



Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

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

December 1, 2013 – February 28, 2014

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 exceedances occur, 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 and to the Los Angeles County Department of Regional Planning. This report summarizes the winter quarter monitoring results from the seventh year of continuous monitoring.

ES-2. Statistics

The percent data capture for PM₁₀ at the Sunshine Canyon Landfill monitoring site was 100% for this quarterly period and the percent data capture at Van Gogh Elementary School was 99.9%. At the Landfill site, 0.7% of the captured PM₁₀ data were invalidated, while 0.1% were deemed suspect. At Van Gogh School, 1.2% of the captured data were invalidated, while 0.1% were deemed suspect. Data capture for BC was 99.3% at the Landfill site with all captured data valid and 99.4% at Van Gogh School with 2.2% deemed suspect due to a failed flow check. The wind data capture percentage was 99.1% at the Landfill site and 100.0% at Van Gogh School. About 98.5% of the captured wind data were valid at both locations, except 0.1% of wind speed data that were suspect at the Landfill site.

There were two exceedances of the federal 24-hr PM₁₀ standard of 150 µg/m³ during this quarter at the Landfill site (a concentration of 155 µg/m³ on December 4, 2013, and a concentration of 181 µg/m³ on December 9, 2013). There were no federal exceedances during this quarter at Van Gogh School. The percentage of days on which the state standard of 50 µg/m³ was exceeded for the December-February quarter was 16% for the Landfill site and 1% for the Van Gogh School site. Average BC concentrations during the winter season are variable across multiple years and do not have any distinct year-to-year trend like the trend that has been noted for the summer quarter, when average concentrations have decreased each year from 2008 to 2013.

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, 2013, through February 28, 2014 (referred to as “this quarter” or “this quarterly period” throughout this report). Data from this quarterly period represent the seventh 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 1 gives completeness statistics for all measured variables for this quarter. The percent data capture for PM₁₀ was 100% at the Landfill site and 99.9% at the Van Gogh School. At the Landfill monitoring site, 0.7% of the captured PM₁₀ data were invalidated, and 0.1% were deemed suspect. At Van Gogh School, 1.2% of the captured data were invalidated, and 0.1% were deemed suspect. Suspect data are included in subsequent analyses (e.g., regional comparisons), while invalid data are not.

BC data capture was 99.3% at the Landfill site and 99.4% at the Van Gogh School, with all data valid. The wind data capture percentage was 99.1% at the Landfill site and 100% at Van Gogh School. About 98.5% of the wind data were valid at each site; 0.1% of the wind speed data were suspect at the Landfill site.

Table 1. Data completeness statistics for this quarter.

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	12/1/2013 through 2/28/2014	100.0	99.3	99.1	99.3	100.0	98.7	0.1	0.0	0.1
Van Gogh Elem. School	12/1/2013 through 2/28/2014	99.9	99.4	100.0	98.8	100.0	98.5	0.1	2.2	0.0

^a Percent Data Capture is the number of collected data values divided by the total number of expected data values 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 number of data values that are either valid or suspect, divided by the number of captured data values.

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

3. PM₁₀ Exceedances

The federal and state PM₁₀ exceedances for the current quarter, the corresponding quarters of the previous six years (2008–2013), and of the baseline year (November 22, 2001, to November 21, 2002), are summarized in **Table 2**. There were no exceedances of the federal 24-hr PM₁₀ standard of 150 µg/m³ during this quarter at Van Gogh School. There were two exceedances at the Landfill monitoring site (a concentration of 155 µg/m³ on December 4, 2013, and a concentration of 181 µg/m³ on December 9, 2013). The percentage of days on which the state standard of 50 µg/m³ was exceeded for the December-February quarter was 1% for the Van Gogh School site and 16% for the Landfill site.

Table 2. Number of exceedances of federal and state 24-hr PM₁₀ standards during this quarter and the December–February quarterly periods of the baseline year (2002) and each year from 2008 through 2014. 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 on which valid 24-hr averages were measured* and the *percentage of exceedances* out of the total number of days on which valid 24-hr average PM₁₀ concentrations were measured.

Site	Quarterly Period	PM ₁₀ Standard Exceedances, Dates, and Percentages	
		Federal 24-hr 150 µg/m ³	State 24-hr 50 µg/m ³
Sunshine Canyon Landfill	12/01/01–02/28/02	0	8/55 (15%)
	12/01/07–02/29/08	1 (2/14/08)	10/83 (12%)
	12/01/08–02/28/09	1 (1/9/09)	3/51 (6%)
	12/01/09–02/28/10	0	0/87 (0%)
	12/01/10–02/28/11	1 (1/20/11)	7/90 (8%)
	12/01/11–02/29/12	0	13/91 (14%)
	12/01/12–02/28/13	0	2/88 (2%)
	12/01/13–02/28/14	2 (12/4/13, 12/9/13)	14/90 (16%)
Van Gogh School	12/01/01–02/28/02	0	7/70 (10%)
	12/01/07–02/29/08	0	2/73 (3%)
	12/01/08–02/28/09	0	6/85 (7%)
	12/01/09–02/28/10	0	0/81 (0%)
	12/01/10–02/28/11	0	1/88 (1%)
	12/01/11–02/29/12	0	2/86 (2%)
	12/01/12–02/28/13	0	3/87 (3%)
	12/01/13–02/28/14	0	1/90 (1%)

