



**Sonoma Technology, Inc.**  
*Air Quality Research and Innovative Solutions*

# **Thirty-First Quarterly Report of Ambient Air Quality Monitoring at Sunshine Canyon Landfill and Van Gogh Elementary School**

June 1, 2015 – August 31, 2015

**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. PM<sub>10</sub> (particulate matter less than 10 microns in aerodynamic diameter) is measured hourly. Wind speed (WS) and wind direction (WD) are measured as 1-minute averages, and black carbon (BC, a surrogate for diesel particulate matter [DPM]) is averaged over 5-minute intervals. The collected data undergo quarterly validation and are evaluated for completeness. BC data are compensated for filter tape saturation effects, which cause BC values to be underestimated. In the data collected since 2007, this compensation increases values by about 13% compared to uncompensated values.

Following data validation, all data are reported as hourly averages. PM<sub>10</sub> concentrations are then compared with federal and state PM<sub>10</sub> standards. When PM<sub>10</sub> exceedances occur, additional comparisons are made with the historical, regional, and annual ambient PM<sub>10</sub> concentrations. At least annually, the PM<sub>10</sub> 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 Thirty-First Quarterly Report summarizes the summer quarter monitoring results from the eighth year of continuous monitoring.

### ES-2. Statistics

The percent data capture for PM<sub>10</sub> was 100% at both the Sunshine Canyon Landfill monitoring site and at Van Gogh Elementary School for this quarterly period. At the Landfill site, 0.4% of the captured PM<sub>10</sub> data were invalidated, and 0.2% were deemed suspect. At Van Gogh School, 67% of the captured PM<sub>10</sub> data were invalidated, and 0.05% were deemed suspect. The PM<sub>10</sub> data from Van Gogh School were invalidated because the monitor did not pass flow checks; these older PM<sub>10</sub> monitors are having difficulty controlling the flow and, thus, both BAMs will soon be replaced with new monitors. BC data capture was 98.7% at the Landfill site, with none of the data invalidated and 0.02% suspect, while 99.1% was captured at Van Gogh School, with none of the data invalidated and 0.01% deemed suspect. The wind data capture percentage was 99.9% at the Landfill site and 100% at Van Gogh School. At the Landfill site, 1.4% of the wind data were invalidated, and 0.3% were deemed suspect. At Van Gogh School, 1.7% of the wind data were invalidated, and no data were deemed suspect.

There were no exceedances of the federal 24-hr PM<sub>10</sub> standard of 150 µg/m<sup>3</sup> during this quarter at either site. The percentage of days on which the state PM<sub>10</sub> standard of 50 µg/m<sup>3</sup> was exceeded for the June–August quarter was 9% at the Sunshine Canyon Landfill site and 0% at Van Gogh School (eight days and zero days, respectively). From 2008 to 2015, summer quarter average 24-hr BC concentrations ranged from 0.76 to 1.41 µg/m<sup>3</sup> at the Landfill site, and from 0.76 to 1.08 µg/m<sup>3</sup> at the Van Gogh site. This summer quarter at the Sunshine Canyon Landfill site had the lowest BC average (0.76 µg/m<sup>3</sup>) of all prior summer quarters.

## 1. Introduction

This report provides a summary of data completeness, ambient PM<sub>10</sub> (particulate matter less than 10 microns in aerodynamic diameter) concentrations, average and maximum BC concentrations, instrument flow rate verification (quality control) data, and field operations for the summer quarterly period of June 1, 2015, through August 31, 2015. Data from this period represent the eighth consecutive year of summer-season data collected from continuous monitoring at the Sunshine Canyon Landfill and Van Gogh Elementary School monitoring sites. PM<sub>10</sub> was measured via a beta-attenuation monitor (BAM), and BC was measured via an Aethalometer.

## 2. Data Completeness

**Table 1** gives completeness statistics for all measured variables during the summer quarter. The percent data capture for PM<sub>10</sub> was 100% both at the Landfill site and Van Gogh School. At the Landfill monitoring site, approximately 0.4% of the captured PM<sub>10</sub> data were invalidated, and 0.2% were deemed suspect. At Van Gogh School, 67% of the captured data were invalidated, and 0.05% were deemed suspect. Suspect data are included in subsequent analyses (e.g., regional comparisons), while invalid data are not. The BAM instrument at Van Gogh School did not pass flow checks for two of the three months (see Section 5), leading to a high amount of invalidated data. These older PM<sub>10</sub> monitors are having difficulty controlling the flow and, thus, both BAMs will soon be replaced with new monitors.

