



Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

Seventeenth Quarterly Report of Ambient Air Quality Monitoring at Sunshine Canyon Landfill and Van Gogh Elementary School

(December 1, 2011 – February 29, 2012)

Quarterly Report
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Executive Summary

ES-1. Background

Continuous monitoring of meteorological and air quality parameters began at the Sunshine Canyon Landfill (the Landfill) and at Van Gogh Elementary School in the nearby community of Granada Hills in fall 2007. PM₁₀ (particulate matter less than 10 microns in aerodynamic diameter) is measured hourly. Wind speed and wind direction are measured as 1-minute averages, and black carbon (BC, a surrogate for diesel particulate matter) is averaged over 5-minute intervals. The collected data undergo quarterly validation and are evaluated for completeness.

Following data validation, all data are reported as hourly averages. PM₁₀ concentrations are then compared with federal and state PM₁₀ standards. When PM₁₀ concentrations are above the standards, additional comparisons are made with the historical, regional, and annual ambient PM₁₀ concentrations. At least annually, the PM₁₀ and BC data are analyzed to characterize the impact of landfill operations on ambient air quality on a neighborhood scale. The validated hourly data and a summary of the analytical results and field operations are reported to the Planning Department of the City of Los Angeles. This Seventeenth Quarterly Report summarizes the winter quarter monitoring results from the fourth year of continuous monitoring.

ES-2. Statistics

Data capture for the monitoring period of December 1, 2011, through February 29, 2012, was greater than 95% for all parameters at both sites, but wind sensor damage caused some data invalidation at each of the two sites. About 16% of wind data were invalidated at the Community site because of damage to a newly installed propeller on the wind speed sensor. This follows an 8% loss of wind data from the previous quarter. High winds at the Landfill site caused a gross misalignment of the mast holding the wind speed sensor, and wind data from the first seven days of December were invalidated at that location, reducing the valid data percentage by about 7%. There were no exceedances of the 150 µg/m³ 24-hr federal PM₁₀ standard during this monitoring quarter. The more stringent 24-hr California state PM₁₀ standard (50 µg/m³) was exceeded during this period on 14% of days at the Landfill site and on 2% of days at the Van Gogh School site. Average 24-hr BC concentrations for the winter quarter remain below the baseline year levels. Except for a slight increase noted in the 2009–2010 quarter, average 24-hr BC concentrations at Van Gogh School have been decreasing. At the Landfill site, the concentrations have been slightly more variable.

ES-3. Landfill Gas Sampling

Landfill gas (LFG) sampling for non-methane organic carbon compounds (NMOC) and methane was conducted on three separate days during the winter quarter. The majority of NMOC concentrations for these samples were within or below the concentration range observed in Los Angeles and Ventura County. On one sample day, 1,1,2,2-tetrachloroethane was detected at the Community site, but the Landfill site samples on that day were below the method

detection limit (MDL). This NMOC has not been detected in any of the previous four years of the City-mandated Condition c.10.a sampling.

1. Introduction

This report provides a summary of data completeness, ambient PM₁₀ (particulate matter less than 10 microns in aerodynamic diameter) concentrations, average and maximum black carbon (BC) concentrations, instrument flow rate verification (quality control) data, and field operations for the quarterly period of December 1, 2011, through February 29, 2012. Data from this quarterly period represent the fourth consecutive year of winter season data collected from continuous monitoring at the Sunshine Canyon Landfill and Van Gogh Elementary School monitoring sites.

2. Data Completeness

Table 2-1 gives completeness statistics for all measured variables for the period December 1, 2011, through February 29, 2012. The percent of valid PM₁₀ and BC data exceeded 95% at both monitoring locations. A small percentage of PM₁₀ data was invalidated because of downtime during equipment maintenance. Recovery of BC data was 100% at both sites. While the wind data capture percentage was high, the percent valid wind data was negatively impacted at both locations. At the Landfill site, extremely high winds in late November and early December 2011 caused a gross misalignment of the mast supporting the wind sensor. The mast was reoriented on December 7, but the interim misalignment caused about seven days of wind data to be invalidated. The mast was reconfigured, with extra support added on February 4, 2012, to prevent this problem in the future. At the Community site, about 16% of the captured January 2012 data were invalidated due to severe damage to the wind speed propeller, illustrated in **Figure 2-1**. During the fall quarter (September–November 2011), similar damage on the wind speed sensor (one entire blade was missing) caused a contiguous segment of the 1-minute wind data time series to be invalidated, yielding only 88% valid data. As a result of this damage, the propeller on the monitor has been replaced twice in the last six months. The cause of the damage is unclear at this time.