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 negative health effects, BC is often measured as a surrogate for DPM in ambient air. Findings from the Multiple Air Toxics Exposure Study III, conducted by the South Coast Air Quality Management District (SCAQMD), showed DPM to be the most important toxic pollutant contributing to risk in the Los Angeles Basin.¹

Table 3 provides the 24-hr average and 24-hr maximum BC concentrations collected in this quarter, and compares these concentrations with data from the corresponding quarters of the six previous years as well as the baseline year. We reported that the June–August average and maximum 24-hr BC concentrations exhibited a consistent downward trend at the Landfill monitoring site from 2008 through 2013 (see the 23rd Quarterly Report). This pattern in average BC concentrations is also observable when comparing fall quarter (September through November) data among different years, but is not observable in the December–February quarter over the past six years.

Table 3. Comparison of 24-hr BC concentrations for this quarter with those measured in the December–February quarterly periods of the baseline year (2002) and each year from 2008 through 2014.

Site	Quarterly Period	BC Concentrations ($\mu\text{g}/\text{m}^3$)	
		Average 24-hr	Maximum 24-hr
Sunshine Canyon Landfill	12/01/01–02/28/02	0.88	3.49
	12/01/07–02/29/08	0.54	1.91
	12/01/08–02/28/09	0.56	2.02
	12/01/09–02/28/10	0.72	2.38
	12/01/10–02/28/11	0.55	2.44
	12/01/11–02/29/12	0.64	1.89
	12/01/12–02/28/13	0.61	2.10
	12/01/13–02/28/14	0.67	2.33
Van Gogh School	12/01/01–02/28/02	0.76	3.72
	12/01/07–02/29/08	0.47	1.72
	12/01/08–02/28/09	0.55	3.14
	12/01/09–02/28/10	0.63	1.86
	12/01/10–02/28/11	0.53	2.48
	12/01/11–02/29/12	0.49	1.79
	12/01/12–02/28/13	0.44	1.75
	12/01/13–02/28/14	0.45	1.58

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 at <http://www.aqmd.gov/prdas/matesIII/Final/Document/aaa-covermates3.pdf>.

One likely contributing factor is the meteorology that characterizes these different times of the year. In summer months, southerly (onshore) wind flows dominate, so for the majority of each day's diurnal cycle, the BC concentrations are influenced heavily by air masses moving northward from the greater metropolitan area. Ongoing efforts to reduce ambient concentrations of DPM in the South Coast Air Basin (SoCAB) may have contributed to reduced BC concentrations on a regional scale. However, basin-wide evidence of this is lacking because BC has no standard, is not a criteria pollutant, and is not routinely measured at the California Air Resources Board (CARB) or SCAQMD air monitoring stations. During the fall period, meteorological conditions are more mixed, with diurnal patterns exhibiting both onshore and offshore flow characteristics. The northerly flows that occur during these time periods can carry cleaner upwind air from north of the SoCAB, with variable contributions from the landfill operations (variable because landfill activity levels vary throughout the work day and between work days and non-work days).

Figure 1 shows a notched box-whisker plot² of the winter quarter PM₁₀ and BC data for the seven monitoring years. Each box indicates the interquartile range (IQR), where 50% of the data lie, with the notch at the median. If notches do not overlap, this indicates the median concentrations are statistically different at the 95% confidence level. The whiskers go to 1.5 times the IQR; points beyond this are shown individually.

The following observations can be made regarding Figure 1:

- The landfill monitor has registered an exceedance of the Federal 24-hr PM₁₀ standard of 150 µg/m³ in four of the seven winter quarters (two exceedances in the current quarter).
- Median 24-hr PM₁₀ concentrations were statistically significantly lower at Van Gogh School than at the Landfill site for winter quarters 2011, 2012, and 2014.
- Median 24-hr BC concentrations were statistically significantly lower at Van Gogh School than at the Landfill site for winter quarters 2012 through 2014.

² A notched box-whisker plot shows the entire distribution of concentrations for each year. In box-whisker plots, each box shows the 25th, 50th (median), and 75th percentiles. The boxes are notched (narrowed) at the median and return to full width at the 95% lower and upper confidence interval values. These plots indicate that we are 95% confident that the median falls within the notch. If the 95% confidence interval is beyond the 25th or 75th percentile, then the notches extend beyond the box (hence a "folded" appearance).

