6	8.8	1.8	2.2	1.8	3.2
2-Methyl hexane	N/A	N/A						
2-Methyl pentane	N/A	N/A		3.3				1.6
2-Pentene	N/A	N/A						
3-Methyl hexane	N/A	N/A		1.1				
3-Methyl pentane	N/A	N/A		2				
Acetaldehyde	N/A	N/A	2	2.1	4	2.8	2.4	1
Butanal	N/A	N/A			1.3	1.1	1.7	
Butane	N/A	N/A	2.4	8.6	2.6	2.4	1.6	2.4
Difluorochloromethane	N/A	N/A	2.6					
Heptanal	N/A	N/A	1.1					
Hexamethyl cyclotrisiloxane	N/A	N/A			2.3			
Isobutane	N/A	N/A	2.4	5.8	1.7		1.2	1.9
Limonene	N/A	N/A						
Methyl cyclohexane	N/A	N/A		1				
Methyl cyclopentane	N/A	N/A		2.2				
Octamethyl cyclotrisiloxane	N/A	N/A			1.1			
Pentane	N/A	N/A		4.8				
Trimethyl silanol	N/A	N/A						

Dominguez Elementary School - Outdoor VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			12/8/08	12/9/08	12/10/08	12/11/08	12/12/08	12/15/08
2,2,3,3-Tetramethyl butane	N/A	N/A				1.1	1.2	
2,2,4-Trimethyl pentane	N/A	N/A		1.9				
2,2-Dimethyl hexane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A						
2,4-Dimethyl hexane	N/A	N/A						
2-Methyl butane	N/A	N/A	1.2	4.8	1.5	4	3.9	
2-Methyl hexane	N/A	N/A		1.1				
2-Methyl pentane	N/A	N/A				2.5	2.6	
2-Pentene	N/A	N/A		1.4				
3-Methyl hexane	N/A	N/A		1.4				
3-Methyl pentane	N/A	N/A				1.4	1.5	
Acetaldehyde	N/A	N/A						
Butanal	N/A	N/A						
Butane	N/A	N/A		3.5	1	2.5	2.6	
Difluorochloromethane	N/A	N/A						
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A						
Isobutane	N/A	N/A		2.1		1.4	1.4	
Limonene	N/A	N/A						
Methyl cyclohexane	N/A	N/A						
Methyl cyclopentane	N/A	N/A		1.5		1.2	1.2	
Octamethyl cyclotrisiloxane	N/A	N/A						
Pentane	N/A	N/A				1.7	1.7	
Trimethyl silanol	N/A	N/A						

Dominguez Elementary School - Outdoor VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)			
			12/16/08	12/17/08	12/18/08	12/19/08
2,2,3,3-Tetramethyl butane	N/A	N/A				
2,2,4-Trimethyl pentane	N/A	N/A				
2,2-Dimethyl hexane	N/A	N/A				
2,3-Dimethyl pentane	N/A	N/A				
2,4-Dimethyl hexane	N/A	N/A				1.1
2-Methyl butane	N/A	N/A	1.3			1.5
2-Methyl hexane	N/A	N/A				
2-Methyl pentane	N/A	N/A	1.1			
2-Pentene	N/A	N/A				
3-Methyl hexane	N/A	N/A				
3-Methyl pentane	N/A	N/A				
Acetaldehyde	N/A	N/A				
Butanal	N/A	N/A				
Butane	N/A	N/A				1.1
Difluorochloromethane	N/A	N/A				
Heptanal	N/A	N/A				
Hexamethyl cyclotrisiloxane	N/A	N/A				
Isobutane	N/A	N/A				
Limonene	N/A	N/A				
Methyl cyclohexane	N/A	N/A				
Methyl cyclopentane	N/A	N/A				
Octamethyl cyclotrisiloxane	N/A	N/A				
Pentane	N/A	N/A				
Trimethyl silanol	N/A	N/A	1.4			

Dominguez Elementary School - Room 7 (DZ-7) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/18/08	11/19/08	11/20/08	11/21/08	11/24/08	11/25/08
Propylene	1.0	0.04	9.5	4.4	3.4	5.9	5.3	2.8
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.7	0.6	0.6	0.6	0.7	0.5
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03			0.01		0.02	0.02
Chloromethane	0.5	0.08	0.8	0.9	0.7	0.8	0.6	0.92
Bromomethane	0.5	0.05			0.02	0.02		0.02
Ethanol	1.5	0.30	140	310	480	380	59	480
Freon 11(Trichlorofluoromethane)	0.5	0.04			0.3			
Isopropyl alcohol(2-Propanol)	1.5	0.03	14	35	39	31	6.9	32
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.08	0.08	0.06	0.06	0.06	0.06
Acetone	3.0	0.08	37	44	22	35	16	33
1,1-Dichloroethene	0.5	0.03						
Carbon disulfide	1.0	0.04	0.08	0.08	0.08	0.07	0.06	0.1
Methylene chloride	1.5	0.04	1.8	1	0.6	2.2	0.7	0.5
n-Hexane	0.5	0.03	2.2	1	0.9	1.8	0.8	0.5
2-Butanone(MEK)	1.5	0.07	2.5	2.3	1.4	2.5	1.2	2.7
Ethyl acetate	0.5	0.07	1	0.7	0.3	0.5	0.3	0.3
Chloroform	0.5	0.03	0.1	0.07	0.06	0.1	0.06	0.05
Tetrahydrofuran	0.5	0.07	1.7	0.4	0.2	0.6	0.4	0.4
1,1,1-Trichloroethane	0.5	0.04			0.02			
Cyclohexane	0.5	0.04	1.5	0.8	0.5	3.3	0.5	0.4
Carbon tetrachloride	0.5	0.04	0.07	0.07	0.07	0.07	0.06	0.06
n-Heptane	0.5	0.04	2.6	1.9		1.1	0.8	
Benzene	0.5	0.02	2.1	1	0.8	1.6	1	0.6
Trichloroethene	0.5	0.04	0.05	0.05	0.04	0.06	0.03	0.06
Bromodichloromethane	0.5	0.04						
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.4	0.4	0.4	4	0.2	0.9
cis-1,3-Dichloropropene	0.5	0.04						
Toluene	0.5	0.05	8.3	4.2	2.8	7.2	4.5	3.2
trans-1,3-Dichloropropene	0.5	0.04						
1,1,2-Trichloroethane	0.5	0.06						
2-Hexanone(MBK)	1.5	0.05			0.1	0.2	0.2	0.5
Tetrachloroethene	0.5	0.04	0.3	0.1	0.08	0.4	0.1	0.1
Chlorobenzene	0.5	0.04						
Ethylbenzene	0.5	0.05	1.1	0.6	0.5	1.1	0.7	0.5
Xylene (para & meta)	1.0	0.10	3.9	1.8	1.5	3.7	2.3	1.4
Xylene (Ortho)	0.5	0.05	1.4	0.7	0.7	1.4	0.8	0.6
Styrene	0.5	0.05	1.3	0.5	0.4	0.7	0.4	0.6
1,1,2,2-Tetrachloroethane	0.5	0.08						
4-Ethyltoluene	0.5	0.06	1.3	0.7	0.6	1.2	0.7	0.5
1,3,5-Trimethylbenzene	0.5	0.05	0.4	0.2		0.4	0.2	0.2
1,2,4-Trimethylbenzene	0.5	0.08	1.4	0.8	0.6	1.3	0.7	0.6
1,3-Dichlorobenzene	0.5	0.06						
1,4-Dichlorobenzene	0.5	0.05	0.5	0.7	0.5	0.7	0.2	0.8
1,2-Dichlorobenzene	0.5	0.10						
1,2,4-Trichlorobenzene	1.0	0.10						
Hexachloro-1,3-butadiene	0.5	0.30		0.02				

Dominguez Elementary School - Room 7 (DZ-7) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/26/08	12/1/08	12/2/08	12/3/08	12/4/08	12/5/08
Propylene	1.0	0.04	1.1	3				
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.5	0.4	0.5	0.4	3.6	1.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.02			0.03	0.04	0.05
Chloromethane	0.5	0.08	0.9	0.7	0.8	1	0.7	0.7
Bromomethane	0.5	0.05	0.02	0.04				
Ethanol	1.5	0.30	130	32	40	160	49	49
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2			0.1	0.7	0.3
Isopropyl alcohol(2-Propanol)	1.5	0.03	16	3.9	6.6	5.9	2.5	7.6
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.06			0.05	0.05	
Acetone	3.0	0.08	17	19	6.8	10	12	9
1,1-Dichloroethene	0.5	0.03					0.02	
Carbon disulfide	1.0	0.04	0.04	0.02	0.02	0.08	0.07	0.09
Methylene chloride	1.5	0.04	0.2	0.2	0.2	0.2	0.2	0.4
n-Hexane	0.5	0.03	0.2	0.4	0.07	0.1	0.1	0.2
2-Butanone(MEK)	1.5	0.07	0.5	3.3	0.2	1.4	1.4	0.4
Ethyl acetate	0.5	0.07	0.3					
Chloroform	0.5	0.03				0.04	0.04	
Tetrahydrofuran	0.5	0.07						
1,1,1-Trichloroethane	0.5	0.04						
Cyclohexane	0.5	0.04	0.2	0.2	0.06	0.08	0.1	0.1
Carbon tetrachloride	0.5	0.04	0.06			0.04	0.04	0.03
n-Heptane	0.5	0.04				0.4		0.3
Benzene	0.5	0.02	0.3	0.3	0.05	0.1	0.1	0.2
Trichloroethene	0.5	0.04	0.02			0.03	0.03	0.04
Bromodichloromethane	0.5	0.04						
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.2	0.1	0.4	0.1	0.1	0.1
cis-1,3-Dichloropropene	0.5	0.04						0.02
Toluene	0.5	0.05	1.3	0.9	0.1	0.2	0.3	0.7
trans-1,3-Dichloropropene	0.5	0.04				0.02	0.02	
1,1,2-Trichloroethane	0.5	0.06					0.03	
2-Hexanone(MBK)	1.5	0.05		0.2		0.2	0.2	
Tetrachloroethene	0.5	0.04	0.03	0.02		0.03	0.04	0.05
Chlorobenzene	0.5	0.04				0.03	0.03	0.03
Ethylbenzene	0.5	0.05	0.2	0.1	0.03	0.06	0.08	0.1
Xylene (para & meta)	1.0	0.10	0.6	0.4	0.06	0.1	0.2	0.3
Xylene (Ortho)	0.5	0.05	0.3	0.2	0.03	0.07	0.08	0.2
Styrene	0.5	0.05	0.2	0.1	0.02	0.04	0.05	0.1
1,1,2,2-Tetrachloroethane	0.5	0.08					0.03	0.03
4-Ethyltoluene	0.5	0.06	0.3	0.2	0.04	0.05	0.1	0.2
1,3,5-Trimethylbenzene	0.5	0.05	0.08	0.04	0.01	0.03	0.05	0.07
1,2,4-Trimethylbenzene	0.5	0.08	0.3	0.2	0.04	0.05	0.1	0.2
1,3-Dichlorobenzene	0.5	0.06				0.03	0.03	0.03
1,4-Dichlorobenzene	0.5	0.05	0.8	0.1	0.08	0.06	0.06	0.05
1,2-Dichlorobenzene	0.5	0.10	0.02			0.03	0.03	0.03
1,2,4-Trichlorobenzene	1.0	0.10				0.04	0.04	0.04
Hexachloro-1,3-butadiene	0.5	0.30	0.03			0.03	0.04	0.03

Dominguez Elementary School - Room 7 (DZ-7) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			12/8/08	12/9/08	12/10/08	12/11/08	12/12/08	12/15/08
Propylene	1.0	0.04		1.8	1.7			
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	1	6.3	0.6	0.8	0.5	0.5
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.03	0.02				
Chloromethane	0.5	0.08	0.7	0.6		0.6	0.5	0.6
Bromomethane	0.5	0.05						
Ethanol	1.5	0.30	22	26	35	34	68	27
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.3	1.1	0.3	0.2	0.2	0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	3.6	3.7	4.6	3.6	14	3.6
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.03	0.03	0.03	0.02		
Acetone	3.0	0.08	11	14	9.1	9.2	20	10
1,1-Dichloroethene	0.5	0.03	0.3					
Carbon disulfide	1.0	0.04	0.07	0.05	0.04	0.04	0.02	0.02
Methylene chloride	1.5	0.04	0.3	0.5	0.3	0.4	0.6	0.3
n-Hexane	0.5	0.03	0.08	0.1	0.09	0.1	0.2	0.09
2-Butanone(MEK)	1.5	0.07	1	1.3	0.2	0.6	0.7	0.5
Ethyl acetate	0.5	0.07					0.1	
Chloroform	0.5	0.03						0.02
Tetrahydrofuran	0.5	0.07						
1,1,1-Trichloroethane	0.5	0.04						
Cyclohexane	0.5	0.04	0.06	0.1	0.1	0.1	0.3	0.06
Carbon tetrachloride	0.5	0.04	0.03	0.03	0.03			0.02
n-Heptane	0.5	0.04			0.1	0.5		
Benzene	0.5	0.02	0.1	0.2	0.1	0.2	0.1	0.1
Trichloroethene	0.5	0.04	0.02	0.02				
Bromodichloromethane	0.5	0.04			0.01			
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.04	0.08	0.03		3	0.07
cis-1,3-Dichloropropene	0.5	0.04						
Toluene	0.5	0.05	0.3	0.5	0.4	0.7	0.4	0.4
trans-1,3-Dichloropropene	0.5	0.04						
1,1,2-Trichloroethane	0.5	0.06						
2-Hexanone(MBK)	1.5	0.05	0.1	0.2			0.08	0.07
Tetrachloroethene	0.5	0.04	0.02	0.04	0.02	0.02		
Chlorobenzene	0.5	0.04	0.01					
Ethylbenzene	0.5	0.05	0.05	0.08	0.06	0.1	0.07	0.07
Xylene (para & meta)	1.0	0.10	0.1	0.2	0.2	0.3	0.2	0.2
Xylene (Ortho)	0.5	0.05	0.06	0.1	0.08	0.1	0.08	0.1
Styrene	0.5	0.05	0.02	0.07	0.1	0.08	0.05	0.06
1,1,2,2-Tetrachloroethane	0.5	0.08						
4-Ethyltoluene	0.5	0.06	0.05	0.08	0.07	0.1	0.07	0.1
1,3,5-Trimethylbenzene	0.5	0.05	0.02	0.03	0.03	0.05		0.04
1,2,4-Trimethylbenzene	0.5	0.08	0.05	0.08	0.07	0.2	0.07	0.1
1,3-Dichlorobenzene	0.5	0.06	0.01	0.01				
1,4-Dichlorobenzene	0.5	0.05	0.04	0.05	0.02	0.02	0.01	0.07
1,2-Dichlorobenzene	0.5	0.10	0.01	0.01				
1,2,4-Trichlorobenzene	1.0	0.10	0.02	0.02	0.02			0.03
Hexachloro-1,3-butadiene	0.5	0.30	0.02	0.02	0.01			

Dominguez Elementary School - Room 7 (DZ-7) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)			
			12/16/08	12/17/08	12/18/08	12/19/08
Propylene	1.0	0.04		1		1.5
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.4	0.4	0.4	0.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03				
Chloromethane	0.5	0.08	0.6	0.5	0.5	0.6
Bromomethane	0.5	0.05				
Ethanol	1.5	0.30	110	54	110	56
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2	0.2	0.2	0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	5.4	4.6	5.6	3.6
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.02	0.04	0.02	
Acetone	3.0	0.08	7.9	6.5	11	14
1,1-Dichloroethene	0.5	0.03				
Carbon disulfide	1.0	0.04	0.06	0.01	0.03	
Methylene chloride	1.5	0.04	0.4	0.2	0.2	0.3
n-Hexane	0.5	0.03		0.1	0.09	0.1
2-Butanone(MEK)	1.5	0.07		0.4	0.8	0.8
Ethyl acetate	0.5	0.07		0.4	0.8	
Chloroform	0.5	0.03				
Tetrahydrofuran	0.5	0.07				
1,1,1-Trichloroethane	0.5	0.04				
Cyclohexane	0.5	0.04	0.08		0.1	0.1
Carbon tetrachloride	0.5	0.04		0.04	0.02	
n-Heptane	0.5	0.04			0.3	
Benzene	0.5	0.02	0.2	0.2	0.1	0.2
Trichloroethene	0.5	0.04				
Bromodichloromethane	0.5	0.04				
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.05	0.05	0.04	
cis-1,3-Dichloropropene	0.5	0.04				
Toluene	0.5	0.05	0.5	0.6	1.5	0.9
trans-1,3-Dichloropropene	0.5	0.04				
1,1,2-Trichloroethane	0.5	0.06				
2-Hexanone(MBK)	1.5	0.05				
Tetrachloroethene	0.5	0.04		0.02		
Chlorobenzene	0.5	0.04				
Ethylbenzene	0.5	0.05	0.09	0.1	0.05	0.1
Xylene (para & meta)	1.0	0.10	0.3	0.3	0.2	0.4
Xylene (Ortho)	0.5	0.05	0.4	0.1	0.06	0.2
Styrene	0.5	0.05	0.07	0.07	0.02	0.2
1,1,2,2-Tetrachloroethane	0.5	0.08				
4-Ethyltoluene	0.5	0.06	0.2	0.1	0.06	0.2
1,3,5-Trimethylbenzene	0.5	0.05	0.06	0.04	0.02	0.05
1,2,4-Trimethylbenzene	0.5	0.08	0.2	0.1	0.06	0.2
1,3-Dichlorobenzene	0.5	0.06	0.02			
1,4-Dichlorobenzene	0.5	0.05	0.05	0.04	0.04	0.04
1,2-Dichlorobenzene	0.5	0.10	0.02			
1,2,4-Trichlorobenzene	1.0	0.10	0.04			
Hexachloro-1,3-butadiene	0.5	0.30				