**Table 1.** Data completeness statistics for the summer monitoring quarter.

Monitoring Location	Dates	Percent Data Capture <sup>a</sup>			Percent Data Valid or Suspect <sup>b</sup>			Percent Data Suspect <sup>c</sup>		
		PM <sub>10</sub>	BC	WS/WD	PM <sub>10</sub>	BC	WS/WD	PM <sub>10</sub>	BC	WS/WD
Sunshine Canyon Landfill	6/1/15–8/31/15	100	98.7	99.9	99.6	100	98.6	0.2	0.02	0.3
Van Gogh Elem. School	6/1/15–8/31/15	100	99.1	100	33.0	100	98.3	0.05	0.01	0.0

<sup>a</sup> Percent Data Capture is the number 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 per hour and 288 data values per day are expected).

<sup>b</sup> 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.

<sup>c</sup> Percent Data Suspect is the number of data values labeled as suspect divided by the number of captured data values.

BC data capture was 98.7% at the Landfill site, with none of the data invalidated and 0.02% deemed suspect, while 99.1% was captured at Van Gogh School, with none of the data invalidated and 0.01% deemed suspect.

The wind data capture percentage was 99.9% at the Landfill site and 100% at Van Gogh School. At the Landfill site, 1.4% of the wind data were invalidated, with 0.3% of wind data deemed suspect. The percentage of wind data invalidated at Van Gogh School was 1.7%, with none of the wind data deemed suspect.

### 3. PM<sub>10</sub> Exceedances

The federal and state PM<sub>10</sub> exceedances for the summer 2015 quarter, the summer quarters of the previous seven years (2008–2014), and the summer quarter 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 PM<sub>10</sub> standard of 150 µg/m<sup>3</sup> during this quarter at either site. The percentage of days on which the state standard of 50 µg/m<sup>3</sup> was exceeded for the June–August quarter was 9% for the Landfill site (eight days) and 0% at the Van Gogh School site (zero days).

**Table 2.** Number of exceedances of federal and state 24-hr PM<sub>10</sub> standards during the summer quarters of the baseline year (2002) and 2008–2015. In the “Federal” column, the values are *number of exceedances* and the *date(s)* 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 PM<sub>10</sub> concentrations were measured.

Site	Quarterly Period	Exceedances of PM <sub>10</sub> Standard	
		Federal 24-Hr 150 µg/m <sup>3</sup>	State 24-Hr 50 µg/m <sup>3</sup>
Sunshine Canyon Landfill	6/1/02–8/31/02	0	44/67 (66%)
	6/1/08–8/31/08	0	28/92 (30%)
	6/1/09–8/31/09	0	16/87 (18%)
	6/1/10–8/31/10	0	11/91 (12%)
	6/1/11–8/31/11	0	23/92 (25%)
	6/1/12–8/31/12	0	10/76 (13%)
	6/1/13–8/31/13	0	14/91 (15%)
	6/1/14–8/31/14	0	19/91 (21%)
	<b>6/1/15–8/31/15</b>	<b>0</b>	<b>8/92 (9%)</b>
Van Gogh Elementary School	6/1/02–8/31/02	0	5/16 (31%)
	6/1/08–8/31/08	0	25/89 (28%)
	6/1/09–8/31/09	0	13/90 (14%)
	6/1/10–8/31/10	0	27/83 (33%)
	6/1/11–8/31/11	0	11/92 (12%)
	6/1/12–8/31/12	0	10/92 (11%)
	6/1/13–8/31/13	0	9/90 (10%)
	6/1/14–8/31/14	0	22/86 (26%)
	<b>6/1/15–8/31/15</b>	<b>0</b>	<b>0/30 (0%)</b>

## 4. Average and Maximum Black Carbon Concentrations

Although no federal or state standards exist for BC concentrations in ambient air, BC is a measurable component of ambient air that correlates well with DPM. Because of growing evidence that DPM is associated with several negative 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 IV (MATES IV), 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 basin.<sup>1</sup>