Table 2-1. Data completeness statistics for the recent monitoring quarter, December 1, 2011, through February 29, 2012.

Monitoring Location	Dates	Percent Data Capture (%) ^a			Percent Data Valid or Suspect (%) ^b			Percent Data Suspect (%) ^c		
		PM ₁₀	BC	WS/WD	PM ₁₀	BC	WS/WD	PM ₁₀	BC	WS/WD
Sunshine Canyon Landfill	12/1/11–2/29/12	99.5%	100.0%	99.4%	99.6%	99.8%	93.0%	0.0%	0.0%	0.0%
Van Gogh Elem. School	12/1/11–2/29/12	100.0%	100.0%	96.8%	95.4%	100.0%	83.9%	0.0%	0.0%	3.4%

^a Percent Data Capture is the percentage of collected data values divided by the total number of expected data intervals in the date range (e.g., for the raw BC 5-minute data, 12 data values are expected per hour and 288 data values are expected per day).

^b Percent Data Valid or Suspect is the percentage of data values that are either valid or suspect, divided by the number of captured data values.

^c Percent Data Suspect is the percentage of data values labeled as suspect divided by the number of captured data values.



Figure 2-1. The wind speed propeller on the RM Young 5305 wind speed sensor at the Community site (Van Gogh School) suffered severe damage in January, causing significant loss of data.

3. PM₁₀ Exceedances

The federal and state PM₁₀ exceedances for the current quarter and the corresponding quarters of the previous three years (2008, 2009, and 2010) and the baseline year (November 22, 2001, to November 21, 2002), are summarized in **Table 3-1**. There were no exceedances of the federal 24-hr PM₁₀ standard of 150 µg/m³ during this quarter. The percentage of days exceeding the state standard of 50 µg/m³ for the December–February quarter was 2% for the Van Gogh School site and 14% for the Sunshine Canyon Landfill site.

Table 3-1. Number of exceedances of federal and state 24-hr PM₁₀ standards during the current quarter and the December–February quarterly periods of the baseline year and of 2008, 2009, and 2010. In the “Federal” column, the values are *number of exceedances* and the *date* on which those exceedances occurred. In the “State” column, the values are *number of exceedances/total days having valid 24-hour averages* and the *percentage of exceedances* out of the total number of days having valid 24-hr average PM₁₀ concentrations.

Site	Quarterly Period	PM ₁₀ Standard	
		Federal 24-hr 150 µg/m ³	State 24-hr 50 µg/m ³
Van Gogh School	12/1/01–2/28/02	0	7/70 (10%)
	12/1/08–2/28/09	0	6/85 (7%)
	12/1/09–2/28/10	0	0
	12/1/10–2/28/11	0	1/88 (1%)
	12/1/11–2/29/12	0	2/86 (2%)
Sunshine Canyon Landfill	12/1/01–2/28/02	0	8/55 (15%)
	12/1/08–2/28/09	1 (1/9/09)	3/51 (6%)
	12/1/09–2/28/10	0	0
	12/1/10–2/28/11	1 (1/20/11)	7/90 (8%)
	12/1/11–2/29/12	0	13/91 (14%)

4. Average and Maximum Black Carbon Concentrations

While no federal or state standards exist for BC concentrations in ambient air, BC is a measurable component of ambient air that correlates well with diesel particulate matter (DPM). Because of growing evidence that DPM is associated with several adverse health effects, BC is often measured in an attempt to quantify the relative amounts of DPM in ambient air. Findings from the Multiple Air Toxics Exposure Study III, conducted by the South Coast Air Quality Management District (SCAQMD), found DPM to be the most important toxic air pollutant contributing to risk in the Los Angeles basin¹.