Dominguez Elementary School - Room 7 (DZ-7) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/18/08	11/19/08	11/20/08	11/21/08	11/24/08	11/25/08
.alpha.-Pinene	N/A	N/A						
1,3-Pentadiene	N/A	N/A						
1-Butanol	N/A	N/A						2.9
1R-.alpha.-Pinene	N/A	N/A						
2,2,3,3-Tetramethyl butane	N/A	N/A		1.8	1.5		1.7	
2,2,4-Trimethyl pentane	N/A	N/A	4					
2,2-Dimethyl hexane	N/A	N/A				2.9		
2,3-Dimethyl pentane	N/A	N/A	2.7			1.9	1.2	
2,4-bis(trimethylsiloxane) Benzaldehyde	N/A	N/A			28			
2-Methyl butane	N/A	N/A	16	6.9	6	12	7.3	4.4
2-Methyl hexane	N/A	N/A	2.1					
2-Methyl pentane	N/A	N/A	6.4	2.8	2.4	4.9	2.8	
2-Methyl-1,3-butadiene	N/A	N/A		3.2	1.3	2.6		2.5
3-Methyl hexane	N/A	N/A	2.5			2	1.2	
3-Methyl pentane	N/A	N/A	3.5	1.5	1.4	2.6	1.5	
4-Ethyl-2,2,6,6-tetramethyl heptane	N/A	N/A						1.8
Acetaldehyde	N/A	N/A		1.6	1.3		1.5	3.1
Benzaldehyde	N/A	N/A	2.1	2	2.4	2.5	1.9	
Butanal	N/A	N/A						
Butane	N/A	N/A	11	5.3	5.4	8.4	5.3	3.6
Butyl ester acetic acid	N/A	N/A	8.8					
Decanal	N/A	N/A						
Difluorochloromethane	N/A	N/A						
D-Limonene	N/A	N/A	1.7	5.5	1.5	2.6		
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A					1	
Hexanal	N/A	N/A		1.2				1.8
Isobutane	N/A	N/A	7	3.3	12	5	3.8	2.2
Methyl cyclopentane	N/A	N/A	3	1.3	1.3	2.3	1.3	
Nonanal	N/A	N/A		1.2				2.3
Ocatanal	N/A	N/A						1.8
Octamethyl cyclotrisiloxane	N/A	N/A			68			
Pentane	N/A	N/A	6.1	3.1		5.4	3.1	2.8
Tridecane	N/A	N/A						

Dominguez Elementary School - Room 7 (DZ-7) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/26/08	12/1/08	12/2/08	12/3/08	12/4/08	12/5/08
.alpha.-Pinene	N/A	N/A	1.2					
1,3-Pentadiene	N/A	N/A	2.2					
1-Butanol	N/A	N/A	1.8					
1R-.alpha.-Pinene	N/A	N/A						
2,2,3,3-Tetramethyl butane	N/A	N/A						
2,2,4-Trimethyl pentane	N/A	N/A						
2,2-Dimethyl hexane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A						
2,4-bis(trimethylsiloxane) Benzaldehyde	N/A	N/A						
2-Methyl butane	N/A	N/A	2.6	2.8		2.1		1.3
2-Methyl hexane	N/A	N/A						
2-Methyl pentane	N/A	N/A						
2-Methyl-1,3-butadiene	N/A	N/A						
3-Methyl hexane	N/A	N/A						
3-Methyl pentane	N/A	N/A						
4-Ethyl-2,2,6,6-tetramethyl heptane	N/A	N/A						
Acetaldehyde	N/A	N/A		2.7		2.7	1.5	
Benzaldehyde	N/A	N/A						
Butanal	N/A	N/A				1.1	1	
Butane	N/A	N/A	2	3.4	1.8	1.9	1.1	1.6
Butyl ester acetic acid	N/A	N/A						
Decanal	N/A	N/A						
Difluorochloromethane	N/A	N/A			1.5			
D-Limonene	N/A	N/A	37					
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A						
Hexanal	N/A	N/A						
Isobutane	N/A	N/A	1.7	2.6	1.9	1.6	1.3	1.8
Methyl cyclopentane	N/A	N/A						
Nonanal	N/A	N/A	1.1					
Ocatanal	N/A	N/A						
Octamethyl cyclotrisiloxane	N/A	N/A		1				
Pentane	N/A	N/A		1.5				
Tridecane	N/A	N/A	1.1					

Dominguez Elementary School - Room 7 (DZ-7) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			12/8/08	12/9/08	12/10/08	12/11/08	12/12/08	12/15/08
.alpha.-Pinene	N/A	N/A						
1,3-Pentadiene	N/A	N/A						
1-Butanol	N/A	N/A						
1R-.alpha.-Pinene	N/A	N/A		1.9	4.1			
2,2,3,3-Tetramethyl butane	N/A	N/A						
2,2,4-Trimethyl pentane	N/A	N/A						
2,2-Dimethyl hexane	N/A	N/A		2.4				
2,3-Dimethyl pentane	N/A	N/A						
2,4-bis(trimethylsiloxane) Benzaldehyde	N/A	N/A						
2-Methyl butane	N/A	N/A					1.1	
2-Methyl hexane	N/A	N/A						
2-Methyl pentane	N/A	N/A						
2-Methyl-1,3-butadiene	N/A	N/A						
3-Methyl hexane	N/A	N/A			4.3			
3-Methyl pentane	N/A	N/A						
4-Ethyl-2,2,6,6-tetramethyl heptane	N/A	N/A						
Acetaldehyde	N/A	N/A						
Benzaldehyde	N/A	N/A		2.4				
Butanal	N/A	N/A		2				
Butane	N/A	N/A				1	1.8	
Butyl ester acetic acid	N/A	N/A						
Decanal	N/A	N/A		1.9				
Difluorochloromethane	N/A	N/A					1.9	
D-Limonene	N/A	N/A						
Heptanal	N/A	N/A		1.9				
Hexamethyl cyclotrisiloxane	N/A	N/A						
Hexanal	N/A	N/A						
Isobutane	N/A	N/A				1.3	1.3	
Methyl cyclopentane	N/A	N/A						
Nonanal	N/A	N/A						
Ocatanal	N/A	N/A		1.8				
Octamethyl cyclotrisiloxane	N/A	N/A						
Pentane	N/A	N/A						
Tridecane	N/A	N/A						

Dominguez Elementary School - Room 7 (DZ-7) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv) 12/16/08	12/17/08	12/18/08	12/19/08
.alpha.-Pinene	N/A	N/A				
1,3-Pentadiene	N/A	N/A				
1-Butanol	N/A	N/A				
1R-.alpha.-Pinene	N/A	N/A				
2,2,3,3-Tetramethyl butane	N/A	N/A				
2,2,4-Trimethyl pentane	N/A	N/A				
2,2-Dimethyl hexane	N/A	N/A				
2,3-Dimethyl pentane	N/A	N/A				
2,4-bis(trimethylsiloxane) Benzaldehyde	N/A	N/A				
2-Methyl butane	N/A	N/A				
2-Methyl hexane	N/A	N/A				
2-Methyl pentane	N/A	N/A				
2-Methyl-1,3-butadiene	N/A	N/A				
3-Methyl hexane	N/A	N/A				
3-Methyl pentane	N/A	N/A				
4-Ethyl-2,2,6,6-tetramethyl heptane	N/A	N/A				
Acetaldehyde	N/A	N/A				
Benzaldehyde	N/A	N/A				
Butanal	N/A	N/A				
Butane	N/A	N/A				1.2
Butyl ester acetic acid	N/A	N/A				
Decanal	N/A	N/A				
Difluorochloromethane	N/A	N/A				
D-Limonene	N/A	N/A				
Heptanal	N/A	N/A				
Hexamethyl cyclotrisiloxane	N/A	N/A				
Hexanal	N/A	N/A				
Isobutane	N/A	N/A				1
Methyl cyclopentane	N/A	N/A				
Nonanal	N/A	N/A				
Ocatanal	N/A	N/A				
Octamethyl cyclotrisiloxane	N/A	N/A				
Pentane	N/A	N/A				
Tridecane	N/A	N/A				

Dominguez Elementary School - Room 9 (DZ-9) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/18/08	11/19/08	11/20/08	11/21/08	11/24/08	11/25/08
Propylene	1.0	0.04			4.1		4.4	2.8
Freon 12 (Dichlorodifluoromethane)	0.5	0.04		0.6	0.6		0.6	0.5
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03			0.02	0.02	0.02	0.02
Chloromethane	0.5	0.08	0.7	0.7	0.7	0.7	0.8	0.8
Vinyl chloride	0.5	0.04						
Bromomethane	0.5	0.05			0.05			0.02
Ethanol	1.5	0.30	200	580	150	120	520	180
Freon 11(Trichlorofluoromethane)	0.5	0.04			0.3			0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	17	160	20	92	270	200
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06		0.06	0.06	0.06	0.06	0.06
Acetone	3.0	0.08	25	27	17	27	31	26
Carbon disulfide	1.0	0.04	0.09	0.06	0.04	0.09	0.05	0.04
Methylene chloride	1.5	0.04	1.2	1	0.6	1.4	0.6	0.4
n-Hexane	0.5	0.03	1.1	1.3	1.4	1.2	0.7	0.5
2-Butanone(MEK)	1.5	0.07	1.8	2.2	2.5	2.3	2.3	2.5
cis-1,2-Dichloroethene	0.5	0.05						
Ethyl acetate	0.5	0.07	1.6	0.7	0.3	0.8	0.4	0.3
Chloroform	0.5	0.03	0.08	0.07	0.07	0.09	0.05	0.05
Tetrahydrofuran	0.5	0.07	0.5	0.2	0.1	0.4	0.3	0.2
1,1,1-Trichloroethane	0.5	0.04			0.02	0.02		
Cyclohexane	0.5	0.04	0.8	1.7	0.8	1.7	0.5	0.3
Carbon tetrachloride	0.5	0.04	0.07	0.07	0.07	0.07	0.06	0.06
n-Heptane	0.5	0.04	1.2	4.7	0.9	0.9	0.6	
Benzene	0.5	0.02	1.2	1.1	1.1	1.3	0.8	0.6
Trichloroethene	0.5	0.04	0.09	0.07	0.05	0.06	0.03	0.06
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.5	1.3	0.3	0.4	0.4	0.4
cis-1,3-Dichloropropene	0.5	0.04						
Toluene	0.5	0.05	5.4	5.1	4.3	6.4	3.8	3
trans-1,3-Dichloropropene	0.5	0.04						
2-Hexanone(MBK)	1.5	0.05		0.1	0.2	0.2	0.4	0.4
Tetrachloroethene	0.5	0.04	0.3	0.2	0.1	0.2	0.1	0.09
Dibromochloromethane	0.5	0.06						
Chlorobenzene	0.5	0.04						
Ethylbenzene	0.5	0.05	0.7	0.7	0.6	0.9	0.5	0.4
Xylene (para & meta)	1.0	0.10	2.4	2	1.8	2.9	1.7	1.1
Xylene (Ortho)	0.5	0.05	0.9	0.9	0.7	1.1	0.7	0.5
Styrene	0.5	0.05	1.1	0.6	0.6	0.5	1.1	0.4
1,1,2,2-Tetrachloroethane	0.5	0.08						
4-Ethyltoluene	0.5	0.06	0.8	0.7	0.6	0.9	0.6	0.4
1,3,5-Trimethylbenzene	0.5	0.05	0.2	0.2		0.3	0.2	0.1
1,2,4-Trimethylbenzene	0.5	0.08	0.9	0.7	0.6	1	0.7	0.5
1,3-Dichlorobenzene	0.5	0.06						
1,4-Dichlorobenzene	0.5	0.05	0.08	0.09	0.09	0.1	0.1	0.08
1,2-Dichlorobenzene	0.5	0.10						
1,2,4-Trichlorobenzene	1.0	0.10						
Hexachloro-1,3-butadiene	0.5	0.30		0.03				0.03

Dominguez Elementary School - Room 9 (DZ-9) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/26/08	12/1/08	12/2/08	12/3/08	12/4/08	12/5/08
Propylene	1.0	0.04	0.9	4	1.1	0.7	1.1	2.6
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.5	0.5	0.4	0.4	0.5	0.6
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.02		0.02	0.04	0.05	0.05
Chloromethane	0.5	0.08	0.7	0.7	0.6	0.8	0.6	0.6
Vinyl chloride	0.5	0.04				0.04		
Bromomethane	0.5	0.05		0.05		0.05		
Ethanol	1.5	0.30	110	210	82	59	61	84
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2		0.2	0.3	0.3	0.4
Isopropyl alcohol(2-Propanol)	1.5	0.03	41	15	5.4	8.7	4.2	39
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.06	0.06	0.07	0.09	0.08	0.1
Acetone	3.0	0.08	13	23	16	7.8	23	16
Carbon disulfide	1.0	0.04	0.03	0.04	0.05	0.07	0.09	0.1
Methylene chloride	1.5	0.04	0.2	0.4	0.1	0.2	0.4	0.5
n-Hexane	0.5	0.03	0.2	1.4	0.2	0.2	0.3	0.5
2-Butanone(MEK)	1.5	0.07	0.4	2.2	2.8	0.8	4	1
cis-1,2-Dichloroethene	0.5	0.05				0.02		
Ethyl acetate	0.5	0.07	0.4	0.3				0.2
Chloroform	0.5	0.03		0.06				0.08
Tetrahydrofuran	0.5	0.07		0.4				
1,1,1-Trichloroethane	0.5	0.04						
Cyclohexane	0.5	0.04	0.1	0.7	0.1	0.1	0.2	0.4
Carbon tetrachloride	0.5	0.04	0.06	0.07	0.07	0.08	0.07	0.07
n-Heptane	0.5	0.04			0.6		0.2	0.4
Benzene	0.5	0.02	0.2	1.2	0.2	0.2	0.4	0.9
Trichloroethene	0.5	0.04	0.02	0.04		0.03	0.07	0.05
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.1	0.2	0.2	0.2	0.2	0.08
cis-1,3-Dichloropropene	0.5	0.04				0.02		0.02
Toluene	0.5	0.05	1.2	4.9	0.8	0.6	1.2	2.6
trans-1,3-Dichloropropene	0.5	0.04				0.02	0.02	
2-Hexanone(MBK)	1.5	0.05		0.1	0.3		0.4	
Tetrachloroethene	0.5	0.04	0.02	0.06		0.05	0.07	0.1
Dibromochloromethane	0.5	0.06					0.02	0.02
Chlorobenzene	0.5	0.04						0.03
Ethylbenzene	0.5	0.05	0.2	0.6	0.09	0.1	0.2	0.4
Xylene (para & meta)	1.0	0.10	0.4	1.9	0.2	0.3	0.4	1.1
Xylene (Ortho)	0.5	0.05	0.2	0.8	0.1	0.2	0.2	0.4
Styrene	0.5	0.05	0.1	0.9	0.07	0.08	0.09	0.9
1,1,2,2-Tetrachloroethane	0.5	0.08						0.04
4-Ethyltoluene	0.5	0.06	0.2	0.7	0.1	0.2	0.2	0.4
1,3,5-Trimethylbenzene	0.5	0.05	0.05	0.2	0.03	0.09	0.06	0.1
1,2,4-Trimethylbenzene	0.5	0.08	0.2	0.7	0.1	0.3	0.2	0.4
1,3-Dichlorobenzene	0.5	0.06				0.03	0.03	0.03
1,4-Dichlorobenzene	0.5	0.05	0.06	0.1	0.03	0.04	0.04	0.05
1,2-Dichlorobenzene	0.5	0.10	0.02			0.03	0.03	0.03
1,2,4-Trichlorobenzene	1.0	0.10				0.04	0.04	0.03
Hexachloro-1,3-butadiene	0.5	0.30	0.03			0.03	0.03	0.03