Black carbon Aethalometers are subject to a saturation effect, where the buildup of BC on the air sampling tape causes an artifact that affects the accuracy of the measured concentration.<sup>2,3</sup> Instrument response is dampened with heavier loading (i.e., heavier concentrations) of BC aerosol. This artifact can bias BC concentration readings to be lower. However, mathematical methods to correct the BC concentration values are available and are widely used. All the reported BC values to date from the Landfill and Van Gogh sites have been adjusted to compensate for this tape saturation effect; this compensation had not been performed in quarterly reports prior to the 29<sup>th</sup> (Winter 2015) Quarterly Report. Because the compensation process changes the reported concentration, and because uncompensated values were used in previous reports, prior-year BC concentrations shown in this report (e.g., Table 3) do not match concentrations reported in reports prior to the 29<sup>th</sup> Quarterly Report. All BC data shown in this report have been compensated, with the exception of the baseline year; raw data for the baseline year are unavailable for compensation.

**Table 3** provides the 24-hr average and maximum compensated BC concentrations collected during the summer 2015 quarter and compares them to compensated BC data from the summer quarters of the seven previous years. Note that the baseline year data are *not* compensated. The summer 2015 quarter data are consistent with the previous summers, though the summer 2015 BC average at the Sunshine Landfill site is the lowest average for the summer recorded since the beginning of the study.

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<sup>1</sup> South Coast Air Quality Management District (2015) MATES-IV: Multiple Air Toxics Exposure Study in the South Coast Air Basin. Final report, May. Available at <http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7>.

<sup>2</sup> Drinovec L. et al. (2014) The "dual-spot" Aethalometer: an improved measurement of aerosol black carbon with real-time loading compensation. *Atmos. Meas. Tech. Discuss.*, 7(9), 10179-10220, doi: 10.5194/amtd-7-10179-2014. Available at <http://www.atmos-meas-tech-discuss.net/7/10179/2014/>.

<sup>3</sup> Allen G. (2014) Analysis of spatial and temporal trends of black carbon in Boston. Report prepared by Northeast States for Coordinated Air Use Management (NESCAUM), Boston, MA, January. Available at [nescaum.org/documents/analysis-of-spatial-and-temporal-trends-of-black-carbon-in-boston/nescaum-boston-bc-final-rept-2014.pdf/](http://nescaum.org/documents/analysis-of-spatial-and-temporal-trends-of-black-carbon-in-boston/nescaum-boston-bc-final-rept-2014.pdf/).



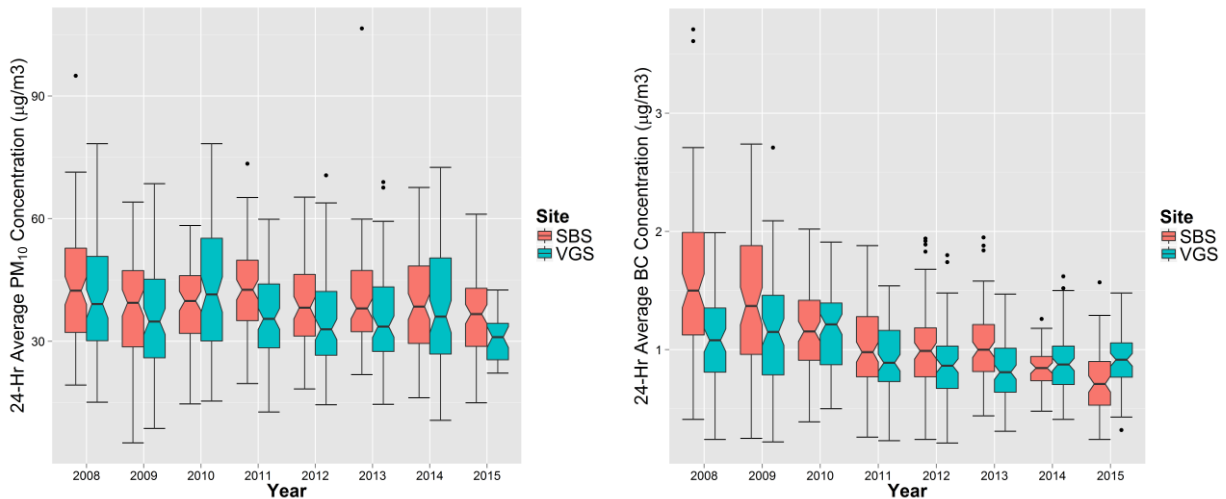
**Table 3.** Twenty-four hour BC concentrations for the summer quarter of the baseline year (2002) and each year from 2008 through 2015. Asterisks (\*) denote uncompensated BC values.