¹ South Coast Air Quality Management District (2008) MATES-III: Multiple air toxics exposure study in the South Coast Air Basin. Final report prepared for the South Coast Air Quality Management District, Diamond Bar, CA, September. Available on the Internet at <http://www.aqmd.gov/prdas/matesIII/Final/Document/aaa-covermates3.pdf>.

Table 4-1 provides the 24-hr average and maximum 24-hr BC concentrations for December 1, 2011, through February 29, 2012, and compares these concentrations with data from corresponding quarters of the three most recent years and the baseline year. The average and maximum 24-hr BC concentrations during this period were lower than those measured in the baseline year. Except for a slight increase noted in the 2009–2010 quarter, average 24-hr BC concentrations at Van Gogh School have been decreasing. At the Landfill site, average 24-hr BC concentrations have been slightly more variable. The maximum 24-hr BC concentrations in the winter quarters of 2008–2011 were lower than the baseline year of 2002, but variable between years.

Table 4-1. Comparison of 24-hr BC concentrations for the current quarter with those measured in the December–February quarterly periods of the baseline year and of 2008, 2009, and 2010.

Site	Quarterly Period	BC Concentrations ($\mu\text{g}/\text{m}^3$)	
		Average 24-hr	Maximum 24-hr
Van Gogh School	12/1/01–2/28/02	0.76	3.72
	12/1/08–2/28/09	0.55	3.14
	12/1/09–2/28/10	0.63	1.86
	12/1/10–2/28/11	0.53	2.48
	12/1/11–2/29/12	0.49	1.79
Sunshine Canyon Landfill	12/1/01–2/28/02	0.88	3.49
	12/1/08–2/28/09	0.56	2.02
	12/1/09–2/28/10	0.72	2.38
	12/1/10–2/28/11	0.55	2.44
	12/1/11–2/29/12	0.64	1.89

5. Landfill Gas (LFG) Sampling

The ambient air quality monitoring work conducted during 2008–2011 at these sites has demonstrated that landfill impacts on the neighboring communities have seasonal, as well as diurnal, components. Given the limited number of LFG sampling periods (four per year) prescribed by the Conditions of Approval (c.10.a), we have chosen to focus on sampling LFG during the fall and winter months, when winds change from an onshore (southerly) flow to an offshore (northerly) flow, and when early morning meteorological conditions favor downslope air flow patterns that may carry pollutants from the landfill to the community. The complaint registry at the SCAQMD indicates that odor complaints from the community are most frequent from October to January, suggesting that transport from the landfill may be occurring during those months.

Sampling for methane and non-methane organic compounds (NMOC) was conducted on December 7, 2011, and on January 13 and February 3, 2012. The results for these samples are presented here. A fourth sample was obtained on March 7, 2012, but lab analyses of that

sample are yet to be completed. Between 7:00 and 9:00 a.m. on each of those days, a total of four separate, integrated (hourly) samples were obtained: consecutive 1-hr samples were collected from 7:00 to 8:00 a.m. and 8:00 to 9:00 a.m. local time at each of the two monitoring sites. The samples were analyzed for methane by the American Society for Testing and Materials (ASTM) method D1946, and for NMOC by TO-15 using a Full Scan at Low Level and by Selective Ion Monitoring. Target compounds included NMOC commonly associated with landfills, including those compounds specified in SCAQMD's Core Group of "Carcinogenic and Toxic Air Contaminants" listed in Rule 1150.1. Some other compounds included are not listed in SCAQMD's Core Group but appear in the list of the Agency for Toxic Substances and Disease Registry (ATSDR), part of the Centers for Disease Control (CDC).

5.1 Methane

Available data from the methane sampling during the winter quarter of 2011–2012 are shown in **Table 5-1**. Most samples exhibited methane concentrations near the average ambient concentration for the northern hemisphere of 1.8 ppmV. The 1.2 ppmV value for the Community site on January 13, 2012, is at the lower limit for acceptable laboratory quality control ($\pm 30\%$) and is considered suspect.