Dominguez Elementary School - Room 9 (DZ-9) VOC data

			VOC concentration (ppbv)					
SPECIATED ORGANIC COMPOUNDS	**Reporting Limit (ppbv)**	**Method Detection limit (ppbv)**	**12/8/08**	**12/9/08**	**12/10/08**	**12/11/08**	**12/12/08**	**12/15/08**
Propylene	1.0	0.04			1.4	4.9	2.6	1.1
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.5	0.6	0.5	0.7	0.4	0.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.03	0.03	0.03			
Chloromethane	0.5	0.08	0.5	0.5	0.4	0.5	0.4	0.5
Vinyl chloride	0.5	0.04						
Bromomethane	0.5	0.05						
Ethanol	1.5	0.30	68	30	110	68	21	110
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.3	0.3		0.4	0.2	0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	4.9	43	53	6.2	36	20
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.09	0.09	0.08	0.06	0.06	0.05
Acetone	3.0	0.08	14	15	15	25	17	12
Carbon disulfide	1.0	0.04	0.03	0.05	0.05	0.03		
Methylene chloride	1.5	0.04	0.3	0.6	0.2	0.8	0.6	0.2
n-Hexane	0.5	0.03	0.2	0.5	0.6	0.9	0.6	0.2
2-Butanone(MEK)	1.5	0.07	1.7	0.9	1.2	2	2.4	1.3
cis-1,2-Dichloroethene	0.5	0.05						
Ethyl acetate	0.5	0.07	0.1	0.3		0.3	0.2	
Chloroform	0.5	0.03	0.06	0.06		0.07		
Tetrahydrofuran	0.5	0.07		0.7				
1,1,1-Trichloroethane	0.5	0.04						
Cyclohexane	0.5	0.04	0.2	0.3	1.1	0.6	0.4	0.2
Carbon tetrachloride	0.5	0.04	0.08	0.08	0.07	0.06	0.06	0.05
n-Heptane	0.5	0.04		0.5	1.6	0.8	0.6	0.6
Benzene	0.5	0.02	0.3	0.8	0.4	1.1	0.6	0.3
Trichloroethene	0.5	0.04	0.02	0.04	0.02	0.06	0.02	0.02
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.08	0.1	0.3	0.1	0.1	0.2
cis-1,3-Dichloropropene	0.5	0.04						
Toluene	0.5	0.05	1	2.2	1.4	4.4	2.3	0.8
trans-1,3-Dichloropropene	0.5	0.04						
2-Hexanone(MBK)	1.5	0.05	0.1		0.2	0.1	0.4	0.2
Tetrachloroethene	0.5	0.04	0.03	0.08	0.04	0.1	0.09	0.03
Dibromochloromethane	0.5	0.06						
Chlorobenzene	0.5	0.04						
Ethylbenzene	0.5	0.05	0.1	0.3	0.2	0.6	0.3	0.1
Xylene (para & meta)	1.0	0.10	0.4	1	0.8	1.9	1.1	0.4
Xylene (Ortho)	0.5	0.05	0.2	0.4	0.2	0.7	0.4	0.2
Styrene	0.5	0.05	0.07	0.4	0.6	0.7	0.3	0.1
1,1,2,2-Tetrachloroethane	0.5	0.08						
4-Ethyltoluene	0.5	0.06	0.1	0.3	0.2	0.6	0.3	0.1
1,3,5-Trimethylbenzene	0.5	0.05	0.04	0.1	0.06	0.2	0.1	0.05
1,2,4-Trimethylbenzene	0.5	0.08	0.1	0.3	0.2	0.6	0.4	0.2
1,3-Dichlorobenzene	0.5	0.06	0.01	0.01				
1,4-Dichlorobenzene	0.5	0.05	0.02	0.02	0.02	0.04	0.03	0.02
1,2-Dichlorobenzene	0.5	0.10	0.01	0.01		0.02	0.01	
1,2,4-Trichlorobenzene	1.0	0.10	0.02	0.02	0.02	0.04	0.04	0.03
Hexachloro-1,3-butadiene	0.5	0.30		0.01	0.01	0.02		

Dominguez Elementary School - Room 9 (DZ-9) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)			
			12/16/08	12/17/08	12/18/08	12/19/08
Propylene	1.0	0.04		0.4	1.7	2.6
Freon 12 (Dichlorodifluoromethane)	0.5	0.04		0.4	0.4	0.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03		0.02		
Chloromethane	0.5	0.08	0.4	0.5	0.4	0.4
Vinyl chloride	0.5	0.04				
Bromomethane	0.5	0.05				
Ethanol	1.5	0.30	54	76	52	40
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2	0.2	0.2	0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	2.4	2.7	9.6	31
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06		0.05	0.05	0.05
Acetone	3.0	0.08	19	5.8	9.9	16
Carbon disulfide	1.0	0.04	0.02	0.01	0.02	0.03
Methylene chloride	1.5	0.04	0.4	0.1	0.1	0.3
n-Hexane	0.5	0.03	0.3	0.1	0.3	0.4
2-Butanone(MEK)	1.5	0.07	2	0.2	0.9	1
cis-1,2-Dichloroethene	0.5	0.05				
Ethyl acetate	0.5	0.07		0.5		
Chloroform	0.5	0.03				
Tetrahydrofuran	0.5	0.07				
1,1,1-Trichloroethane	0.5	0.04				
Cyclohexane	0.5	0.04	0.3	0.2	0.3	0.3
Carbon tetrachloride	0.5	0.04	0.05	0.06	0.05	0.05
n-Heptane	0.5	0.04	3.7	3.9	1.3	1.4
Benzene	0.5	0.02	0.6	0.1		0.6
Trichloroethene	0.5	0.04		0.02		0.02
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.1	0.05	0.1	0.06
cis-1,3-Dichloropropene	0.5	0.04				
Toluene	0.5	0.05	1.7	0.4	6.5	2
trans-1,3-Dichloropropene	0.5	0.04				
2-Hexanone(MBK)	1.5	0.05			0.3	
Tetrachloroethene	0.5	0.04	0.06	0.02		0.04
Dibromochloromethane	0.5	0.06				
Chlorobenzene	0.5	0.04				
Ethylbenzene	0.5	0.05	0.2	0.05	0.2	0.3
Xylene (para & meta)	1.0	0.10	0.8	0.2	0.6	1
Xylene (Ortho)	0.5	0.05	0.3	0.08	0.3	0.4
Styrene	0.5	0.05	0.25	0.03	0.06	0.8
1,1,2,2-Tetrachloroethane	0.5	0.08				
4-Ethyltoluene	0.5	0.06	0.3	0.06	0.2	0.3
1,3,5-Trimethylbenzene	0.5	0.05	0.09	0.02	0.3	0.09
1,2,4-Trimethylbenzene	0.5	0.08	0.2	0.07	0.2	0.3
1,3-Dichlorobenzene	0.5	0.06				
1,4-Dichlorobenzene	0.5	0.05	0.02	0.02	0.02	0.03
1,2-Dichlorobenzene	0.5	0.10				
1,2,4-Trichlorobenzene	1.0	0.10				0.02
Hexachloro-1,3-butadiene	0.5	0.30				

Dominguez Elementary School - Room 9 (DZ-9) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv) 11/18/08	11/19/08	11/20/08	11/21/08	11/24/08	11/25/08
4-Bromofluorobenzene	N/A	N/A	9.84	10.13	10.69	11.36	11.97	11.86
1,3-Dimethyl cyclohexane	N/A	N/A						
1,3-Pentadiene	N/A	N/A	1.4					
1,4-Pentadiene	N/A	N/A						1.4
1-Butanol	N/A	N/A			1.2			1.9
1-Dodecene	N/A	N/A						
1S-.alpha.-Pinene	N/A	N/A						1.5
2,2,3,3-Tetramethyl butane	N/A	N/A			2.1			
2,2,4,6,6-Pentamethyl heptane	N/A	N/A		9.4		5.3		13
2,2,4-Trimethyl pentane	N/A	N/A	2.3	2.1			1.2	
2,2-Dimethyl hexane	N/A	N/A				2.4		
2,3,3-Trimethyl pentane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A	1.5		1.1			
2-Methyl butane	N/A	N/A	8.2	7.4	9	8.9	5.3	3.8
2-Methyl hexane	N/A	N/A	1.3	1.4				
2-Methyl pentane	N/A	N/A	3.5	3.3	3.6	3.7	2	1.5
2-Methyl-1,3-butadiene	N/A	N/A	1.6				1.5	
3-Methyl butanal	N/A	N/A						
3-Methyl hexane	N/A	N/A	1.5	1.5	1.3	1.5		
3-Methyl pentane	N/A	N/A	1.9	1.8	2.1	2		
Acetaldehyde	N/A	N/A			1.6		2.4	2.4
Benzaldehyde	N/A	N/A				1.9	2	3
Butanal	N/A	N/A						
Butane	N/A	N/A	5.9	6.1	8.3	6.7	4.3	3.1
Difluorochloromethane	N/A	N/A	26	3.6		19		
D-Limonene	N/A	N/A	1.1			1.7		1.9
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A						
Hexanal	N/A	N/A						
Isobutane	N/A	N/A	4.6	4	5.1	4.6	3.5	2.2
Methyl cyclohexane	N/A	N/A			1.1			
Methyl cyclopentane	N/A	N/A	1.6	1.6	1.9	1.7		
Nonanal	N/A	N/A					2	2
Ocatanal	N/A	N/A					2	
Octamethyl cyclotrisiloxane	N/A	N/A					10	16
Octane	N/A	N/A						
Pentane	N/A	N/A	3.6	4		4.1	3	
trans-1,4-Dimethyl cyclohexane	N/A	N/A						

Dominguez Elementary School - Room 9 (DZ-9) VOC data

			VOC concentration (ppbv)					
TENTATIVELY IDENTIFIED COMPOUNDS	**Reporting Limit (ppbv)**	**Method Detection limit (ppbv)**	**11/26/08**	**12/1/08**	**12/2/08**	**12/3/08**	**12/4/08**	**12/5/08**
4-Bromofluorobenzene	N/A	N/A	11.53	9.44	9.66	8.08	9.07	8.76
1,3-Dimethyl cyclohexane	N/A	N/A						
1,3-Pentadiene	N/A	N/A						
1,4-Pentadiene	N/A	N/A						
1-Butanol	N/A	N/A						
1-Dodecene	N/A	N/A			1			
1S-.alpha.-Pinene	N/A	N/A						
2,2,3,3-Tetramethyl butane	N/A	N/A						1.3
2,2,4,6,6-Pentamethyl heptane	N/A	N/A	1.1					
2,2,4-Trimethyl pentane	N/A	N/A						
2,2-Dimethyl hexane	N/A	N/A						
2,3,3-Trimethyl pentane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A						
2-Methyl butane	N/A	N/A	2	8.5	2.1	1.3	1.9	3.5
2-Methyl hexane	N/A	N/A						
2-Methyl pentane	N/A	N/A		3.1				1.9
2-Methyl-1,3-butadiene	N/A	N/A		1.6				
3-Methyl butanal	N/A	N/A			1		1.1	
3-Methyl hexane	N/A	N/A						
3-Methyl pentane	N/A	N/A		1.9				
Acetaldehyde	N/A	N/A		1.6	2.6	1.2	3	
Benzaldehyde	N/A	N/A		1.4				
Butanal	N/A	N/A			1.1		2	
Butane	N/A	N/A	1.6	8.1	2.9	1.7	1.8	2.6
Difluorochloromethane	N/A	N/A						
D-Limonene	N/A	N/A	2.2					
Heptanal	N/A	N/A			1.1			
Hexamethyl cyclotrisiloxane	N/A	N/A		2.5				
Hexanal	N/A	N/A			1			
Isobutane	N/A	N/A	1.6	5.5	2.1	7	1.4	2.1
Methyl cyclohexane	N/A	N/A						
Methyl cyclopentane	N/A	N/A		2				
Nonanal	N/A	N/A			1.6			
Ocatanal	N/A	N/A			1.3			
Octamethyl cyclotrisiloxane	N/A	N/A	1.3	3.4				
Octane	N/A	N/A						
Pentane	N/A	N/A		4.8				
trans-1,4-Dimethyl cyclohexane	N/A	N/A						

Dominguez Elementary School - Room 9 (DZ-9) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			12/8/08	12/9/08	12/10/08	12/11/08	12/12/08	12/15/08
4-Bromofluorobenzene	N/A	N/A	8.61	8.41	8.22	9.55	9.52	10.21
1,3-Dimethyl cyclohexane	N/A	N/A						
1,3-Pentadiene	N/A	N/A						
1,4-Pentadiene	N/A	N/A						
1-Butanol	N/A	N/A			1.9			
1-Dodecene	N/A	N/A						
1S-.alpha.-Pinene	N/A	N/A						
2,2,3,3-Tetramethyl butane	N/A	N/A		1		1.9	1.1	
2,2,4,6,6-Pentamethyl heptane	N/A	N/A						
2,2,4-Trimethyl pentane	N/A	N/A						
2,2-Dimethyl hexane	N/A	N/A						
2,3,3-Trimethyl pentane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A				1.6		
2-Methyl butane	N/A	N/A	1.2	2.7	1.4	4.5	3.2	
2-Methyl hexane	N/A	N/A			1.6	1.2		
2-Methyl pentane	N/A	N/A		1.7		3.2		
2-Methyl-1,3-butadiene	N/A	N/A						
3-Methyl butanal	N/A	N/A						
3-Methyl hexane	N/A	N/A			2.4	1.4		
3-Methyl pentane	N/A	N/A				1.8	1.2	
Acetaldehyde	N/A	N/A						
Benzaldehyde	N/A	N/A						
Butanal	N/A	N/A					1.1	
Butane	N/A	N/A	1	2.1	1.2	3.5	2.3	
Difluorochloromethane	N/A	N/A						
D-Limonene	N/A	N/A					2.3	
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A						
Hexanal	N/A	N/A						
Isobutane	N/A	N/A		1.3		1.8	1.6	
Methyl cyclohexane	N/A	N/A						
Methyl cyclopentane	N/A	N/A				1.5	1.1	
Nonanal	N/A	N/A						
Ocatanal	N/A	N/A			1.3			
Octamethyl cyclotrisiloxane	N/A	N/A						
Octane	N/A	N/A						
Pentane	N/A	N/A						
trans-1,4-Dimethyl cyclohexane	N/A	N/A						

Dominguez Elementary School - Room 9 (DZ-9) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)			
			12/16/08	12/17/08	12/18/08	12/19/08
4-Bromofluorobenzene	N/A	N/A	9.66	9.52	9.74	10.01
1,3-Dimethyl cyclohexane	N/A	N/A			1.8	
1,3-Pentadiene	N/A	N/A				
1,4-Pentadiene	N/A	N/A				
1-Butanol	N/A	N/A				
1-Dodecene	N/A	N/A				
1S-.alpha.-Pinene	N/A	N/A				
2,2,3,3-Tetramethyl butane	N/A	N/A				
2,2,4,6,6-Pentamethyl heptane	N/A	N/A				
2,2,4-Trimethyl pentane	N/A	N/A				
2,2-Dimethyl hexane	N/A	N/A				
2,3,3-Trimethyl pentane	N/A	N/A	1.2			
2,3-Dimethyl pentane	N/A	N/A	1.4	1.1		
2-Methyl butane	N/A	N/A	1.6		1.1	1.5
2-Methyl hexane	N/A	N/A	2.4	2.2		
2-Methyl pentane	N/A	N/A	1.1			1.2
2-Methyl-1,3-butadiene	N/A	N/A				
3-Methyl butanal	N/A	N/A				
3-Methyl hexane	N/A	N/A	5	5.1	1.3	1.5
3-Methyl pentane	N/A	N/A				
Acetaldehyde	N/A	N/A	1.1			
Benzaldehyde	N/A	N/A				
Butanal	N/A	N/A				
Butane	N/A	N/A	1.2		1	1.2
Difluorochloromethane	N/A	N/A				
D-Limonene	N/A	N/A				
Heptanal	N/A	N/A				
Hexamethyl cyclotrisiloxane	N/A	N/A				
Hexanal	N/A	N/A				
Isobutane	N/A	N/A				
Methyl cyclohexane	N/A	N/A				
Methyl cyclopentane	N/A	N/A				
Nonanal	N/A	N/A				
Ocatanal	N/A	N/A				
Octamethyl cyclotrisiloxane	N/A	N/A				
Octane	N/A	N/A			2.7	
Pentane	N/A	N/A				
trans-1,4-Dimethyl cyclohexane	N/A	N/A			1	

Dominguez Elementary School - Room 11 (DZ-11) VOC data

			VOC concentration (ppbv)					
SPECIATED ORGANIC COMPOUNDS	**Reporting Limit (ppbv)**	**Method Detection limit (ppbv)**	**11/18/08**	**11/19/08**	**11/20/08**	**11/21/08**	**11/24/08**	**11/25/08**
Propylene	1.0	0.04		5.4	3.7	6	4.5	2.9
Freon 12 (Dichlorodifluoromethane)	0.5	0.04		0.7	0.5	0.7	0.6	0.6
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03			0.01		0.01	0.01
Chloromethane	0.5	0.08	0.9	0.8	0.7	0.8	0.8	0.8
Vinyl chloride	0.5	0.04						
Bromomethane	0.5	0.05			0.04	0.03		0.02
Ethanol	1.5	0.30	530	150	180	170	270	200
Freon 11(Trichlorofluoromethane)	0.5	0.04			0.3			0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	70	22	15	12	11	16
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06		0.07	0.06	0.06	0.06	0.06
Acetone	3.0	0.08	34	30	20	28	29	21
Carbon disulfide	1.0	0.04	0.08	0.07	0.07	0.05	0.06	0.06
Methylene chloride	1.5	0.04	1.3	1	0.6	1.8	0.6	0.4
n-Hexane	0.5	0.03	1.3	1.1	1.9	1.5	0.6	0.4
2-Butanone(MEK)	1.5	0.07	2.4	2.8	1.8	2.4	2.5	1.9
Ethyl acetate	0.5	0.07	0.9	0.5	0.3	0.5	0.2	0.2
Chloroform	0.5	0.03	0.1	0.08	0.06	0.09	0.05	0.05
Tetrahydrofuran	0.5	0.07	0.7	0.6	0.1	0.5	0.3	0.2
Cyclohexane	0.5	0.04	1	0.7	2.2	9.6	0.5	0.3
Carbon tetrachloride	0.5	0.04	0.07	0.07	0.07	0.07	0.06	0.07
n-Heptane	0.5	0.04	3.6	0.7	1.7	1.1	0.6	
Benzene	0.5	0.02	1.5	1.2	1	1.6	0.8	0.6
Trichloroethene	0.5	0.04	0.07	0.07	0.03	0.07	0.02	0.05
Bromodichloromethane	0.5	0.04						
4-Methyl-2-pentanone(MIBK)	0.5	0.06	42	0.4	0.7	0.5	0.3	0.7
cis-1,3-Dichloropropene	0.5	0.04						
Toluene	0.5	0.05	6.8	4.9	3.3	9.6	3.2	2.4
trans-1,3-Dichloropropene	0.5	0.04						
1,1,2-Trichloroethane	0.5	0.06						
2-Hexanone(MBK)	1.5	0.05		0.2	0.1		0.4	0.2
Tetrachloroethene	0.5	0.04	0.3	0.2	0.08	0.3	0.1	0.09
Chlorobenzene	0.5	0.04						
Ethylbenzene	0.5	0.05	0.9	0.8	0.5	1.7	0.5	0.4
Xylene (para & meta)	1.0	0.10	3.1	2.3	1.7	5.7	1.7	1.2
Xylene (Ortho)	0.5	0.05	1.1	0.9	0.7	1.7	0.7	0.6
Styrene	0.5	0.05	1.5	0.6	0.4	0.7	1.3	0.4
Bromoform	0.5	0.05			0.01			
1,1,2,2-Tetrachloroethane	0.5	0.08						
4-Ethyltoluene	0.5	0.06	1.1	0.8	0.6	1.2	0.6	0.5
1,3,5-Trimethylbenzene	0.5	0.05	0.3	0.2		0.3	0.2	0.1
1,2,4-Trimethylbenzene	0.5	0.08	1.1	0.8	0.6	1.2	0.6	0.5
1,3-Dichlorobenzene	0.5	0.06						
1,4-Dichlorobenzene	0.5	0.05	0.2	0.1	0.09	0.2	0.1	0.08
1,2-Dichlorobenzene	0.5	0.10						
1,2,4-Trichlorobenzene	1.0	0.10						
Hexachloro-1,3-butadiene	0.5	0.30	0.02					