Site	Quarterly Period	BC Concentrations ( $\mu\text{g}/\text{m}^3$ )	
		Average 24-Hr	Maximum 24-Hr
Sunshine Canyon Landfill	6/1/02–8/31/02	1.09*	2.69*
	6/1/08–8/31/08	1.41	3.01
	6/1/09–8/31/09	1.26	2.45
	6/1/10–8/31/10	1.06	1.88
	6/1/11–8/31/11	0.99	1.78
	6/1/12–8/31/12	0.93	1.79
	6/1/13–8/31/13	0.98	1.98
	6/1/14–8/31/14	0.79	1.34
	<b>6/1/15–8/31/15</b>	<b>0.76</b>	<b>1.58</b>
Van Gogh Elementary School	6/1/02–8/31/02	1.40*	2.33*
	6/1/08–8/31/08	0.98	1.71
	6/1/09–8/31/09	1.03	2.23
	6/1/10–8/31/10	1.08	1.75
	6/1/11–8/31/11	0.86	1.43
	6/1/12–8/31/12	0.81	1.63
	6/1/13–8/31/13	0.76	1.31
	6/1/14–8/31/14	0.86	1.50
	<b>6/1/15–8/31/15</b>	<b>0.92</b>	<b>1.48</b>

**Figure 1** shows a notched box-whisker plot<sup>4</sup> of the summer quarter  $\text{PM}_{10}$  and BC data for the eight 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 that 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.

For  $\text{PM}_{10}$ , these plots show no statistically significant trend in the concentrations over the last eight years for the summer quarter. Summer-quarter BC concentrations have declined over the past eight years at both the Landfill site and the Van Gogh School site. The summer-quarter concentrations in 2015 were unusually low at the Landfill site, so Van Gogh School site concentrations were higher than at the Landfill site.

<sup>4</sup> A notched box-whisker plot shows the entire distribution of concentrations for each year. Each box shows the 25<sup>th</sup>, 50<sup>th</sup> (median), and 75<sup>th</sup> percentiles. The whiskers indicate values that are up to 1.5 times the inter-quartile range from the 25<sup>th</sup> or 75<sup>th</sup> percentile. 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 25<sup>th</sup> or 75<sup>th</sup> percentile, then the notches extend beyond the box (hence a “folded” appearance).

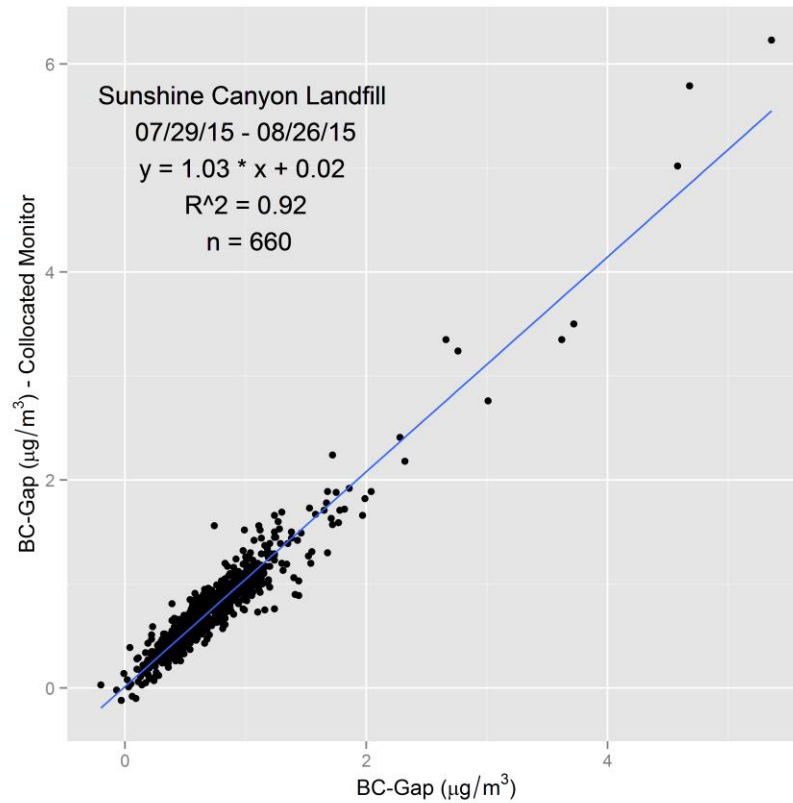


**Figure 1.** Notched box-whisker plot of daily 24-hr average concentrations of PM<sub>10</sub> (left) and BC (right) at Sunshine Canyon Landfill (SBS) and Van Gogh School (VGS) during summer quarters in 2008 to 2015.