Table 5-1. Ambient concentrations of methane measured at the Landfill monitoring site and the Community site on three sampling dates during the winter quarter of 2011–2012.

	Sample Date	Methane Concentration (ppmV)	
		7:00-8:00 a.m.	8:00-9:00 a.m.
Landfill Site	12/7/11	1.8	1.5
	1/13/12	1.7	1.6
	2/3/12	2.2	2.1
Community Site	12/7/11	2.3	1.2 ^a
	1/13/12	1.8	1.7
	2/3/12	2.2	1.7

^a At the lower limit for acceptable laboratory quality control ($\pm 30\%$); considered suspect.

5.2 Non-Methane Organic Compounds (NMOC)

The concentrations of NMOC from the December 7, January 13, and February 3 sample dates are shown in **Figures 5-1**, **5-2**, and **5-3**, respectively. These figures illustrate how the measured concentrations of NMOC compare to annually averaged Los Angeles and Ventura county data from 2008–2010, obtained from the U.S. Environmental Protection Agency's (EPA's) Airdata system. Averages are based on methodology described by McCarthy et al.

(2007)². The figures also allow comparison of the sample data with the method detection limit (MDL) for the compounds.

Some of the compounds associated with landfill emissions have been classified by the EPA as environmental and health hazards, or as air toxics. Cancer and noncancer health benchmarks have been established for many of these compounds³. Sample concentrations are compared to cancer benchmarks in the figures. Exposure to concentrations at this level for 70 years would be expected to result in one additional case of cancer per million people. Concentrations below this level would result in a lower rate, and concentrations above this level would result in a higher rate. The data also show the chronic hazard values for the compounds. These values are also for a 70-year exposure, but the health effects are noncancer, such as asthma, neurological effects, or reproductive effects.

The interpretation of these analytical results is summarized in the following bullets:

- The majority of NMOC concentrations for these samples are within or below the concentration range observed in Los Angeles and Ventura County, or are below the MDL. For the February 3 samples (Figure 5-3), all results conform to this statement.
- The results from the December 7, 2011, sample (Figure 5-1) show slightly elevated levels of benzene and hexane at the Community site for the 8:00 to 9:00 a.m. sample, but not at the Landfill site.
- The results from the January 13, 2012, sample from the Community site exhibit a few concentrations of interest:
 - Both the 7:00 to 8:00 a.m. and the 8:00 to 9:00 a.m. samples exhibit detectable levels of 1,1,2,2-tetrachloroethane. This NMOC has not been detected in any of the previous four years of the City-mandated Condition c.10.a NMOC sampling. It is not commonly found in ambient air samples, but is commonly monitored because of its high toxicity. It was previously used as an industrial solvent or as an ingredient in paints and pesticides, but commercial production for these uses in the United States has ended. Thus the presence of 1,1,2,2-tetrachloroethane is of interest but its source is unknown; this compound was below the MDL for the Landfill site samples on that day.
 - Benzene, toluene, and xylenes were above typical ranges at the Community site for the 8:00 to 9:00 a.m. sample, but not detected in the sample from the Landfill site. The presence of 1,3-butadiene in the morning samples suggests that motor vehicle exhaust was likely a contributing factor to these concentrations.

² McCarthy M.C., Hafner H.R., Chinkin L.R., and Charrier J.G. (2007) Temporal variability of selected air toxics in the United States. *Atmos. Environ.* **41** (34), 7180-7194 (STI-2894). Available on the Internet at <http://dx.doi.org/10.1016/j.atmosenv.2007.05.037>.