Dominguez Elementary School - Room 11 (DZ-11) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/26/08	12/1/08	12/2/08	12/3/08	12/4/08	12/5/08
Propylene	1.0	0.04	1.2	4.4				2.7
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.5	0.4	0.5	0.4	0.5	0.6
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.01	0.01	0.01	0.04	0.04	0.06
Chloromethane	0.5	0.08	0.8	0.6	0.6	0.9	0.6	0.6
Vinyl chloride	0.5	0.04				0.05		
Bromomethane	0.5	0.05		0.06		0.05		
Ethanol	1.5	0.30	260	100	310	210	63	41
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2	0.2	0.2	0.2	0.3	0.4
Isopropyl alcohol(2-Propanol)	1.5	0.03	160	52	32	13	4.4	5.4
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.06	0.06	0.06	0.09	0.09	0.1
Acetone	3.0	0.08	26	28	14	17	13	22
Carbon disulfide	1.0	0.04	0.03	0.06		0.07	0.04	0.1
Methylene chloride	1.5	0.04	0.2	0.4	0.2	0.3	0.4	0.6
n-Hexane	0.5	0.03	0.2	1.5	0.3	0.3	0.3	0.6
2-Butanone(MEK)	1.5	0.07	2.1	3.9	1.4	2	1.2	1.6
Ethyl acetate	0.5	0.07	0.2	0.3		0.3	0.2	0.3
Chloroform	0.5	0.03	0.03	0.06		0.06		0.09
Tetrahydrofuran	0.5	0.07						
Cyclohexane	0.5	0.04		0.7		0.2	0.2	0.4
Carbon tetrachloride	0.5	0.04	0.06	0.07	0.07	0.08	0.07	0.07
n-Heptane	0.5	0.04	1.4	1.3			0.2	0.5
Benzene	0.5	0.02	0.2	1.2	0.2	0.4	0.4	0.9
Trichloroethene	0.5	0.04	0.02	0.03		0.04	0.06	0.05
Bromodichloromethane	0.5	0.04				0.03		
4-Methyl-2-pentanone(MIBK)	0.5	0.06	2	0.4	0.1	0.2	0.2	0.2
cis-1,3-Dichloropropene	0.5	0.04				0.02		
Toluene	0.5	0.05	1	4.6	0.8	0.9	1	2.7
trans-1,3-Dichloropropene	0.5	0.04				0.02		0.02
1,1,2-Trichloroethane	0.5	0.06					0.03	
2-Hexanone(MBK)	1.5	0.05	0.2	0.4	0.2	0.2	0.1	0.1
Tetrachloroethene	0.5	0.04	0.03	0.08		0.06	0.07	0.1
Chlorobenzene	0.5	0.04					0.03	0.04
Ethylbenzene	0.5	0.05	0.2	0.6	0.1	0.2	0.2	0.4
Xylene (para & meta)	1.0	0.10	0.5	2	0.3	0.4	0.4	1.2
Xylene (Ortho)	0.5	0.05	0.3	0.9	0.2	0.2	0.2	0.5
Styrene	0.5	0.05	0.1	0.8	0.1	0.1	0.1	0.9
Bromoform	0.5	0.05						
1,1,2,2-Tetrachloroethane	0.5	0.08					0.03	0.04
4-Ethyltoluene	0.5	0.06	0.2	0.7	0.2	0.1	0.2	0.5
1,3,5-Trimethylbenzene	0.5	0.05	0.05	0.2	0.04	0.06	0.06	0.2
1,2,4-Trimethylbenzene	0.5	0.08	0.2	0.8	0.2	0.1	0.2	0.5
1,3-Dichlorobenzene	0.5	0.06				0.03	0.03	0.03
1,4-Dichlorobenzene	0.5	0.05	0.05	0.1	0.03	0.04	0.04	0.06
1,2-Dichlorobenzene	0.5	0.10				0.03	0.03	0.04
1,2,4-Trichlorobenzene	1.0	0.10				0.05	0.03	0.05
Hexachloro-1,3-butadiene	0.5	0.30				0.04	0.03	0.04

Dominguez Elementary School - Room 11 (DZ-11) VOC data

			VOC concentration (ppbv)					
SPECIATED ORGANIC COMPOUNDS	**Reporting Limit (ppbv)**	**Method Detection limit (ppbv)**	**12/8/08**	**12/9/08**	**12/10/08**	**12/11/08**	**12/12/08**	**12/15/08**
Propylene	1.0	0.04	1				4.7	0.7
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.5	0.5	0.6	0.6	0.6	0.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.03	0.02				
Chloromethane	0.5	0.08	0.5	0.5	0.4	0.6	0.5	0.5
Vinyl chloride	0.5	0.04						
Bromomethane	0.5	0.05						
Ethanol	1.5	0.30	18	42	6.4	60	23	99
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2	0.2	0.2	0.2	0.4	0.2
Isopropyl alcohol(2-Propanol)	1.5	0.03	35	8.4	4.2	7.9	3.2	13
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06	0.04	0.04			0.06	0.03
Acetone	3.0	0.08	14	15	5.9	19	19	15
Carbon disulfide	1.0	0.04	0.03	0.06	0.04	0.02	0.02	
Methylene chloride	1.5	0.04	0.2	0.5	0.2	0.5	0.8	0.3
n-Hexane	0.5	0.03	0.05	0.1	0.07	0.2	0.8	0.1
2-Butanone(MEK)	1.5	0.07	0.8	0.7	0.3	1.4	1.3	
Ethyl acetate	0.5	0.07					0.2	
Chloroform	0.5	0.03						
Tetrahydrofuran	0.5	0.07						
Cyclohexane	0.5	0.04	0.04	0.08		0.2	0.5	0.2
Carbon tetrachloride	0.5	0.04	0.03	0.03			0.06	
n-Heptane	0.5	0.04			0.1	0.2	0.6	
Benzene	0.5	0.02	0.07	0.2	0.2	0.1	1.1	0.06
Trichloroethene	0.5	0.04		0.02			0.06	
Bromodichloromethane	0.5	0.04						
4-Methyl-2-pentanone(MIBK)	0.5	0.06	0.04	0.09				2.9
cis-1,3-Dichloropropene	0.5	0.04						2.9
Toluene	0.5	0.05	0.1	0.4	0.5	0.5	3.8	
trans-1,3-Dichloropropene	0.5	0.04						
1,1,2-Trichloroethane	0.5	0.06						
2-Hexanone(MBK)	1.5	0.05		0.1		0.2		
Tetrachloroethene	0.5	0.04	0.01	0.03	0.02	0.02	0.1	
Chlorobenzene	0.5	0.04	0.01					
Ethylbenzene	0.5	0.05	0.03	0.07	0.07	0.08	0.6	0.03
Xylene (para & meta)	1.0	0.10	0.08	0.2	0.2	0.2	1.7	0.08
Xylene (Ortho)	0.5	0.05	0.04	0.1	0.1	0.1	0.6	0.03
Styrene	0.5	0.05	0.02	0.06	0.2	0.06	0.7	0.02
Bromoform	0.5	0.05						
1,1,2,2-Tetrachloroethane	0.5	0.08		0.03				
4-Ethyltoluene	0.5	0.06	0.04	0.07	0.1	0.08	0.5	0.03
1,3,5-Trimethylbenzene	0.5	0.05	0.02	0.03	0.05	0.03	0.1	0.01
1,2,4-Trimethylbenzene	0.5	0.08	0.04	0.08	0.2	0.08	0.5	0.04
1,3-Dichlorobenzene	0.5	0.06	0.01	0.01				
1,4-Dichlorobenzene	0.5	0.05	0.01	0.02	0.01	0.01	0.04	0.01
1,2-Dichlorobenzene	0.5	0.10						
1,2,4-Trichlorobenzene	1.0	0.10	0.02	0.02	0.02	0.02		0.02
Hexachloro-1,3-butadiene	0.5	0.30	0.01					

Dominguez Elementary School - Room 11 (DZ-11) VOC data

SPECIATED ORGANIC COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv) 12/16/08	12/17/08	12/18/08	12/19/08
Propylene	1.0	0.04			1.1	1.8
Freon 12 (Dichlorodifluoromethane)	0.5	0.04	0.4	0.4	0.4	0.4
Freon 114(1,2-Dichlorotetrafluoroethan)	0.5	0.03	0.02			
Chloromethane	0.5	0.08	0.5	0.6	0.5	0.5
Vinyl chloride	0.5	0.04				
Bromomethane	0.5	0.05				
Ethanol	1.5	0.30	110	150	58	32
Freon 11(Trichlorofluoromethane)	0.5	0.04	0.2	0.2	0.2	0.1
Isopropyl alcohol(2-Propanol)	1.5	0.03	18	20	10	5.4
Freon 113(1,1,2-Trichlorotrifluoroethan)	0.5	0.06			0.02	
Acetone	3.0	0.08	14	17	19	15
Carbon disulfide	1.0	0.04	0.04	0.01	0.03	
Methylene chloride	1.5	0.04	0.4	0.2	0.2	0.3
n-Hexane	0.5	0.03	0.1			0.05
2-Butanone(MEK)	1.5	0.07	0.3	0.6	1	
Ethyl acetate	0.5	0.07		0.2		
Chloroform	0.5	0.03				
Tetrahydrofuran	0.5	0.07				
Cyclohexane	0.5	0.04	0.1		0.05	
Carbon tetrachloride	0.5	0.04	0.03	0.02	0.02	
n-Heptane	0.5	0.04				
Benzene	0.5	0.02	0.2	0.03	0.05	0.09
Trichloroethene	0.5	0.04	0.02			
Bromodichloromethane	0.5	0.04				
4-Methyl-2-pentanone(MIBK)	0.5	0.06	6.6	3.5	0.2	0.8
cis-1,3-Dichloropropene	0.5	0.04				
Toluene	0.5	0.05	0.6	0.07	0.3	0.2
trans-1,3-Dichloropropene	0.5	0.04				
1,1,2-Trichloroethane	0.5	0.06				
2-Hexanone(MBK)	1.5	0.05		0.08	0.2	
Tetrachloroethene	0.5	0.04	0.03			
Chlorobenzene	0.5	0.04				
Ethylbenzene	0.5	0.05	0.1	0.02	0.03	0.05
Xylene (para & meta)	1.0	0.10	0.4	0.05	0.07	0.2
Xylene (Ortho)	0.5	0.05	0.2		0.04	0.06
Styrene	0.5	0.05	0.06			0.05
Bromoform	0.5	0.05				
1,1,2,2-Tetrachloroethane	0.5	0.08				
4-Ethyltoluene	0.5	0.06	0.2	0.02	0.03	0.05
1,3,5-Trimethylbenzene	0.5	0.05			0.01	0.02
1,2,4-Trimethylbenzene	0.5	0.08	0.2	0.02	0.03	0.05
1,3-Dichlorobenzene	0.5	0.06	0.01			
1,4-Dichlorobenzene	0.5	0.05	0.03			
1,2-Dichlorobenzene	0.5	0.10	0.01			
1,2,4-Trichlorobenzene	1.0	0.10	0.05			
Hexachloro-1,3-butadiene	0.5	0.30				

Dominguez Elementary School - Room 11 (DZ-11) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			11/18/08	11/19/08	11/20/08	11/21/08	11/24/08	11/25/08
1,1-Difluoroethane	N/A	N/A						
1-Butanol	N/A	N/A						1.7
1-Dodecene	N/A	N/A						
2,2,3,3-Tetramethyl butane	N/A	N/A			2.1			
2,2,4,6,6-Pentamethyl heptane	N/A	N/A					1.2	
2,2,4-Trimethyl pentane	N/A	N/A	2.8					
2,2-Dimethyl hexane	N/A	N/A		2.1		3		
2,3-Dimethyl pentane	N/A	N/A	1.8	1.3	1.3	1.8		
2-Methyl butane	N/A	N/A	9.2	7.7	8.2	11	4.7	3.8
2-Methyl hexane	N/A	N/A	1.5		1.6	1.4		
2-Methyl pentane	N/A	N/A	4.1	3.2	3.6	4.6	2	1.4
2-Methyl-1,3-butadiene	N/A	N/A	2.6	1.8	1.3	1.7	1.4	1.1
3-Methyl butanal	N/A	N/A						
3-Methyl butane	N/A	N/A						
3-Methyl hexane	N/A	N/A	1.9		1.7	1.8	1.1	
3-Methyl pentane	N/A	N/A	2.1	1.8	2.2	2.5	1.1	
3-Methyl-1,2-butadiene	N/A	N/A						
Acetaldehyde	N/A	N/A	1.3	1.7	1.5		1.9	2.1
Benzaldehyde	N/A	N/A		1.4	1	1.5	1.8	1.6
Butanal	N/A	N/A						
Butane	N/A	N/A	6.4	6.4	7.5	7.9	3.9	3.1
Butyl ester acetic acid	N/A	N/A	8.8					
Difluorochloromethane	N/A	N/A	12					
D-Limonene	N/A	N/A				1.4		
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A					3.5	
Hexanal	N/A	N/A						
Isobutane	N/A	N/A	4.6	4.9	4.5	4.7	2.9	2.3
Methyl cyclohexane	N/A	N/A			1.2			
Methyl cyclopentane	N/A	N/A	1.8	1.4	2.3	2		
Naphthalene	N/A	N/A						
Nonanal	N/A	N/A						1.4
Ocatanal	N/A	N/A					1.1	1.3
Octamethyl cyclotrisiloxane	N/A	N/A					5.7	5.3
Pentanal	N/A	N/A						
Pentane	N/A	N/A	4.1	3.7		4.9	2.5	

Dominguez Elementary School - Room 11 (DZ-11) VOC data

			VOC concentration (ppbv)					
TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	11/26/08	12/1/08	12/2/08	12/3/08	12/4/08	12/5/08
1,1-Difluoroethane	N/A	N/A						
1-Butanol	N/A	N/A						
1-Dodecene	N/A	N/A			1			
2,2,3,3-Tetramethyl butane	N/A	N/A		1.6				
2,2,4,6,6-Pentamethyl heptane	N/A	N/A						
2,2,4-Trimethyl pentane	N/A	N/A						1.3
2,2-Dimethyl hexane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A						
2-Methyl butane	N/A	N/A	2.1	8.7	2.2	2.1	2	3.9
2-Methyl hexane	N/A	N/A						
2-Methyl pentane	N/A	N/A		3.3				2
2-Methyl-1,3-butadiene	N/A	N/A	1.2					
3-Methyl butanal	N/A	N/A					1.1	
3-Methyl butane	N/A	N/A						1
3-Methyl hexane	N/A	N/A						
3-Methyl pentane	N/A	N/A		2.1				
3-Methyl-1,2-butadiene	N/A	N/A						1.2
Acetaldehyde	N/A	N/A	2.8	2.7	2.1	2.7		
Benzaldehyde	N/A	N/A	1.8	1.6				
Butanal	N/A	N/A			1.6	1.1		
Butane	N/A	N/A	2	8.5	2.6	2.5	1.8	2.9
Butyl ester acetic acid	N/A	N/A						
Difluorochloromethane	N/A	N/A						
D-Limonene	N/A	N/A					2.5	8
Heptanal	N/A	N/A			2.4			
Hexamethyl cyclotrisiloxane	N/A	N/A	3.3		1.2			
Hexanal	N/A	N/A			1.8			
Isobutane	N/A	N/A		5.6	2.3	1.8	1.3	2.6
Methyl cyclohexane	N/A	N/A						
Methyl cyclopentane	N/A	N/A		2.1				
Naphthalene	N/A	N/A						
Nonanal	N/A	N/A		1.7	1.7			
Ocatanal	N/A	N/A		1.6	1.8			
Octamethyl cyclotrisiloxane	N/A	N/A	6.9					
Pentanal	N/A	N/A			1.5			
Pentane	N/A	N/A						