## 5. Field Operations

On July 29, 2015, a second Magee Scientific Aethalometer (Model AE22) was installed at the Landfill monitoring site at the southern berm of the landfill. This STI-supplied Aethalometer will be placed in the upwind site at the northern rim of the landfill, once the site infrastructure is completed. The purpose of collocating this Aethalometer with the existing one at the southern berm site is to provide data that demonstrate the comparability of the two instruments' performance. This ensures that differences in BC concentrations noted between upwind and downwind measurements are due to differences in ambient BC concentrations and not to differences in machine performance.

**Figure 2** is a scatter plot of the first 27 days of hourly averaged BC concentrations. The correlation is excellent, with very little bias shown between the two monitors. The second Aethalometer will remain in place until it is moved to the new upwind site.



**Figure 2.** Scatter plot and linear regression statistics for the collocated Aethalometers at the southern berm of the Landfill site. The X-axis represents the existing monitor.

**Tables 4 and 5** list dates and major tasks associated with visits to the Sunshine Canyon Landfill and Van Gogh School sites in summer 2015.

**Table 4.** Sunshine Canyon Landfill monitoring site visits and field maintenance and operations.

Date of Site Visit	Description of Work
June 2, 2015	Performed flow check on BC and BAM samplers. Cleaned BAM roller, vane, and nozzle. Collected PM <sub>10</sub> and BC data.
July 1, 2015	Performed flow check on BC and BAM samplers. Recalibrated temperature on BAM sampler. Cleaned BAM roller, vane, and nozzle. Collected PM <sub>10</sub> and BC data.
July 29, 2015	Performed flow check on BC and BAM samplers. Installed a second AE22 Aethalometer. Cleaned BAM roller, vane, and nozzle. Collected PM <sub>10</sub> and BC data.
August 26, 2015	Collected data from second Aethalometer.

**Table 5.** Van Gogh School monitoring site visits and field maintenance and operations.

Date of Site Visit	Description of Work
June 2, 2015	Performed flow check on BC and BAM samplers. Cleaned BAM roller, vane, and nozzle. Collected PM <sub>10</sub> and BC data.
July 1, 2015	Performed flow check on BC and BAM samplers. Adjusted tension on BAM tape. Cleaned BAM roller, vane, and nozzle. Collected PM <sub>10</sub> and BC data.
July 29, 2015	Performed flow check on BC and BAM samplers. Resolved BAM flow issue. Cleaned BAM roller, vane, and nozzle. Collected PM <sub>10</sub> and BC data.
August 26, 2015	Spot-checked BAM sampler. Resolved BAM flow issue.

**Table 6** shows the PM<sub>10</sub> 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 liters per minute (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 PM<sub>10</sub> monitors and Aethalometer BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites.

Location	Date	Flow Rates (lpm)					
		BAM as Found	Reference as Found	BAM as Left	Reference as Left	Aethalometer as Found	Reference as Found
Sunshine Canyon Landfill	6/2/15	16.7	16.6	16.7	16.6	3.0	3.3
Sunshine Canyon Landfill	7/1/15	16.7	16.1	16.7	16.6	3.0	3.2
Sunshine Canyon Landfill	7/29/15	16.7	16.3	16.7	16.3	3.1	7.1
Sunshine Canyon Landfill	8/26/15	-	-	-	-	-	-
Van Gogh Elementary School	6/2/15	16.7	16.8	16.7	16.8	3.1	3.4
Van Gogh Elementary School	7/1/15	16.7	16.8	16.7	16.8	3.1	3.4
Van Gogh Elementary School	7/29/15	16.7	14.8 <sup>a</sup>	16.7	16.9	3.0	3.4
Van Gogh Elementary School	8/26/15	16.7	15.7 <sup>a</sup>	16.7	16.6	3.0	3.2

<sup>a</sup> Outside flow criteria