³ <http://www.epa.gov/ttn/atw/toxsource/table1.pdf>

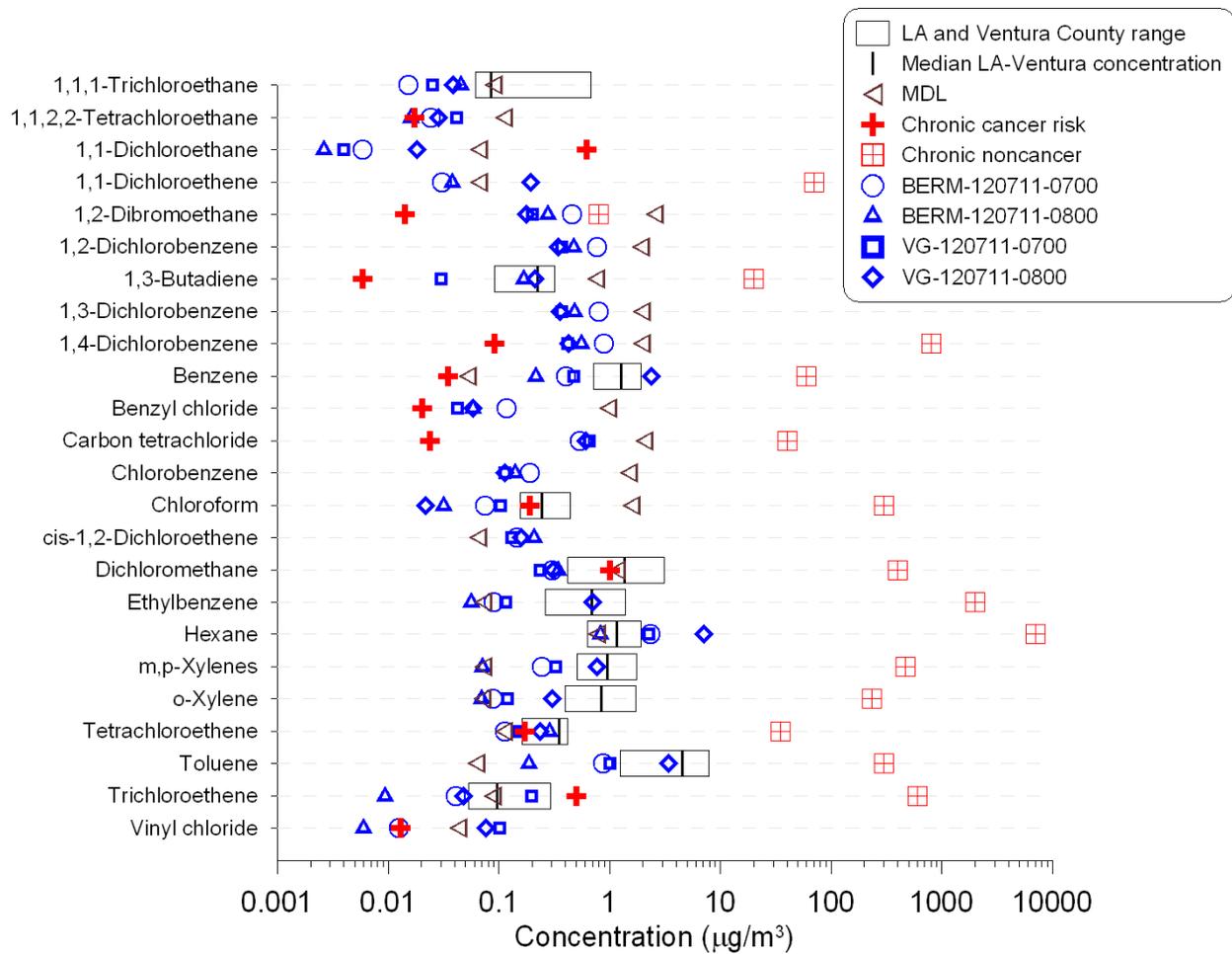


Figure 5-1. Ranges of the 10th to 90th percentile quarterly averages and median values for Los Angeles and Ventura County NMOC data from 2008–2010, as available. Concentrations determined from the December 7, 2011, samples collected at the Landfill site (BERM) and the Community site at Van Gogh Elementary School site (VG); MDLs; chronic cancer risk; and chronic noncancer hazard levels. Any data not shown were not detected by the analytical laboratory. Data below the MDL that were reported are shown.