Dominguez Elementary School - Room 11 (DZ-11) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)					
			12/8/08	12/9/08	12/10/08	12/11/08	12/12/08	12/15/08
1,1-Difluoroethane	N/A	N/A				2.6		
1-Butanol	N/A	N/A						
1-Dodecene	N/A	N/A						
2,2,3,3-Tetramethyl butane	N/A	N/A		1			1.8	
2,2,4,6,6-Pentamethyl heptane	N/A	N/A						
2,2,4-Trimethyl pentane	N/A	N/A						
2,2-Dimethyl hexane	N/A	N/A						
2,3-Dimethyl pentane	N/A	N/A						
2-Methyl butane	N/A	N/A		2.7			4.4	
2-Methyl hexane	N/A	N/A					1.1	
2-Methyl pentane	N/A	N/A		1.7			3.2	
2-Methyl-1,3-butadiene	N/A	N/A						
3-Methyl butanal	N/A	N/A						
3-Methyl butane	N/A	N/A						
3-Methyl hexane	N/A	N/A					1.3	
3-Methyl pentane	N/A	N/A					1.7	
3-Methyl-1,2-butadiene	N/A	N/A						
Acetaldehyde	N/A	N/A						
Benzaldehyde	N/A	N/A						
Butanal	N/A	N/A						
Butane	N/A	N/A	1.3	2.1			3.4	1.1
Butyl ester acetic acid	N/A	N/A						
Difluorochloromethane	N/A	N/A						
D-Limonene	N/A	N/A					2.3	
Heptanal	N/A	N/A						
Hexamethyl cyclotrisiloxane	N/A	N/A						
Hexanal	N/A	N/A						
Isobutane	N/A	N/A		1.3	2.4	1.2	1.7	
Methyl cyclohexane	N/A	N/A						
Methyl cyclopentane	N/A	N/A					1.4	
Naphthalene	N/A	N/A						
Nonanal	N/A	N/A						
Ocatanal	N/A	N/A						
Octamethyl cyclotrisiloxane	N/A	N/A						
Pentanal	N/A	N/A						
Pentane	N/A	N/A						

Dominguez Elementary School - Room 11 (DZ-11) VOC data

TENTATIVELY IDENTIFIED COMPOUNDS	Reporting Limit (ppbv)	Method Detection limit (ppbv)	VOC concentration (ppbv)			
			12/16/08	12/17/08	12/18/08	12/19/08
1,1-Difluoroethane	N/A	N/A				
1-Butanol	N/A	N/A				
1-Dodecene	N/A	N/A				
2,2,3,3-Tetramethyl butane	N/A	N/A	1.1			
2,2,4,6,6-Pentamethyl heptane	N/A	N/A				
2,2,4-Trimethyl pentane	N/A	N/A				
2,2-Dimethyl hexane	N/A	N/A				
2,3-Dimethyl pentane	N/A	N/A				
2-Methyl butane	N/A	N/A				
2-Methyl hexane	N/A	N/A				
2-Methyl pentane	N/A	N/A				
2-Methyl-1,3-butadiene	N/A	N/A				
3-Methyl butanal	N/A	N/A				
3-Methyl butane	N/A	N/A				
3-Methyl hexane	N/A	N/A				
3-Methyl pentane	N/A	N/A				
3-Methyl-1,2-butadiene	N/A	N/A				
Acetaldehyde	N/A	N/A				
Benzaldehyde	N/A	N/A				
Butanal	N/A	N/A				
Butane	N/A	N/A	1.1			
Butyl ester acetic acid	N/A	N/A	1.6			
Difluorochloromethane	N/A	N/A				
D-Limonene	N/A	N/A				
Heptanal	N/A	N/A				
Hexamethyl cyclotrisiloxane	N/A	N/A				
Hexanal	N/A	N/A				
Isobutane	N/A	N/A	1.4			
Methyl cyclohexane	N/A	N/A				
Methyl cyclopentane	N/A	N/A				
Naphthalene	N/A	N/A	1.2			
Nonanal	N/A	N/A				
Ocatanal	N/A	N/A				
Octamethyl cyclotrisiloxane	N/A	N/A				
Pentanal	N/A	N/A				
Pentane	N/A	N/A				

STATUS OF RESEARCH ON POTENTIAL MITIGATION CONCEPTS TO REDUCE EXPOSURE TO NEARBY TRAFFIC POLLUTION

August 23, 2012

California Environmental Protection

Air Resources Board

Introduction

Air Resources Board (ARB) staff has prepared this document to provide information on scientific research that has been conducted on various building-related and site mitigation concepts suggested as potentially effective approaches for reducing the traffic-related exposures of those living near high traffic roadways. While it provides useful information for consideration of potential mitigation approaches, this paper is not intended as guidance for any specific project, and does not provide a methodology for determining appropriate mitigation measures for purposes of compliance with the California Environmental Quality Act. This review looked only at the current status of air pollution research, and does not address other potential community benefits of the concepts, such as the aesthetic and noise reduction benefits of adding vegetation or sound walls.

The State's current set-back requirement for schools (500 feet [ft]; PRC 21151.8) and the ARB's recommendations on siting for housing and other sensitive uses (e.g., 500 ft from major roadways and 1000 ft from busy distribution centers and rail yards; ARB 2005a) are intended to help protect the public from exposure to traffic emissions. Such emissions have been associated with a variety of serious health impacts in epidemiological studies, including exacerbation of respiratory and cardiovascular diseases and conditions, increased asthma and bronchitis in children, and increased risk of premature death. Traffic pollutant concentrations near high traffic roadways have been found to be 2 to 10 times higher than levels at a distance from the roadways. Also, recent studies have shown elevated traffic pollutant levels at greater distances from the roadway than previously measured.

ARB and the U.S. EPA continue to adopt increasingly stringent regulations limiting emissions from vehicles of all types, which have substantially reduced, and will continue to reduce, vehicle emissions. However, recently adopted regulations have compliance dates extending as far as 2025 for full implementation, and fleet turnover to zero or near-zero technologies will take 20 to 30 years. New reductions in vehicle emissions are improving regional air quality throughout California, including near roadways. As the ARB and the air districts work to reduce emissions from diesel PM and other pollutants, the impact of proximity will also be reduced. However, the differential exposure to high air pollution near high traffic roadways compared to other locations makes the siting of housing in those locations a continuing health concern. Recognizing that unhealthful levels of air pollution is a long term problem, ARB is funding research to identify advanced technologies to further reduce vehicle emissions, to better understand traffic related air pollution exposures, and to explore the benefits of high efficiency filtration in California homes.

As communities plan for more compact development, the potential health impacts of infill projects will need to be considered. Infill development can reduce urban sprawl and has other potential health and environmental benefits. It also has the potential to increase exposure to traffic pollution due to the proximity of the infill areas to established traffic routes.

Status of Research on Traffic Exposures and Health Impacts

Measurements of air pollutants near roadways show a consistent finding of elevated levels based on proximity. Black carbon, often used as an indicator of diesel exhaust, and ultrafine particles (particles less than 0.1 microns in size), which are emitted in very high numbers from vehicles, are often 2 to 10 times (or more) higher near roadways and freeways (Zhu et al., 2002a, 2002b, 2006; Kuhn et al., 2005; Westerdahl et al., 2005; Ntziachristos et al., 2007; Kozawa et al., 2009a). Concentrations of PM2.5 (particles 2.5 microns or less in diameter) near busy roadways can be about 20% higher than levels at a distance (Zhu et al., 2002a; Kim et al., 2004; Janssen et al., 2001). Nitrogen oxides also are elevated near roadways, usually about 2 to 3 times the levels measured at a distance from the roadway (Kim et al., 2004; Singer et al., 2004; Kozawa et al., 2009a; Durant et al., 2010).

Previous studies of near roadway pollutant levels showed that concentrations of pollutants emitted from vehicles were highest right at the roadway and decreased substantially in the first 300-500 feet from the roadway (Zhu et al., 2002b; Knape 1999). These results were consistent with health studies that showed a stronger association of health impacts for those living within 300-500 ft of the roadway compared to those living farther than 500 ft from the roadway (Brunekreef et al., 1997; Venn et al., 2001; English et al., 1999). More recent studies have shown a somewhat longer plume of increased pollutant concentrations farther from the roadway. Using data collected mostly during the day and near roadways, a meta-analysis of many studies found that for almost all pollutants, elevated levels of pollutants caused by the increased contributions from roadways returns to background levels at 160 - 570 meters (m; 525 – 1870 ft; Karner et al., 2010). The range of distances needed to reach background is usually a result of local meteorological conditions, which can vary significantly; however, a more constant observation is a steep concentration gradient observed closest to the roadway, within 500 ft, with a more gradual and extended decline at further distances. Another meta-analysis found that the “spatial extent of impact” of motor vehicles can extend up to 400 m (1312 ft) for black carbon and particles and 500 m (1640 ft) for nitrogen dioxide (NO_2; Zhou and Levy 2007). Levels of traffic pollutants near roadways vary due to many factors, including traffic type and density, wind direction and speed, local and roadway topography, and time of day and season (Zhu et al., 2004; Kuhn et al., 2005; Moore et al., 2007; Ning et al., 2007; Hu et al., 2009; Kozawa et al., 2009a, 2009b).

In a major 2008 review of the scientific literature by the Health Effects Institute (HEI), proximity to busy roadways was found to be associated with a variety of adverse health impacts, the strongest association being exacerbation of asthma, with others including asthma onset in children, impaired lung function, and increased heart disease (HEI, 2010). More recent studies have added to the list of effects and heightened concern regarding exposure to traffic emissions. Respiratory and cardiovascular effects seen in these studies include an increased risk of new-onset chronic obstructive pulmonary disease (Andersen et al., 2010), a faster progression of atherosclerosis in those living within 100 m of highways in Los Angeles (Künzli et al., 2010), increased risk of premature death from circulatory disease (Jerrett et al., 2009), and increased incidence of new heart disease (Kan et al., 2008). Other effects include increased risk of low birth weight (Brauer et al., 2008; Llop et al., 2010) and increased risk of pre-term delivery (Wilhelm and Ritz, 2003; Wilhelm et al., 2011) for mothers living very near heavy traffic, lower immune function in post-menopausal women living within 150 m of arterial roads (Williams et al., 2009), and increased risk of Type 2 diabetes in post-menopausal women (Krämer et al., 2010).

Children appear to be particularly vulnerable to the adverse effects of traffic emissions. Epidemiological studies have found significant associations of children living near high traffic areas with decreased lung function (Brunekreef et al., 1997; Gauderman et al., 2007), increased medical visits and hospital admissions for childhood asthma (English et al., 1999; Lin et al., 2002), increased wheezing (Venn et al., 2001), and increased childhood asthma and bronchitis (Kim et al., 2004; Gauderman et al., 2005; McConnell et al., 2006), including development of new asthma cases (McConnell et al., 2010; Gehring et al., 2010). Children living near busy roadways are especially likely to experience elevated exposures because they would also play outdoors in the neighborhood and typically would attend nearby schools. Their higher breathing rates per unit of body mass relative to adults (Adams, 1993) and their developing immune, neurological, and respiratory systems make them especially susceptible to impacts from air pollution.

ARB's recommendation to avoid siting sensitive land uses such as new housing within 500 ft of busy roadways was based on the traffic exposure and health studies completed as of 2005. More recent studies confirm the relationship, and indicate that in some situations an elevated risk extends well past 500 ft. A few studies have measured elevated pollutant levels at distances well beyond 1000 ft (305 m; Karner et al., 2010; Zhou and Levy, 2007). For example, Hu and colleagues (2009) found that in the pre-dawn hours in Los Angeles, elevated ultrafine particle number concentration, nitric oxide, and particle-bound polycyclic aromatic hydrocarbons extended at least 1200 m (3937 ft) downwind of the freeway and did not reach background levels until a distance of 2600 m (8530 ft). More importantly, results from the Southern California Children's Health Study on the association of residential distance to traffic and lung function development, performed in the same general location as the Hu et al. study, found adverse health effects in children living as far as 1500 m (4921 ft) from roads (Gauderman et al., 2007). These are not unique findings; in the HEI (2010) report mentioned above, the authors noted that studies showed that people living up to 500 m (1640 ft) from heavy traffic are most at risk from the health effects of traffic pollution.

Status of Research on Mitigation Concepts

Various building and site mitigation approaches have been suggested as potential means to reduce exposure to traffic pollution near roadways. A review by ARB staff found that there has been limited study of most of these approaches. Building measures examined include high efficiency filtration for residences through either central, in-duct type filtration or portable air cleaners; and external building design measures, such as locating the air intakes for ventilation systems on the opposite side of the building from outdoor sources, reducing the size and number of openable windows on the side of the building nearest the outdoor sources, or housing people in tall buildings. Site mitigation measures examined include the use of sound walls and vegetation as barriers. These measures are all assessed further below. Studies of elevated and below-grade roadways and freeway caps (also called freeway decks, lids or covers), which are covers over a sunken roadway that produce a road tunnel, also were reviewed, but studies were limited and results variable, and these measures are not feasible or are impractical for most new housing developments. Traffic measures such as those to reduce vehicle miles traveled also were considered; most such measures are typically integrated into roadway and community planning for regional benefits.

Building-related Measures: Filtration

No single building-related measure has been identified as adequate to reduce entry of pollutants from nearby roadways to the extent expected from set-back under common conditions. However, the use of high efficiency filtration appears to be relatively effective in most circumstances, as discussed below. It is especially appropriate for new homes because new homes in California must have mechanical ventilation systems [CCR 2008, Title 24, Section 150(o)], and those systems purposely pull outdoor air into the home that often is not filtered at all or is poorly filtered. High efficiency filtration also appears useful in existing homes without mechanical ventilation as discussed below. Mechanical ventilation systems and the Code requirement are discussed further in the Addendum at the end of this paper.

Background for Filtration

Outdoor-generated pollutants enter and leave buildings through three primary mechanisms: mechanical ventilation systems, which actively draw in outdoor air through an intake vent and distribute it throughout the building; natural ventilation (opening of doors or windows), which is the typical ventilation mode for most homes and small commercial buildings in California; and infiltration, which is the passive entry of unfiltered, outdoor air through small cracks and gaps in the building shell. Both natural ventilation and infiltration allow unfiltered air into the building and reduce the effectiveness of any filtration device.

Filter efficiency is rated using several scales, the most common of which is the Minimum Efficiency Reporting Value (MERV) rating system (ASHRAE 52.2-2007 as cited in EPA 2009). Flat fiberglass filters are the most common filters used in residential heating and air systems, and are rated at only MERV 1 to 4; they remove only a portion of the largest particles in the airstream that passes through the filter. MERV 5 to 8 filters are medium efficiency filters that remove some additional types of particles such as mold spores and cat and dog dander, but they still do not remove the finer particles produced on roadways. MERV 9 to 12 filters begin to remove particles smaller than PM2.5. Higher efficiency MERV 13 to 16 filters are rated to remove a portion of the ultrafine and submicron particles emitted from vehicles. True HEPA (high efficiency particle arrestance) filters (equivalent to MERV 17 to 20) remove 99.97% to 99.999% of particles less than 0.3 microns, but these generally have not been available for residential applications. High efficiency filters associated with central heating, ventilating and air conditioning (HVAC) systems must be carefully selected to assure the mechanical system can handle the increased airflow resistance. Additional information on MERV ratings, the size particles they remove, and typical applications are provided in Table 1 in the Addendum at the end of this paper.

High Efficiency Filtration with Mechanical Ventilation

Because mechanical ventilation has not been used in residential buildings until recently, there has been limited assessment of its impact on entry of particles and other pollutants into homes. However, a few recent studies of homes and schools have shown that high efficiency filtration in mechanical ventilation systems can be effective in reducing levels of incoming outdoor particles. In a seven-home study in northern California, Bhangar et al. (2010) found that the two homes with active filtration in a mechanical system had a notably lower portion of indoor particles from outdoors when the systems were on (filtration active) than when they were turned off (no filtration). In a modeling study of Korean residential units with mechanical ventilation, Noh and Hwang (2010) found that filters rated lower than MERV 7 were insufficient for reducing contaminants that enter through the ventilation filter, and concluded that filters should exceed MERV 11. In a school pilot study, a combination of MERV 16 filters used as a replacement for the normal panel filter in the ventilation system and in a separate filtration unit reduced indoor levels of outdoor-generated black carbon, ultrafine particles and PM2.5 by 87% to 96% in three southern California schools (SCAQMD, 2009). Use of the MERV 16 panel filter alone in the HVAC system achieved average particle reductions of nearly 90%. In a study of a single school in Utah, indoor submicron particle counts were reduced to just one-eighth of the outdoor levels in a building with a mechanical system using a MERV 8 filter (Parker et al., 2008). The investigators noted that the building shell and other mechanical system components appeared to play a significant role in the submicron particle removal as well.

These findings are similar to those from earlier studies of mechanically ventilated office buildings (e.g., Jamriska et al., 2000; Fisk et al., 1998). Fisk et al. (2000) concluded that use of higher efficiency filters instead of normal filters can reduce indoor numbers of submicron particles by 90% and that there is evidence of a large rate of removal of submicron indoor particles by processes (e.g., deposition) other than ventilation and filtration.

Because most of the studies discussed above were conducted in buildings with few or no indoor sources of submicron particles, the measured efficiencies of filters for reducing indoor concentrations of submicron particles from all sources may be overestimated. Many other studies have identified activities such as unvented cooking, cigarette smoking, and use of unvented gas appliances as indoor sources of submicron particles (ARB, 2005b, studies cited). These would only be removed by filtration to the extent the indoor air is re-circulated through the filters.