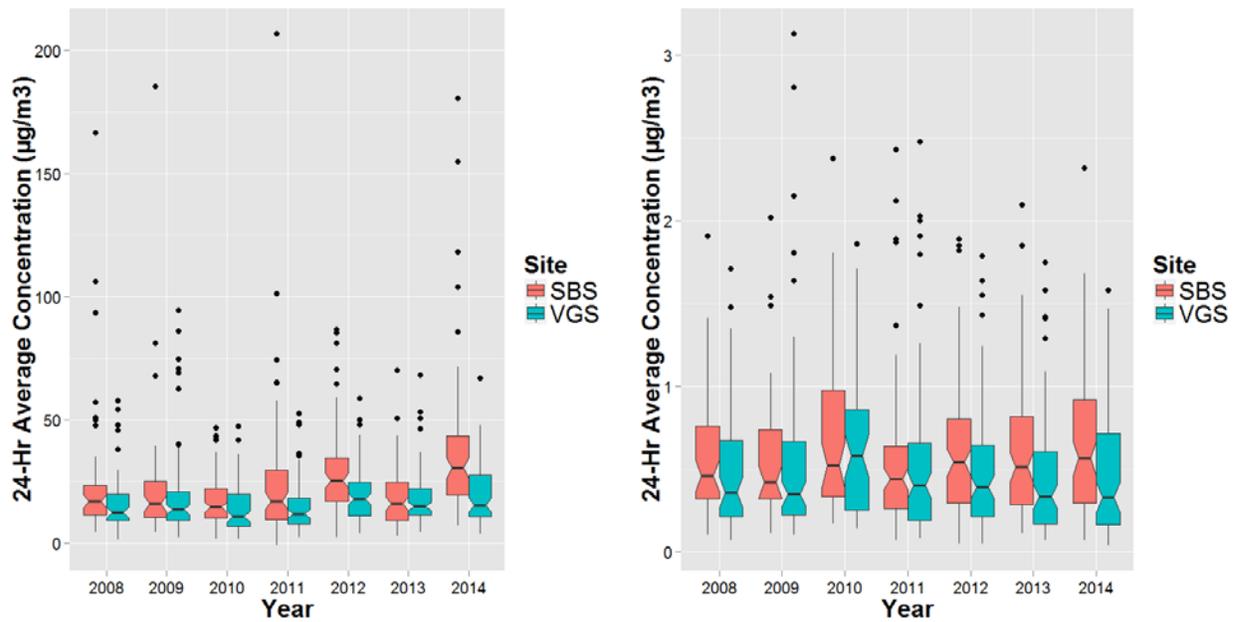


Figure 1. Notched box-whisker plot of daily 24-hr average concentrations for PM₁₀ (left) and BC (right) during winter season at Sunshine Canyon Landfill (SBS) and Van Gogh (VGS) in years 2008 to 2014.

5. Field Operations

Tables 4 and 5 list dates and major tasks associated with visits to the Sunshine Canyon Landfill and Van Gogh School sites between December 1, 2013, and February 28, 2014.

Table 4. Sunshine Canyon Landfill monitoring site visits and field maintenance and operations from December 1, 2013, through February 28, 2014.

Date of Site Visit	Description of Work
January 3, 2014	Cleaned BAM inlet; performed BAM flow/leak check.
January 25, 2014	Replaced BAM vacuum pump, tested new pump, performed BAM flow/leak check.
February 5, 2014	Collected BC data; backed up BC data; performed Aethalometer flow check. Replaced BAM tape, ran BAM self-test. Collected PM ₁₀ data; backed up PM ₁₀ data. Cleaned BAM roller, vane, and cabinet. Performed BAM flow/leak check.

Table 5. Van Gogh School monitoring site visits and field maintenance and operations from December 1, 2013, through February 28, 2014.

Date of Site Visit	Description of Work
January 2, 2014	Cleaned BAM inlet; performed BAM flow/leak check.
January 17, 2014	Tested BAM vacuum pump, replaced vacuum pump motor, and tested.
February 5, 2014	Collected BC data; backed up BC data; performed Aethalometer flow check. Replaced BAM tape. Collected PM ₁₀ data; backed up PM ₁₀ data; performed BAM flow/leak check. Cleaned BAM cabinet, roller, and nozzle.
February 7, 2014	Performed Aethalometer flow calibration.

Table 6 shows the PM₁₀ and BC flow rates as reported by the monitors and measured with a NIST-traceable flow standard. BAM flow rates are volumetric (local temperature and pressure), and Aethalometer flow rates are at standard temperature and pressure. The 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.

Table 6. Flow rates for the BAM PM₁₀ monitors and Aethalometer BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites from December 1, 2013, through February 28, 2014.

Location	Date	Flow Rates (lpm)					
		BAM as Found	Reference	BAM as Left	Reference	Aethalometer as Found	Reference
Sunshine Canyon Landfill	1/3/14	16.8	16.9	16.8	16.9	– ^a	– ^a
Sunshine Canyon Landfill	1/25/14	16.7	16.9	16.7	16.9	– ^a	– ^a
Sunshine Canyon Landfill	2/5/14	16.7	17.0	16.7	17.0	2.8	2.9
Van Gogh Elementary School	1/2/14	17.0	16.9	17.0	16.9	– ^a	– ^a
Van Gogh Elementary School	2/5/14	16.7	16.8	17.0	16.8	3.1	2.1 ^b
Van Gogh Elementary School	2/7/14	– ^a	– ^a	– ^a	– ^a	2.1 ^b	2.9

^a Not recorded.

^b Failed flow check, calibration performed to correct the low flow.