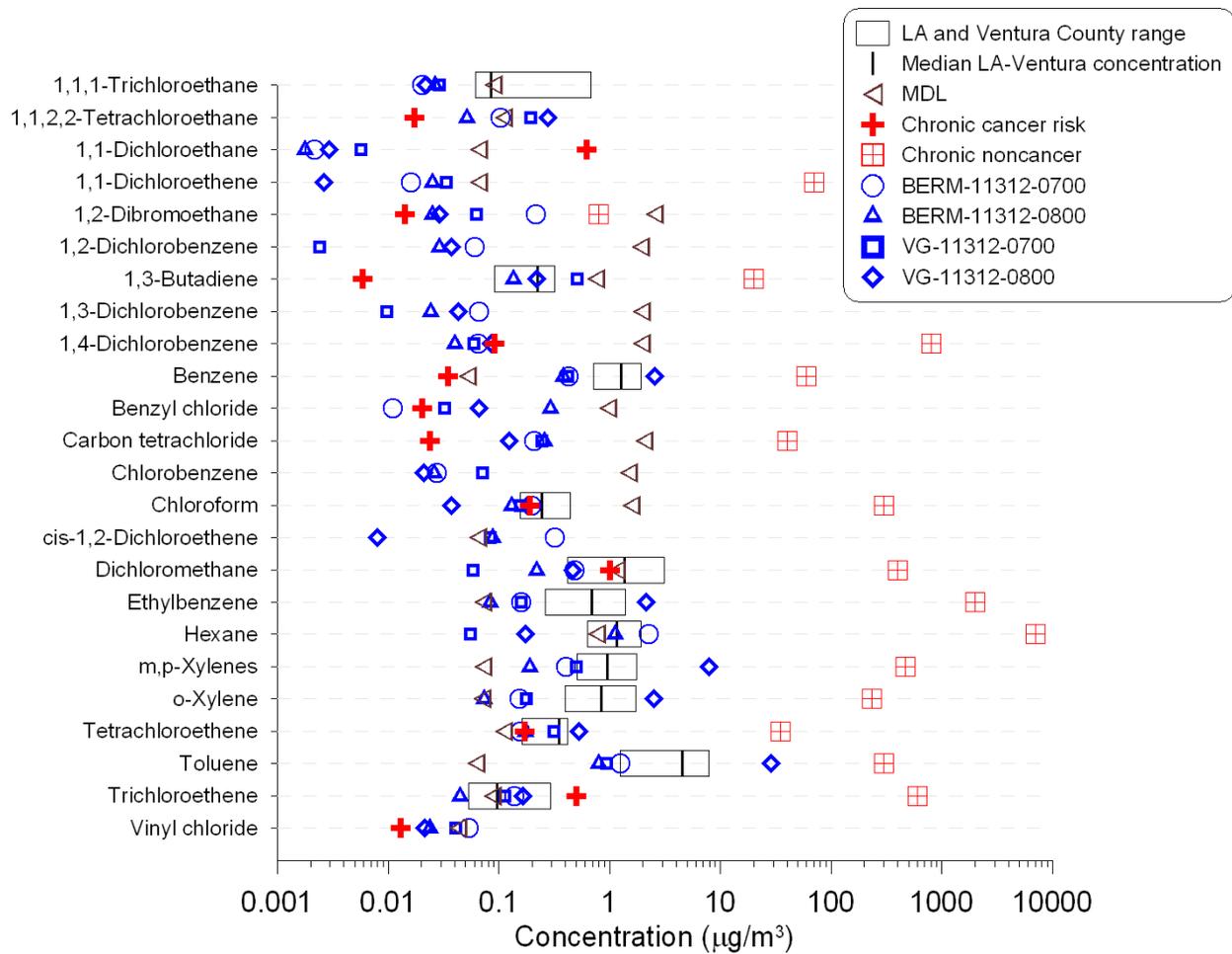


Figure 5-2. Ranges of the 10th to 90th percentile quarterly averages and median values for Los Angeles and Ventura County NMOC data from 2008–2010, as available. Concentrations determined from the January 13, 2012, samples collected at the Landfill site (BERM) and the Community site at Van Gogh Elementary School site (VG); MDLs; chronic cancer risk; and chronic noncancer hazard levels. Any data not shown were not detected by the analytical laboratory. Data below the MDL that were reported are shown.