High Efficiency Portable Air Cleaning Devices

Portable or stand-alone air cleaners are generally not as capable as in-duct air cleaners and those associated with mechanical ventilation systems for cleaning large areas such as an entire home (Consumer Reports, 2007). However, when they are appropriately sized for the space to be treated, and when they use high efficiency or HEPA filters, portable air cleaners can significantly reduce particles in the treated area and serve as an adjunct to other pollutant reduction measures (Hacker and Sparrow, 2005; Shaughnessy et al., 1994; Shaughnessy and Sextro, 2006; Skulberg et al., 2005; Ward et al., 2005). In the pilot study conducted in three southern California schools (discussed above), a large stand-alone air cleaner with MERV 16 filters reduced black carbon, ultrafine particles and PM2.5 counts by 90% or more, and PM2.5 mass by 75%, when the HVAC system was not running (SCAQMD, 2009). Barn et al. (2008) found median removal efficiencies of 55% to 65% for PM2.5 from fires and wood burning by a HEPA air cleaner in 21 winter homes and 17 summer homes. In other work, Fisk et al. (2002) estimated an 80% reduction in outdoor fine mode particles with stand-alone air cleaners using filters in the MERV 11 to 13 range.

Because new California homes are now required to have mechanical ventilation, stand-alone air cleaners are less relevant to the assessment of measures for new California home construction. However, highly efficient portable air cleaners may be useful in reducing indoor exposure to pollutants in existing homes that do not have mechanical ventilation, and in homes that use bathroom exhaust type mechanical ventilation systems, which by their design cannot incorporate filtration of the incoming air because the supply air enters through leakage points throughout the building.

Removal of Gaseous Pollutants

There are limited options for effective removal of gaseous pollutants such as volatile organic chemicals, or VOCs, and NO_2 in central systems, and although the number and variety of technologies are increasing, there has been only limited research to date on their effectiveness. However, a few studies have examined the effectiveness of stand-alone filtration technologies intended to remove gaseous pollutants from the airstream (Shaughnessy and Sextro, 2006). The most comprehensive study was conducted by Chen et al. (2005), who tested the initial performance of 15 air cleaners with a mixture of 16 representative VOCs in a chamber study. Sorption filtration (e.g., activated carbon) removed some but not all VOCs (light and very volatile gases such as aldehydes and dichloromethane were not well removed). However, devices that included sorption media such as activated alumina impregnated with potassium permanganate showed better VOC removal efficiencies. In the schools study discussed above, the stand-alone unit used in one of the schools included charcoal sorbent for removal of gaseous pollutants; it removed 52% of the benzene indoors and 15% of total VOCs when operated with the HVAC turned off (SCAQMD, 2009). In a children's daycare center in Finland, Partti-Pellinen et al. (2000) found that up to 50% to 70% of nitrogen oxides could be removed by chemical filtration using a combination of charcoal, aluminum oxide and potassium permanganate, while another study found about 50% NO_2 removal by a HEPA air cleaner with large quantities of carbon in the adsorption bed, but little or no removal by other types of air cleaners (Shaughnessy et al., 1994).

Results from these studies show effectiveness for some technologies but are not conclusive due to their limited number and scope, including a relative lack of real world measurements. Additionally, some investigators have found that some filters re-emit VOCs that have been removed over time, or emit reaction products from the matter collected on the filter (Daisey and Hodgson, 1989; Fisk, 2007; Destaillats et al., 2011; Hyttinen et al., 2006, 2007).

Limitations of High Efficiency Filtration

Although they can substantially reduce indoor concentrations of pollutants, mechanical filtration systems alone are insufficient to fully protect occupants from particles and other emissions from nearby roadways, for several reasons.

- First, most people tend to open their windows or doors at least part of each day (Offermann, 2009; Phillips et al., 1990), and such natural ventilation involves no filtration of incoming air and can diminish any pollutant reductions attained through the use of the mechanical system. The effectiveness of high efficiency filtration in homes whose occupants open their doors and windows regularly has not been quantified.
- Second, as higher MERV filters are used, greater attention must be paid to the increased air flow resistance that occurs with some filter types; mechanical system motors must be sufficiently sized to accommodate the air flow needs.
- Third, studies have shown that homeowners are not provided with sufficient information regarding use and maintenance of their central HVAC systems, or do not read and follow instructions for maintaining their filters (EPA, 2009; Offermann, 2009). Filtration is only effective if filters are well-fitted and are replaced or maintained according to the manufacturer’s recommendations, and duct leakage is minimized (Thatcher et al., 2001; Wallace et al., 2004). Older (aged) filters have been associated with increased irritant health symptoms and decreased work performance in studies of filtration maintenance in workplaces (Clausen, 2004; Seppänen and Fisk, 2002; Wargocki et al., 2004).
- Finally, as discussed above, gaseous pollutants are not removed by most particle filters, and the technologies for VOC removal in residential applications are limited and still evolving.

Expected Benefits of High Efficiency Filtration

High efficiency filtration has been used in homes and schools only recently, and there is a range of highly variable building characteristics, filtration technologies, and occupant behaviors that determine the effectiveness of high efficiency filters in reducing the overall levels of pollutants indoors. Accordingly, it is difficult to accurately quantify the actual reduction in particulate matter that would be achieved by introducing high efficiency filtration on a widespread basis across the population of California homes and schools. For example, while filters with a MERV 16 rating remove more than 95% of particles from 0.3 to 3 microns in diameter, only those particles in the airstream actually passing through the filter are removed. Factors that determine the fraction of particles removed from the air in a building include the airflow rate through the unit, the amount of time that the system is "on", the extent to which windows and doors are opened, and other factors. While results from the studies conducted in homes and schools to date appear promising, those studies usually limited the opening of windows and doors or followed other specific protocols. Thus, although a substantial reduction in particles would be expected, the reduction that would be realized across the wide variety of conditions in California homes and schools cannot be confidently estimated.

Two kinds of programs are currently being implemented that will provide critical information needed to help confirm and quantify the effectiveness of high efficiency filtration. First, ARB is funding two key studies of high efficiency filtration in homes. Second, several local air quality management districts and school districts are implementing programs to install high efficiency filtration devices in a substantial number of schools in California, and collecting data regarding the performance of the filtration units. These are discussed below.

ARB's Planned High Efficiency Filtration Research

ARB is funding a project entitled "Reducing In-Home Exposure to Air Pollution" to measure the exposure reduction and energy use of combinations of mechanical ventilation and filtration systems in order to identify compatible, low-energy systems that are effective at reducing indoor exposures to indoor, and incoming outdoor, pollutants. The study will be conducted by Drs. Brett Singer and Iain Walker of Lawrence Berkeley National Laboratory. The investigators plan to evaluate 15 current and new systems, and test seven of the most promising systems in a test home near a major roadway in an area with high ambient ozone and PM2.5 levels. They will measure fine and ultrafine particles, ozone, VOCs, NO_2 and black carbon, both indoors and outdoors, along with energy consumption and the performance of systems as filters age. This project is needed because new California homes are now required to have mechanical ventilation as discussed above, and the most widely used, low energy mechanical ventilation systems, bathroom exhaust systems, do not filter the incoming air; hence, the occupants' indoor exposure to outdoor air pollutants can potentially increase with these systems.

ARB is also funding a second study entitled "Benefits of High Efficiency Filtration to Children with Asthma". Dr. Deborah Bennett from the University of California at Davis will conduct this 4-year study of 200 children with asthma in Fresno and Riverside to quantify the exposure and asthma reduction benefits of high efficiency filtration in their homes. One intervention group will have high efficiency filters or filtration systems installed in their homes' central heating and air conditioning systems. The second group will have high efficiency portable air cleaners placed in the child's bedroom and in the main living area. Filters with a MERV rating of 15 or higher will be used. Improvements in asthma symptoms will be evaluated in a randomized cross-over design, with each participant receiving high efficiency air filtration for a year and no filtration for a year, allowing the investigators to identify the improvements related to the air filtration. During the control periods, "sham" filters with little or no particle removal capability will be used. Half of the homes with portable air cleaners will also have filters that remove ozone and VOCs. The extent to which particulate matter (PM10, PM2.5

and ultrafine particles), ozone, black carbon, and nitrogen oxides are reduced will be measured. Key asthma health endpoints will also be examined, including unplanned utilization of the healthcare system for asthma-related illness, short-term medication use, symptom diaries, peak exhaled flow, spirometry and exhaled nitric oxide.

Current Programs Using High Efficiency Filtration

Several programs have been completed or are underway in the State to install and/or test high efficiency filters, primarily in schools, to reduce exposures to pollutants from heavy traffic and/or port-related emissions. Since 2008, the South Coast Air Quality Management District (SCAQMD) has approved $3 million for installation of high efficiency air filtration devices in a total of 18 schools and one community center in the Long Beach and Los Angeles Unified School Districts, San Bernardino and the Boyle Heights area (Kwon, 2012). SCAQMD also has agreed to oversee implementation of a program to utilize $5.4 million in settlement funds to install and maintain high performance air filtration devices at about 47 schools in Wilmington and San Pedro. Installation of the filtration devices was scheduled to begin in summer 2012. Detailed site assessments of the schools are underway prior to installation in order to determine the best filtration device for each classroom and to facilitate assessment of actual improvements in classroom air.

Also, the Bay Area Air Quality Management District (BAAQMD) is conducting a school air filtration project in five schools for about $300,000 (Smith, 2012). In 2010, a contractor completed installation of high efficiency air filtration equipment at five elementary schools located in the Bay View Hunters Point neighborhood of San Francisco. The filtration equipment is designed to reduce exposure inside the schools to particles from outdoor sources, as well as indoor-based particles such as some allergens. Initial monitoring results indicate that there has been a substantial reduction of particulate matter (up to about 50% to 75% for PM2.5 and higher for very small particles) inside the classrooms as a result of the newly installed high performance filters (IQAir, 2012).

To date, these programs appear successful, but overall cost, changes to the operation of the classrooms' central HVAC systems (such as running the system continuously rather than allowing it to switch on and off based on temperature needs) and other considerations (noise, drafts) may reduce the feasibility of the current technologies for use in all classrooms and require further refinements. However, because of the similarities of schools to homes with mechanical ventilation systems, one would expect comparable reductions in particle levels from high efficiency HVAC filtration in new and retrofitted homes.

Cost of High Efficiency Filtration

About a dozen companies offer high efficiency filtration devices incorporated into, or suitable for, residential mechanical ventilation systems, and most offer just one or two models. The devices are rated from MERV 11 to 16, plus several are true HEPA filters (equivalent to about MERV 17 to 20). Initial costs range from about $200 to $2800 for a very high end system; however, most cost less than $500. This range does not include installation, although in a new home the added cost over the installation of the mechanical system itself would be expected to be minimal. Annual filter replacement and/or maintenance cost ranges from about $25 to $255 per year, depending on MERV rating, number of filter changes needed per year, and whether the system includes a carbon filter for VOCs (which increases the cost of filter replacement, as these typically need to be replaced several times per year).

For existing homes and those that are renovated and do not have a mechanical ventilation system, either higher efficiency filters in the central heating and air system or portable high efficiency filtration devices could be used. High efficiency filters for central systems that can accept them cost about $20. However, the increased airflow resistance may cause the central system to be less efficient. Effective, high efficiency portable units range in purchase cost from about $200 to $1250 depending on the size of the room or space to be treated and the specific technologies included (e.g., MERV rating and charcoal or other VOC removal filters) and would typically not involve any installation costs. Replacement filters and maintenance range from about $75 to $500 per year, again depending on the types of filters included and how dirty the air is, which would determine the frequency of filter changes needed. To adequately treat the living areas of most homes (e.g., bedrooms, family room, living room), two or more portable units may be needed.

External Building Design Measures

Moving Air Intakes

Research focused on assessing external building design measures is generally not readily available. Locating air intakes for mechanical ventilation systems on the opposite side of the building from the nearby outdoor source and prevailing wind direction seems logical. However, the reduction of pollutant entry in such a case would depend on the distance of the intake from the outdoor source, the consistency of the prevailing wind direction, and any local geographical or structural objects that might produce wind turbulence or eddies near the building and the air intake. One particle expert has noted that moving the intake would likely only be beneficial when the outdoor source is very near the intake and the intake is moved fairly far away; otherwise, because particles tend to disperse quickly and particle plumes “flow” around buildings, elevated particle concentrations around the building will be fairly consistent (Thatcher, 2010). This view appears at least partially substantiated by an Australian study that found that the concentration of submicron particles was consistently high and relatively undiluted around a building that was within 15 m of the roadway (Morawska et al., 1999). However, because this option has received little scientific study, and because all new California homes are required to use mechanical ventilation, which will often include a supply air intake, this option warrants further study to determine whether there are conditions under which strategic placement of air intakes might provide some benefits.

Reducing Openable Windows

Reducing the size and number of openable windows on the side of the building nearest the outdoor source would likely do little to reduce entry of particles and other pollutants into homes. Furthermore, this potential measure may not be acceptable to homeowners, who often open windows to take advantage of the breeze, from which the benefit arises primarily from opening windows on the prevailing wind side of the building. Windows opened only on the opposite side may result in little air movement in the home. In regions of the State where window opening currently replaces air conditioning in the summer evening and nighttime periods, there could be substantial energy and cost penalties for the increased use of mechanical air conditioning to cool the home. Additionally, increased indoor air stagnation and condensation may occur, which can result in mold issues. Thus, for all of these reasons, this option does not appear practical for single family dwellings. This measure might be acceptable in multi-family dwellings, depending on the specific building design and the ventilation systems used. However, inclusion of a sufficient number of windows (even if unopenable) would allow more daylight into the building, which would reduce energy use for indoor lighting and provide the satisfaction and efficiency benefits that accompany daylighting (Heschong Mahone Group, 2003a, 2003b).

Taller Buildings

Housing people in taller buildings has also been suggested as a possible exposure reduction measure. However, one of the few relevant studies of multi-story buildings near busy roadways found that vertical differences in fine and ultrafine particle concentrations outside buildings with 9 to 26 stories were not significant and can be highly variable, depending on other local sources and local meteorological conditions (Morawska et al., 1999). A second study, conducted in New York, found significant decreases for outdoor black carbon and non-volatile polycyclic aromatic hydrocarbons for floors 6 to 32 during the non-heating season only (Jung et al., 2011). Additionally, floors 3 to 5 showed the highest median outdoor concentrations for all pollutants measured, although the trend was not statistically significant and the elevated pollutants were believed to come from nearby rooftop exhausts. Thus, multi-story housing may reduce exposure in some situations but requires further research to determine conditions under which tall buildings might provide a reliable approach to reduce exposure near busy roadways.

Site-related Measures

The primary site-related measures reviewed by ARB staff were sound walls and vegetation barriers.

Sound Walls

Sound walls appear to reduce pollutant concentrations near the roadway; near-road concentrations (within 15-20 m [49-66 ft]) have shown reductions up to about 50% (Ning et al., 2010; Baldauf et al., 2008; Bowker et al., 2007; Hagler et al., 2012). However, in some studies higher levels of pollution were seen behind the barrier and at a distance from the sound walls and roadways, although in some of these studies the higher levels appear related to other sources of pollution (Ning et al., 2010; Bowker et al., 2007; Hagler et al., 2010; Baldauf et al., 2008). In one of the few field measurement studies of sound walls, conducted along two southern California freeways, Ning et al. (2010) found that concentrations at farther distances (about 80 to 100 m from the roadway) were typically greater for the portions of the roads with sound walls, and background levels behind sound walls were not reached until 250 to 400 m as compared to 150 to 200 m without sound walls. Modeling and tracer studies (Heist et al., 2009; Finn et al., 2009) showed that barriers reduced air pollution downwind of the barrier, although in some cases trapping of pollution and increased levels on the road would occur (Hagler et al., 2011; Finn et al., 2009). Nearby buildings and structural barriers can also affect the attenuation and dispersion of pollution from roadways, but results vary with different meteorological conditions (Bowker et al., 2007; Hagler et al., 2010; Hagler et al., 2012).

Vegetation Barriers

Results for vegetation alone are more variable than those for sound walls. Vegetation can remove some gaseous pollutants by uptake or absorption, and particles are removed primarily by interception (impaction or physical adherence; Nowak et al., 2006; Fujii et al., 2008; Smith, 1990; Pardyjak et al., 2008; Baldauf et al., 2008). However, particles can be resuspended, apparently even at very low wind speeds (Fujii et al., 2008; Smith, 1990). Vegetation may restrict dispersion and increase concentrations on-road in street canyons with closer spacing of trees, particularly in low wind conditions (Gromke, 2011; Gromke and Ruck, 2007, 2009; Buccolieri et al., 2009). Another study has further shown the complexity of the effects of vegetation; investigators found different results depending on particle size and wind speed, and a non-linear increase of particle removal with increased leaf area density, which varies by tree species and season (Steffens et al., 2012). Gaps in vegetation barriers can have a significant negative impact on their effectiveness (Hagler et al., 2012), which needs to be addressed in future California research because California roadside vegetation tends to be less dense than that in the eastern U.S., where most previous field studies have been conducted. Also, some types of vegetation can trigger asthma and allergy attacks, and some emit reactive VOCs that contribute to the formation of ozone.

Sound Walls and Vegetation Combined

A combination of sound walls and vegetation appears to be more effective than either one alone. The two used together have been shown to disperse pollutants more consistently and to greater distances than either alone, with up to about a 60% reduction in near roadway levels (Baldauf et al., 2008; Bowker et al., 2007). While sound walls alone and sound walls combined with vegetation show promise, the increase in concentrations on-road and at a distance seen in some studies can increase exposures of others in the population and thus redistributes, rather than removes, pollutants. Additionally, the complexity of pollutant movement under varying conditions makes accurate prediction of exposure reduction difficult. Specific conditions under which sound walls and vegetation can reliably and consistently reduce exposures to air pollution have not been identified, especially in California.