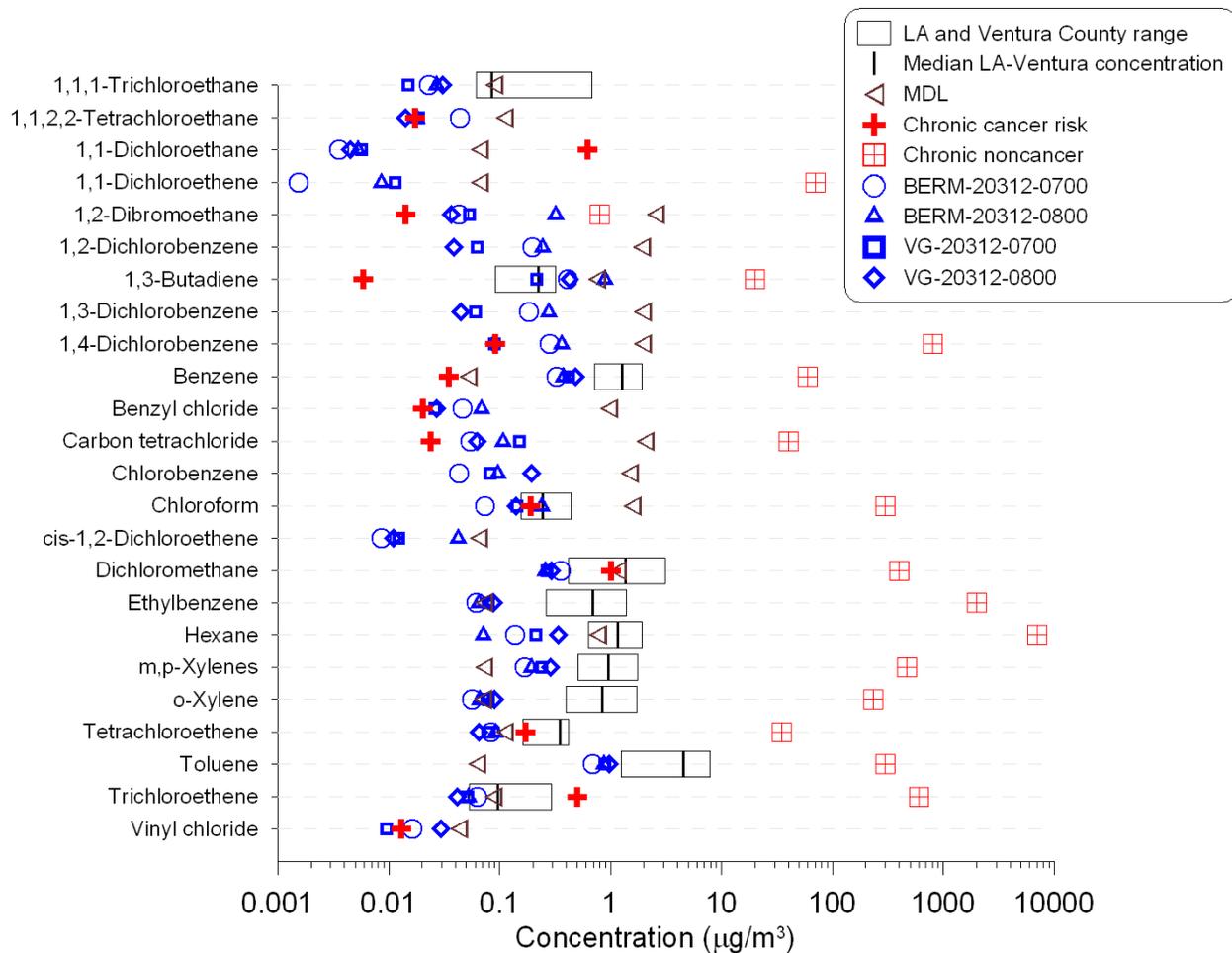


Figure 5-3. Ranges of the 10th to 90th percentile quarterly averages and median values for Los Angeles and Ventura County NMOC data from 2008–2010, as available. Concentrations determined from the February 3, 2012, samples collected at the Landfill site (BERM) and the Community site at Van Gogh Elementary School site (VG); MDLs; chronic cancer risk; and chronic noncancer hazard levels. Any data not shown were not detected by the analytical laboratory. Data below the MDL that were reported are shown.

6. Field Operations

Tables 6-1 and 6-2 list dates and major tasks associated with visits to the Sunshine Canyon Landfill and Van Gogh School sites, respectively, between December 1, 2011, and February 28, 2012. **Table 6-3** shows the PM₁₀ and BC monitors' flow rates as reported by the monitors and measured with a NIST-traceable flow standard. Routine field operations and maintenance were impacted by high winds at the Landfill site, preventing access to the trailer rooftop during a few regularly scheduled visits, and an infestation of bees in the trailer required a professional exterminator. The monitoring equipment was not impacted, but personnel could not access the trailer between the time the bees were discovered and the time they were exterminated. A Windows system file became corrupted at the Landfill site's computer, requiring removal and repair. At Van Gogh School, a broken propeller on the wind speed

sensor caused the loss of several days of data while a new part was ordered and installed. Meteorological sensors at both sites were calibrated in November.

Table 6-1. Sunshine Canyon Landfill monitoring site visits and field maintenance and operations from December 1, 2011, through February 28, 2012.

Date of Site Visit	Description of Work
Wednesday, December 7, 2011	VOC sampling conducted. Re-oriented wind sensor mast to plumb position after damage by recent high winds. Flow checks on PM ₁₀ and BC samplers. Collected PM ₁₀ and BC data.
Tuesday, January 3, 2012	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Leak check on BAM. Collected PM ₁₀ and BC data.
Saturday, February 4, 2012	Installed extra support for mast for 5305 wind sensor.
Saturday, February 11, 2012	Leak check on BAM. Collected PM ₁₀ and BC data. Replaced BAM tape. Aethalometer flow check.

Table 6-2. Van Gogh School monitoring site visits and field maintenance and operations from December 1, 2011, through February 28, 2012.

Date of Site Visit	Description of Work
Wednesday, December 7, 2011	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Collected PM ₁₀ and BC data. VOC sampling conducted.
Tuesday, January 3, 2012	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Leak check on BAM. Collected PM ₁₀ and BC data.
Monday, January 23, 2012	Unscheduled visit to replace RM Young 5305 anemometer propeller.
Wednesday, February 8, 2012	Unscheduled visit to repair broken BAM filter tape and conduct BAM self test.
Saturday, February 11, 2012	Leak check on BAM. Collected PM ₁₀ and BC data. Replaced BAM tape. Aethalometer flow check.

Table 6-3. Flow rates for the BAM PM₁₀ monitors and Aethalometer BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites from December 1, 2011, through February 28, 2012. BAM flow rates are volumetric (local temperature and pressure), and Aethalometer flow rates are at standard temperature and pressure. Reference flows were measured with a NIST-traceable flow standard. BAM target flow rate is 16.7 lpm volumetric to meet the 10-micron cut point of the inlet, with an acceptable range of 16.0 to 17.3 lpm. The Aethalometer has no size cut point.

Location	Date	Flow Rates (lpm)					
		BAM as Found	Reference	BAM as Left	Reference	Aethalometer as Found	Reference
Sunshine Canyon Landfill	12/7/11	16.7	16.9	16.7	16.9	2.6	-2.6
	1/3/12	16.9	19.9	16.9	16.9	2.6	2.7
	2/11/12	16.6	-- ^a	16.6	-- ^a	2.5	2.7
Van Gogh Elementary School	12/7/11	16.7	15.5	16.7	16.7	3.2	3.1
	1/3/12	16.7	16.3	16.7	16.3	3.1	3.1
	2/11/12	16.7	-- ^a	16.7	-- ^a	3.1	3.0

^a TriCal reference flow meter unable to recognize high flow venturi. Repair was required.