Reduction of Indoor-generated Pollutants to Reduce Overall Exposure

Particles, NO_2 and other pollutants emitted by vehicles and other outdoor sources also have indoor sources that can produce higher indoor concentrations at times (ARB, 2005b, Section 2, and sources cited). Therefore, a reduction in indoor emissions and exposures can reduce the overall health impact of exposure to outdoor pollutants because the total exposure (indoor plus outdoor) to those pollutants experienced by the building occupants would be reduced. A number of studies have identified unvented cooking, cigarette smoking, the use of unvented gas appliances, burning of candles and incense, and woodburning as indoor sources of fine and ultrafine particles (Bhangar et al., 2010; ARB, 2005b; Fortmann et al., 2001; Wallace, 1996; Wallace, 2005; Wallace et al., 2008). High fine and ultrafine particle counts have been measured from such indoor sources. In homes with such sources, average indoor concentrations and occupants' personal exposures to fine and ultrafine PM are dominated by those indoor sources. Thus, measures to reduce indoor sources can help to significantly reduce occupants' peak and overall daily exposures to key pollutants emitted from both traffic and indoor sources.

Summary of Research Review

ARB has developed and adopted increasingly stringent regulations limiting emissions from passenger cars, trucks and buses, which have substantially reduced, and will continue to reduce, vehicle emissions. However, recently adopted regulations have compliance dates extending as far as 2025 for full implementation, and fleet turnover to zero or near-zero technologies will take 20 to 30 years. The set-back of buildings from high traffic roadways remains the most certain approach for preventing the residual health risk from traffic pollution exposures for those living closest to the roadways because it distances them from the highest pollutant concentrations. Research conducted since the publication of ARB's recommendations in 2005 further supports the use of set-back.

There are two mitigation measures that can be effective for exposure reduction. Increased filtration of air and reduction of indoor pollution sources potentially can reduce the overall pollution burden in homes. These measures warrant consideration especially in light of recent studies showing that the pollutant plumes at times can extend beyond 1000 ft (305 m) from the roadway. For most residential applications near busy roadways, high efficiency (MERV 13 to 16, or higher) pleated particle filters would generally be considered the most effective approach to filtration because they can remove the very small particles emitted by motor vehicles without emitting ozone, formaldehyde, or other harmful byproducts. Based on a limited number of studies, such high efficiency filtration has been shown to reduce indoor PM2.5 and ultrafine particle levels by up to 90% relative to incoming outdoor levels when doors and windows are kept mostly closed. Purchase costs for high efficiency filtration devices or systems that are compatible with residential mechanical ventilation systems (which are now required in new residential construction in California) range from $200 up to $2800, but most are available for under $500. Because Title 24 now requires mechanical ventilation for new residential construction, enhanced filtration can help avoid increased exposures to outdoor pollutants that may occur. The use of high efficiency air filters in central heating and air systems or stand-alone air cleaning devices can also reduce exposures in existing homes and homes that use certain types of mechanical ventilation systems that cannot accommodate central filtration.

While research shows that high efficiency filtration can be effective, it has several limitations. Filtration cannot remove all incoming outdoor pollutants because of normal building leakage and the fact that most people open windows and doors at least a portion of the day, allowing entry of unfiltered air. Additionally, not all pollutants are filtered by the filter media. Moreover, studies show irregular homeowner maintenance of filters and central systems, and regular maintenance is critical for effective removal of pollutants. ARB is funding two studies that should help further identify the approximate reduction in exposure that high efficiency filtration can provide in homes. High efficiency filtration is already being used or is planned for use in over 70 schools in California; these programs should provide comparable information for high efficiency filtration in classrooms.

The benefits are less clear for most of the other potential mitigation measures examined. Studies have shown that the use of sound walls alone, or sound walls and vegetation together, can reduce near roadway concentrations by about 50% and 60%, respectively. However, the extent of exposure reduction is quite variable under different conditions of meteorology and topography, and increased levels of pollutants can occur on-road and at a distance from the roadway. Thus, unlike the situation with filtration, pollutants are primarily redistributed rather than removed; while individuals living near the roadway would benefit, those traveling on the road or living at a distance could experience elevated exposures at times. The effectiveness of vegetation alone is even more variable, and has not been well-quantified. Furthermore, vegetation with low allergenic potential and low reactive VOC formation needs to be identified and tested, and other limitations of vegetation as a pollution barrier need to be better understood. Research is needed that identifies the specific conditions under which sound walls and vegetation can consistently provide a reliable exposure reduction benefit with limited disbenefits. In particular, California field studies are needed because of the significant differences in California meteorology, building practices, and flora from those of the eastern U.S.

The limited studies conducted to date on other potential mitigation concepts are not promising, although further research may identify situations in which they are generally effective. Placement of air intakes on the side of the building opposite the roadway may make little difference in terms of exposure, due to rapid particle movement around buildings. Locating windows only on the side of the building opposite the roadway reduces indoor daylighting, air circulation and cooling, and may do little to reduce exposure. Finally, taller buildings do not necessarily experience substantially reduced pollutant levels at higher floor levels, depending on local meteorology and other nearby sources of pollution. However, further research on placement of air intakes and housing in taller buildings may identify conditions under which these measures reliably reduce exposures. Research is warranted on these measures and the measures discussed above as effective or showing promise in order to further identify cumulative measures that together can assure sufficient exposure reduction and health protection for those living near busy roadways.

References

Adams WC, 1993. Measurement of Breathing Rate and Volume in Routinely Performed Daily Activities. Final Report to the California Air Resources Board, Contract no. A033-205.

Andersen ZJ, Hvidberg M, Jensen SS, Ketzel M, Loft S, Sørensen M, Tjønneland A, Overvad K, Raaschou-Nielsen O. 2010. Chronic Obstructive Pulmonary Disease and Long-Term Exposure to Traffic-Related Air Pollution: A Cohort Study. American Journal of Respiratory and Critical Care Medicine, doi: 10.1164/rccm.201006-0937OC.

ARB, 2005a. Air Quality and Land Use Handbook: A Community Health Perspective. Califiornia Air Resources Board, April 2005. http://www.arb.ca.gov/ch/handbook.pdf

ARB, 2005b. Report to the California Legislature: Indoor Air Pollution in California. California Air Resources Board. Found at http://www.arb.ca.gov/research/indoor/ab1173/rpt0705.pdf.

Baldauf R, Thomas E, Khlystov A, Isakov V, Bowker G, Long T, Snow R, 2008. Impact of noise barriers on near-road air quality. Atmospheric Environment 42: 7502-7507.

Barn P, Larson T, Noulett M, Kennedy S, Copes R, Brauer M, 2008. Infiltration of forest fire and residential wood smoke: an evaluation of air cleaner effectiveness. J. Exposure Sci. and Environ. Epidemiology 18: 503-511.

Batterman SA, Zhang K, Kononowech R. 2010. Prediction and analysis of near-road concentrations using a reduced-form emission/dispersion model. Environmental Health 9: 29, doi: 10.1186/1476-069X-9-29.

Bemis GR, Ranzieri AJ, Benson PE, Peter RR, Pinkerman KO, Squires BT. 1977. Air Pollution and Roadway Location, Design, and Operation – Project Overview. FHWA-CA-TL-7080-77-25. California Department of Transportation. Found at http://www.dot.ca.gov/newtech/researchreports/1976-1977/77-25.pdf.

Bhangar S, Mullen NA, Hering SV, Kreisberg NM, Nazaroff WW. 2010. Ultrafine particle concentrations and exposures in seven residences in northern California. Indoor Air, doi: 10.1111/j.1600-0668.2010.00689.x.

Bowker GE, Baldauf R, Isakov V, Khlystov A, Petersen W. 2007. The effects of roadside structures on the transport and dispersion of ultrafine particles from highways. Atmospheric Environment 41 (37): 8128-8139.

Brauer M, Lencar C, Tamburic L, Koehoorn M, Demers P, Karr C. 2008. A cohort study of traffic-related air pollution impacts on birth outcomes. Environmental Health Perspectives 116 (5): 680-686.

Brunekreef B, Janssen NA, de Hartog J, Harssema H, Knape M, van Vliet P, 1997. Air pollution from truck traffic and lung function in children living near motorways. Epidemiology 8 (3): 298-303.

Buccolieri R, Gromke C, Di Sabatino S, Ruck B, 2009. Aerodynamic effects of trees on pollutant concentration in street canyons. Science of the Total Environment 407 (19): 5247-5256.

Bunn F, Collier T, Frost C, Ker K, Roberts I, Wentz R, 2003. Traffic calming for the prevention of road traffic injuries: systematic review and meta-analysis. Injury Prevention 9:200-204.

CCR 2008. California Code of Regulations, Title 24, Article 1, Energy Building Regulations, Section 150(o), Ventilation for Indoor Air Quality. Found at http://www.energy.ca.gov/2008publications/CEC-400-2008-001/CEC-400-2008-001-CMF.PDF

CEC 2010. Residential Compliance Manual – 2008 Building Energy Efficiency Standards. Publication number CEC-400-2008-016-CMF-Rev1. California Energy Commission. Found at http://www.energy.ca.gov/2008publications/CEC-400-2008-016/CEC-400-2008-016-CMF-REV1.PDF

Chen W, Zhang JS, Zhang Z, 2005. Performance of air cleaners for removing multiple volatile organic compounds in indoor air. ASHRAE Transactions 111 (1): 1101-1114.

Child & Associates, 2004. M5 East Freeway: A review of emission treatment technologies, systems & applications. NSW Roads and Traffic Authority. Found at http://www.rta.nsw.gov.au/constructionmaintenance/downloads/2004_10_childrepfiltration.pdf

Clausen G, 2004. Ventilation filters and indoor air quality: a review of research from the International Centre for Indoor Environment and Energy. Indoor Air 14 Suppl 7: 202-7.

Consumer Reports, 2007. Air Purifiers: Filtering the Claims. December 2007, issue 12: 48-51.

Dabberdt WF, Cagliostro DJ, Meisel WS, Horowitz AJ, Skinner G, 1974. Studies of air quality on and near highways. Interim report No. 1, 1973-74. Report number PB-82-192147. Stanford Research Institute. Found at http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=6854698.

Daisey JM, and AT Hodgson, 1989. Initial efficiencies of air cleaners for the removal of nitrogen dioxide and volatile organic compounds. Atmospheric Environment 23: 1885-1892.

de Nazelle A, Rodriguez DA, Crawford-Brown D, 2009. The built environment and health: Impacts of pedestrian-friendly designs on air pollution exposure. Science of the Total Environment 407 (8): 2525-35.

Destaillats H, Chen W, Apte M, Li N, Spears M, Almonsi J, Brunner G, Zhang J, Fisk W, 2011. Secondary pollutants from ozone reactions with ventilation filters and degradation of filter media additives. Atmospheric Environment 45: 3561-3568.

Durant JL, Ash CA, Wood EC, Herndon SC, Jayne JT, Knighton WB, Canagaratna MR, Trull JB, Brugge D, Zamore W, Kolb CE, 2010. Short-term variation in near-highway air pollutant gradients on a winter morning. Atmospheric Chemistry and Physics Discussions 10: 1-28.

English P, Neutra R, Scalf R, Sullivan M, Waller L, Zhu L, 1999. Examining associations between childhood asthma and traffic flow using a geographic information system. Environmental Health Perspectives 107 (9): 761-767.

EPA 2007. Measuring the air quality and transportation impacts of infill development. EPA 231-R-07-001. Environmental Protection Agency. Found at http://www.epa.gov/smartgrowth/pdf/transp_impacts_infill.pdf.

EPA 2009. Residential Air Cleaners (Second Edition): A Summary of Available Information. EPA 402-F-09-002. Environmental Protection Agency. Found at http://www.epa.gov/iaq/pdfs/residential_air_cleaners.pdf

Finn D, Clawson KL, Carter RG, Rich JD, Eckman RM, Perry SG, Isakov V, Heist DK, 2010. Tracer studies to characterize the effects of roadside noise barriers on near-road pollutant dispersion under varying atmospheric stability conditions. Atmospheric Environment 44: 204-214.

Fisk WJ, Faulkner D, Sullivan D, Dong M, Dabrowski C, Thomas JJ, Mendell MJ, Hines CJ, Ruder AM, Boeniger MF, 1998. The Healthy Building Intervention Study: Objectives, Methods and Results of Selected Environment Measurements. LBNL-41546. Lawrence Berkeley National Laboratory. Found at http://www.osti.gov/bridge/servlets/purl/674933-HRRsOR/webviewable/.

Fisk WJ, Faulkner D, Sullivan D, Mendell MJ, 2000. Particle Concentrations and Sizes with Normal and High Efficiency Air Filtration in a Sealed Air-Conditioned Office Building. Aerosol Science and Technology 32 (6): 527-544.

Fisk WJ, Faulkner D, Palonen J, Seppanen OA, 2002. Performance and costs of particle air filtration technologies. Indoor Air 12 (4): 223-234.

Fisk WJ, 2007. Can Sorbent-based Gas Phase Air Cleaning for VOCs Substitute for Ventilation in Commercial Buildings? Proceedings of IAQ 2007 conference, “Healthy and Sustainable Buildings,” October 15-17, 2007, Baltimore, MD. Sponsored by ASHRAE, Atlanta.

Fortmann R, Kariher P, Clayton R, 2001. Indoor Air Quality: Residential Cooking Exposures. Final report to the California Air Resources Board. Contract number 97-330. Found at http://www.arb.ca.gov/research/abstracts/97-330.htm.

Fujii E, Lawton J, Cahill TA, Barnes DE, Hayes C, Spada N, McPherson G, 2008. Removal Rates of Particulate Matter onto Vegetation as a Function of Particle Size. Final Report to Breathe California of Sacramento-Emigrant Trails' Health Effects Task Force and Sacramento Metropolitan Air Quality Management District. Found at http://www.sacbreathe.org/Local%20Studies/Vegetation%20Study.pdf.

Gauderman JW, Vora H, McConnell R, Berhane K, Gilliland F, Thomas D, Lurmann F, Avol E, Kunzli N, Jerrett M, Peters J, 2007. Effect of exposure to traffic on lung development from 10 to 18 years of age: a cohort study. Lancet 369: 571-577.

Gauderman WJ, Avol E, Lurmann F, Kuenzli N, Gilliland F, Peters J, 2005. Childhood asthma and exposure to traffic and nitrogen dioxide. Epidemiology 16 (6): 737-743.

Gehring U, Wijga AH, Brauer M, Fischer P, de Jongste JC, Kerkhof M, Oldenwening M, Smit HA, Brunekreef B, 2010. Traffic-related air pollution and the development of asthma and allergies during the first 8 years of life. American Journal of Respiratory and Critical Care Medicine 181 (6): 596-603.

Gromke C and Ruck B, 2007. Influence of trees on the dispersion of pollutants in an urban street canyon – Experimental investigation of the flow and concentration field. Atmospheric Environment 41 (16): 3287-3302.

Gromke C and Ruck B, 2009. On the Impact of Trees on Dispersion Processes of Traffic Emissions in Street Canyons. Boundary-Layer Meteorology 131 (1): 19-34.

Gromke C, 2011. A vegetation modeling concept for Building and Environmental Aerodynamics wind tunnel tests and its application in pollutant dispersion studies. Environmental Pollution, 159: 2094-2099.

Hacker DW and Sparrow EM, 2005. Use of air-cleaning devices to create airborne particle-free spaces intended to alleviate allergic rhinitis and asthma during sleep. Indoor Air 15 (6): 420-431.

Hagler GSW, Thomas ED, Baldauf RW, 2010. High-resolution mobile monitoring of carbon monoxide and ultrafine particle concentrations in a near-road environment. Journal of the Air & Waste Management Association 60 (3): 328-36.

Hagler GSW, Tang W, Freeman MJ, Heist DK, Perry SG, Vette AF, 2011. Model evaluation of roadside barrier impact on near-road air pollution. Atmospheric Environment 45: 2522-2530.

Hagler GSW, Lin MY, Khlystov A, Baldauf RW, Isakov V, Faircloth J, Jackson LE, 2012. Field investigation of roadside vegetative and structural barrier impact on near-road ultrafine particle concentrations under a variety of wind conditions. Science of the Total Environment 419: 7-15.

Hankey S and Marshall JD, 2009. Impacts of urban form on future US passenger-vehicle greenhouse gas emissions. Energy Policy 38 (9): 4880-4887.

HEI, Health Effects Institute, 2010. Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects, Special Report 17. HEI Panel on the Health Effects of Traffic-Related Air Pollution. January 2010.

Heist DK, Perry SG, Brixey LA, 2009. A wind tunnel study of the effect of roadway configurations on the dispersion of traffic-related pollution. Atmospheric Environment 43: 5101-5111.

Heschong Mahone Group, Inc., 2003a. Windows and Offices: A Study of Office Worker Performance and the Indoor Environment. Technical Report to the California Energy Commission, P500-03-082-A-9, October 2003.

Heschong Mahone Group, Inc., 2003b. Windows and Classrooms: A Study of Student Performance and the Indoor Environment. Technical Report to the California Energy Commission, P500-03-082-A-7, October 2003.

Hosking J, Macmillan A, Connor J, Bullen C, Ameratunga S, 2010. Organisational travel plans for improving health. Cochrane Database of Systematic Reviews 3: CD005575, doi: 10.1002/14651858.CD005575.pub3.

Hu S, Fruin S, Kozawa K, Mara S, Paulson S, Winer AM, 2009. A wide area of air pollutant impact downwind of a freeway during pre-sunrise hours. Atmospheric Environment 43: 2541-2549.

Hyttinen M, Pasanen P, Bjorkroth M, Kalliokoski P, 2007. Odors and volatile organic compounds released from ventilation filters. Atmospheric Environment 41: 4029-4039.

Hyttinen M, Pasanen P, Kalliokoski P, 2006. Removal of ozone on clean, dusty and sooty supply air filters. Atmospheric Environment 40: 315-325.

IQAir 2012. Performance Testing & Monitoring Final Report (San Francisco Unified School District), submitted to the Bay Area Air Quality Management District, contract no. 2010-095.

Jamriska M, Morawska L, Clark BA, 2000. Effect of ventilation and filtration on submicrometer particles in an indoor environment. Indoor Air 10 (1): 19-26.

Janssen NAH, van Vliet PHN, Aarts F, Harssema H, Brunekreef B, 2001. Assessment of exposure to traffic related air pollution of children attending schools near motorways. Atmospheric Environment 35 :3875-3884.

Jerrett M, Finkelstein MM, Brook JR, Arain MA, Kanaroglou P, Stieb DM, Gilbert NL, Verma D, Finkelstein N, Chapman KR, Sears MR, 2009. A cohort study of traffic-related air pollution and mortality in Toronto, Ontario, Canada. Environmental Health Perspectives 117 (5): 772-777.

Jung KH, Bernabe K, Moors K, Yan B, Chillrud SN, Whyatt R, Camaan D, Kinney PK, Perera FP, Miller RL, 2011. Effects of Floor Level and Building Type on Residential Levels of Outdoor and Indoor Polycyclic Aromatic Hydrocarbons, Black Carbon, and Particulate Matter in New York City, Atmosphere 2: 96-109.

Kan H, Heiss G, Rose KM, Whitsel EA, Lurmann F, London SJ, 2008. Prospective analysis of traffic exposure as a risk factor for incident coronary heart disease: the Atherosclerosis Risk in Communities (ARIC) study. Environmental Health Perspectives 116 (11): 1463-1468.

Karner AA, Eisinger DS, Niemeier DA, 2010. Near Roadway Air Quality: Synthesizing the Findings from Real-World Data. Environmental Science & Technology 44: 5334-5344.

Kendrick CM, Moore A, Haire A, Bigazzi A, Figliozzi M, Monsere CM, George L, 2011. Impact of bicycle lane characteristics on exposure of bicyclist to traffic-related particulate matter. Transportation Research Record, 2247: 24-32.

Kim JJ, Smorodinsky S, Lipsett M, Singer B, Hodgson A, Ostro B, 2004. Traffic-related air pollution near busy roads: The East Bay Children's Respiratory Health Study. American Journal of Respiratory and Critical Care Medicine 170: 520-526.

Knape M, 1999. Traffic related air pollution in city districts near motorways. The Science of the Total Environment, 235:339-341.

Kozawa K, Fruin S, Winer AM, 2009a. Near-road air pollution impacts of goods movement in communities adjacent to the ports of Los Angeles and Long Beach. Atmospheric Environment 43: 2960-2970.

Kozawa KH, Fruin SA, Winer AM, 2009b. A predictive model to determine near-freeway pollution impacts. Presented at the 2009 Annual Conference for the International Society for Exposure Science, Minneapolis, MN.

Krämer U, Herder C, Sugiri D, Strassburger K, Schikowski T, Ranft U, Rathmann W, 2010. Traffic-related air pollution and incident type 2 diabetes: results from the SALIA cohort study. Environmental Health Perspectives 118 (9): 1273-1279

Kuhn T, Biswas S, Sioutas C, 2005. Diurnal and seasonal characteristics of particle volatility and chemical composition in the vicinity of a light-duty vehicle freeway. Atmospheric Environment 39: 7154-7166.

Künzli N, Jerrett M, Garcia-Esteban R, Basagaña X, Beckermann B, Gilliland F, Medina M, Peters J, Hodis HN, Mack WJ, 2010. Ambient air pollution and the progression of atherosclerosis in adults. PloS One 5 (2): 90-96.

Kwon, 2012. Patricia Kwon, Air Quality Specialist, SCAQMD, personal communication.

Lin S, Munsie JP, Hwang SA, Fitzgerald E, Cayo MR, 2002. Childhood asthma hospitalization and residential exposure to state route traffic. Environmental Research 88 (2): 73-81.

Litman T, 1999. Traffic calming benefits, costs and equity impacts. Victoria Transport Policy Institute, British Columbia, Canada.

Llop S, Ballester F, Estarlich M, Esplugues A, Rebagliato M, Iñiguez C, 2010. Pre-term birth and exposure to air pollutants during pregnancy. Environmental Research 110 (8): 778-785.

Marshall JD, 2008. Environmental inequality: Air pollution exposures in California's South Coast Air Basin. Atmospheric Environment 42 (21): 5499-5503.

Marshall JD, Brauer M, Frank LD, 2009. Healthy neighborhoods: walkability and air pollution. Environmental Health Perspectives 117 (11): 1752-9.

McConnell R, Berhane K, Yao L, Jerrett M, Lurmann F, Gilliland F, Kunzli N, Gauderman J, Avol E, Thomas D, Peters J, 2006. Traffic, susceptibility, and childhood asthma. Environmental Health Perspectives 114 (5): 766-72.

McConnell R, Islam T, Shankardass K, Jerrett M, Lurmann F, Gilliland F, 2010. Childhood incident asthma and traffic-related air pollution at home and school. Environmental Health Perspectives 118 (7): 1021-1026.

Moore KF, Ning Z, Ntziachristos L, Schauer JJ, Sioutas C, 2007. Daily variation in the properties of urban ultrafine aerosol – Part I: Physical characterization and volatility. Atmospheric Environment 41: 8633-8646.

Morawska L, Thomas S, Gilbert D, Greenaway C, Rijnders E, 1999. A study of the horizontal and vertical profile of submicrometer particles in relation to a busy road. Atmospheric Environment 33: 1261-1274.

Nikolaou M, Buffington J, Herrera A, Inkeuk H, 1997. Traffic Air Pollution Effects of Elevated, Depressed, and At-Grade Level Freeways in Texas. Final report FHWA/TX-97/1327-4. Texas Transportation Institute, The Texas A&M University System. Found at http://pubs.chee.uh.edu/faculty/nikolaou/TTIFinalReport.pdf.

Ning Z, Geller MD, Moore KF, Sheesley R, Schauer J, Sioutas C, 2007. Daily variation in chemical characteristics of urban ultrafine aerosols and inference of their sources. Environmental Science and Technology 41: 6000-6006.

Ning Z, Hudda N, Dasher N, Kam W, Herner J, Kozawa K, Mara S, Sioutas C, 2010. Impact of roadside noise barriers on particle size distributions and pollutant concentrations near freeways. Atmospheric Environment 44: 3118-3127.

Noh K-C and Hwang J, 2010. The Effect of Ventilation Rate and Filter Performance on Indoor Particle Concentration and Fan Power Consumption in a Residential Housing Unit. Indoor and Built Environment 19 (4): 444-452.

Nowak DJ, Crane DE, Stevens JC, 2006. Air pollution removal by urban trees and shrubs in the United States. Urban Forestry & Urban Greening 4 (3-4): 115-123.

Ntziachristos L, Ning Z, Geller MD, Sioutas C, 2007. Particle concentration and characteristics near a major freeway with heavy-duty diesel traffic. Environmental Science and Technology 41: 2223-2230.

Offermann F, 2009. Ventilation and Indoor Air Quality in New Homes. Collaborative Report. CEC-500-2009-085. California Air Resources Board and California Energy Commission, PIER Energy-Related Environmental Research Program. Found at http://www.arb.ca.gov/research/apr/past/04-310.pdf

Pardyjak ER, Speckart SO, Yin F, Veranth JM, 2008. Near source deposition of vehicle generated fugitive dust on vegetation and buildings: Model development and theory. Atmospheric Environment 42 (26): 6442-6452.

Parker JL, Larson RR, Eskelson E, Wood EM, Veranth JM, 2008. Particle size distribution and composition in a mechanically ventilated school building during air pollution episodes. Indoor Air 18 (5): 386-393.

Partti-Pellinen K, Marttila O, Ahonen A, Suominen, O. and Haahtela T, 2000. Penetration of Nitrogen Oxides and Particles from Outdoor into Indoor Air and Removal of the Pollutants through Filtration of Incoming Air. Indoor Air 10: 126–132. http://onlinelibrary.wiley.com/doi/10.1034/j.1600-0668.2000.010002126.x/pdf

Phillips TJ, Mulberg EJ, Jenkins PL, 1990. Activity Patterns of California Adults and Adolescents: Appliance Use, Ventilation Practices, and Building Occupancy. Proceedings of the ACEEE 1990 Summer Study on Energy Efficiency in Buildings, Vol. 4.

PRC 21151.8. California Public Resources Code, Division 13, chapter 4, Section 21151.8. See also Education Code Section 17213.

Reich J, 2007. Factors Affecting the Feasibility of Urban Infill Development Over Freeways. Another shade of green: Implementing complex multidisciplinary work. Architecture Department, California Polytechnic State University San Luis Obispo. Found at http://www.arch.calpoly.edu/research/documents/research-0607/Reich_2.pdf.

SCAQMD, 2009. Pilot Study of High Performance Air Filtration for Classrooms Applications. Final Report to the South Coast Air Quality Management District. South Coast Air Quality Management District and IQAir North America. Found at http://www.aqmd.gov/rfp/attachments/2010/AQMDPilotStudyFinalReport.pdf.

Schweitzer L and Zhou J, 2010. Neighborhood air quality, respiratory health, and vulnerable populations in compact and sprawled regions. Journal of the American Planning Association 76 (3): 363-371.

Seppänen OA and Fisk WJ, 2002. Association of ventilation system type with SBS symptoms in office workers. Indoor Air 12 (2): 98-112.

Shaughnessy RJ, Levetin E, Blocker J, Sublette KL, 1994. Effectiveness of Portable Indoor Air Cleaners: Sensory Testing Results. Indoor Air 4 (3): 179-188.

Shaughnessy RJ and Sextro RG, 2006. What is an effective portable air cleaning device? A review. Journal of Occupational and Environmental Hygiene 3 (4): 169-181.

Singer BC, Hodgson AT, Hotchi T, Kim JJ, 2004. Passive measurement of nitrogen oxides to assess traffic-related pollutant exposure for the East Bay Children's Respiratory Health Study. Atmospheric Environment 38: 393-403.

Skulberg KR, Skyberg K, Kruse K, Eduard W, Levy F, Kongerud J, Djupesland P, 2005. The effects of intervention with local electrostatic air cleaners on airborne dust and the health of office employees. Indoor Air 15 (3): 152-159.

Smith WH, 1990. Air pollution and forests. New York: Springer-Verlag.

Smith J, 2012. Information Officer, Bay Area Air Quality Management District. Personal communication.

Steffens JT, Wang YJ, Zhang KM, 2012. Exploration of effects of a vegetation barrier on particle size distributions in a near-road environment. Atmospheric Environment 50: 120-128.

Thatcher TL, 2010. Personal Communication. November 8, 2010.

Thatcher TL, McKone TE, Fisk WJ, Sohn MD, Delp WW, Riley WJ, Sextro RG, 2001. Factors affecting the concentration of outdoor particles indoors (COPI): Identification of data needs and existing data. LBNL-49321. Lawrence Berkeley National Laboratory. Found at http://emc.ornl.gov/CSEPPweb/data/Reports/Berkely%20Reports/LBNL-49321copi.pdf.

U. S. EPA, 2007. Final Rule on the Control of Emissions of Air Pollution from 2007 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Revision of Light-Duty On-Board

Diagnostics Requirements (66 FR 5002, January 18, 2001). Referred to as the "U.S. EPA's 2007 Final Rule" or "2007 Final Rule." See http://www.epa.gov/otaq/diesel.htm#hd2007.

Venn AJ, Lewis SA, Cooper M, Hubbard R, Britton J, 2001. Living near a main road and the risk of wheezing illness in children. American Journal of Respiratory and Critical Care Medicine 164 (12): 2177-2180.

Wallace LA, 1996. Indoor particles: a review. Journal of the Air & Waste Management Association 46 (2): 98-126.

Wallace LA, 2005. Ultrafine particles from a vented gas clothes dryer. Atmospheric Environment 39 (32): 5777-5786.

Wallace LA, Emmerich SJ, Howard-Reed C, 2004. Effect of central fans and in-duct filters on deposition rates of ultrafine and fine particles in an occupied townhouse. Atmospheric Environment 38 (3): 405-413.

Wallace LA, Wang F, Howard-Reed C, Persily A, 2008. Contribution of gas and electric stoves to residential ultrafine particle concentrations between 2 and 64 nm: size distributions and emission and coagulation remission and coagulation rates. Environmental Science & Technology 42 (23): 8641-8647.

Ward M, Siegel JA, Corsi RL, 2005. The effectiveness of standalone air cleaners for shelter-in-place. Indoor Air 15 (2): 127-134.

Wargocki P, Wyon DP, Fanger PO, 2004. The performance and subjective responses of call-center operators with new and used supply air filters at two outdoor air supply rates. Indoor Air 14 Suppl 8: 7-16.

Westerdahl D, Fruin SA, Sax T, Fine PM, Sioutas C, 2005. Mobile platform measurements of ultrafine particles and associated pollutant concentrations on freeways and residential streets in Los Angeles. Atmospheric Environment 39: 3597-3610.

Wilhelm M and Ritz B, 2003. Residential proximity to traffic and adverse birth outcomes in Los Angeles County, California, 1994-1996. Environmental Health Perspectives 111 (2): 207-216.

Wilhelm M, Ghosh JK, Su J, Cockburn M, Jerrett M, Ritz B, 2011. Traffic-related air toxics and preterm birth: a population-based case-control study in Los Angeles County, California. Environmental Health 10 (1): 89.

Williams LA, Ulrich CM, Larson T, Wener MH, Wood B, Campbell PT, Potter JD, McTiernan A, De Roos AJ, 2009. Proximity to traffic, inflammation, and immune function among women in the Seattle, Washington, area. Environmental Health Perspectives 117 (3): 373-8.

Zhou Y and Levy JI, 2007. Factors influencing the spatial extent of mobile source air pollution impacts: a meta-analysis. BioMed Central Public Health 7: 89, doi: 10.1186/1471-2458-7-89.

Zhu Y, Hinds WC, Kim S, Shen S, Sioutas C, 2002a. Concentration and size distribution of ultrafine particles near a major highway. Journal of the Air and Waste Management Association 52: 1032-1043.

Zhu Y, Hinds WC, Kim S, Shen S, Sioutas C, 2002b. Study of ultrafine particles near a major highway with heavy-duty diesel traffic. Atmospheric Environment 36: 4323-4335.
Zhu Y, Hinds WC, Kim S, Shen S, Sioutas C, 2004. Seasonal trends of concentration and size distribution of ultrafine particles near major highways in Los Angeles. Journal of Aerosol Science and Technology 38 (S1): 5-13.

Zhu Y, Kuhn T, Mayo T, Hinds WC, 2006. Comparison of daytime and nighttime concentration profiles and size distributions of ultrafine particles near a major highway. Environmental Science and Technology 40: 2531-2536.

ADDENDUM

Current California Building Code Requirements

Section 150(o) of Title 24 of the California Code of Regulations (CCR 2008) requires mechanical ventilation in all new residential construction in California built after January 1, 2010. Section 150(o) allows the requirement to be met through a variety of system types (CEC 2010). “Exhaust only” type systems increase the entry of unfiltered outdoor air through leakage points in the building shell and can result in negative pressure indoors, thus increasing the possibility of backdrafting of combustion emissions from gas water heaters, fireplaces and other combustion appliances. These are the most widely used systems in California. “Supply systems” typically use a small motor to bring outdoor air in through a ducted supply and can include high efficiency filters to filter the air as it is brought in, prior to circulation of the air throughout the home. Combination (supply and exhaust) systems are available, with some linked to the central heating and air system; these include filtration of incoming outdoor air. However, the Code requires only a MERV 6 air filter (an increase to MERV 8 is proposed in the 2012 revisions to Title 24), which does not remove the smaller particles emitted by vehicles which are the particles of greatest concern. In future construction, the type of mechanical system used in new homes will have a major impact on the entry of outdoor pollutants indoors − if filtration is not included or is weak, indoor exposures to outdoor pollutants likely will increase.

Table 1. MERV Ratings*

MERV Rating	**Average Particle Size Efficiency (PSE), microns – % Removal**			**Typical Controlled Contaminant or Material Sources (ASHRAE 52.2)**	**Typical Building Applications**
	0.3-1.0	**1.0-3.0**	**3.0-10.0**		
1-4			<20%	**> 10 Microns** Textile Fibers Dust Mites, Dust, Pollen	Window AC units Common Residential Minimal Filtration
5			20-35	**3.0 to 10.0 Microns** Cement Dust, Mold Spores, Dusting Aids	Industrial Workplace Better Residential Commercial
8			>70		
9		<50	>85	**1.0 to 3.0 Microns** Legionella, Some Auto Emissions, Humidifier Dust	Hospital Laboratories Better Commercial Superior Residential
12		>80	>90		
13	<75	>90	>90	**0.3 to 1.0 Microns** Bacteria, Droplet Nuclei (sneeze), Most Tobacco Smoke, Insecticide Dust	Superior Commercial Smoking Lounge Hospital Care General Surgery
16	>95	>95	>95		
17**	≥ 99.97			**<0.3 Microns (HEPA/ULPA filters)**** Viruses, Carbon Dust, Fine Combustion Smoke	Clean Rooms Carcinogenic & Radioactive Matls., Orthopedic Surgery
18**	≥ 99.99				
19, 20**	≥ 99.999				

* Adapted from EPA 2009; originally from ANSI/ASHRAE Standard 52.2-2007.
** Not part of the official ASHRAE Standard 52.2 test, but added by ASHRAE for comparison purposes.