



Sonoma Technology, Inc.
Innovative Environmental Solutions

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

June 1, 2017 – August 31, 2017

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 (Landfill site) and at Van Gogh Elementary School (Community site) 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 (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.

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. The PM₁₀ and BC data are analyzed at least once a year 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-Ninth Quarterly Report summarizes the June-August (2017 summer quarter) monitoring results from the eleventh year of continuous monitoring.

The Sunshine Canyon Landfill North site (Landfill North site) was installed in December 2015 and was decommissioned after the Spring 2017 quarter ended on May 31, 2017. Starting July 11, 2016, a one-year program of sampling volatile organic compounds (VOCs) and carbonyl compounds began at the Landfill and Community sites; these VOC data will be summarized in a separate report.

ES-2. Statistics

The percent data capture for PM₁₀ was 99.9% and 100.0% at the Landfill and Community sites, respectively. Approximately 0.4% of the captured PM₁₀ data were invalidated at the Landfill site, and approximately 0.3% were invalidated at the Community site. No hourly PM₁₀ values were deemed suspect at either of the monitoring sites in this quarter. BC data capture was 91.2% at the Landfill site and 88.8% at the Community site. No hourly BC data were deemed suspect or invalidated at the Landfill site. Less than 0.1% of the BC data were deemed suspect at the Community site, and less than 0.1% of the data were invalidated. There was a significant portion of data loss for wind speed and direction at the Community site because of computer hardware and software re-installation.

There were no exceedances of the federal 24-hr PM₁₀ standard of 150 µg/m³ during this quarter at either of the monitoring sites. The percentage of days on which the state PM₁₀ standard of 50 µg/m³ was exceeded during this summer quarter was 46% (41 days) at the Landfill site and 3% (2 days) at the Community site.

1. Introduction

This report summarizes data completeness, ambient PM₁₀ (particulate matter less than 10 microns in aerodynamic diameter) concentrations, average and maximum ambient black carbon (BC, a surrogate for diesel particulate matter [DPM]) concentrations, instrument flow rate verification (quality control) data, and field operations for the quarterly period of June 1, 2017, through August 31, 2017. This is the tenth consecutive year that summer-season data were collected from continuous monitoring at the Sunshine Canyon Landfill site (LS; previously called the Berm site) and the Van Gogh Elementary School Community site (CS) monitoring locations. The monitoring site locations are shown in **Figure 1**. PM₁₀ was measured with a beta-attenuation monitor (BAM), and BC was measured with an Aethalometer. The Sunshine Canyon Landfill North (LN) monitoring site shown in Figure 1 was installed in December 2015 and decommissioned on May 31, 2017. Starting July 11, 2016, a one-year program of one-in-six-day sampling of volatile organic compounds (VOCs) and carbonyl compounds began at the LS and CS sites; these VOC data will be summarized in a separate report.

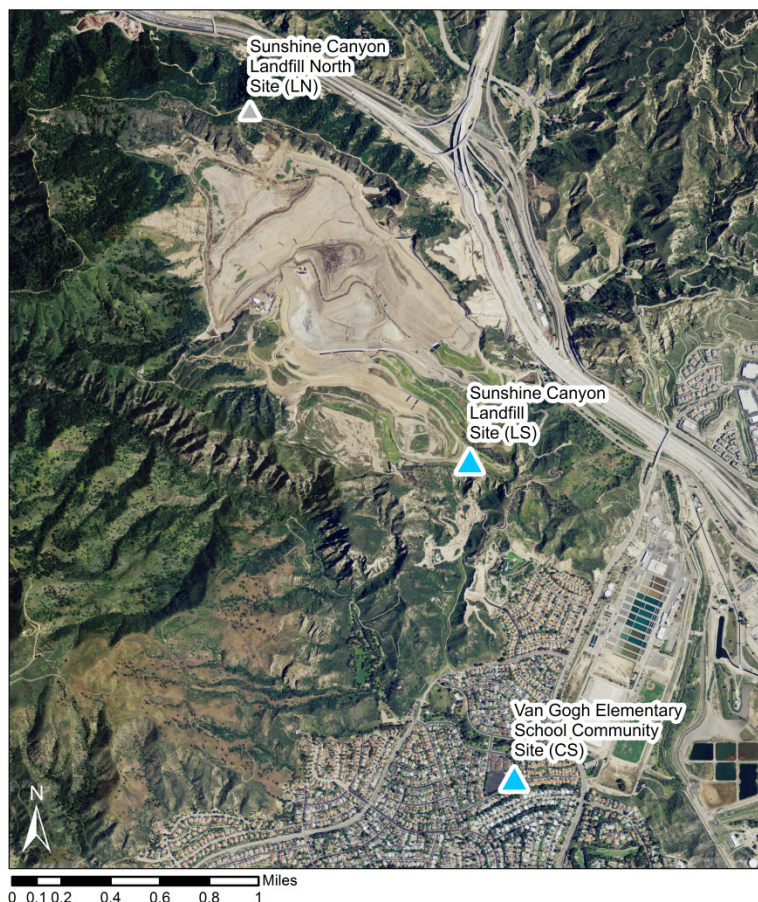


Figure 1. View of Sunshine Canyon Landfill and the surrounding monitoring stations (blue triangles): Sunshine Canyon Landfill (LS), and Community site (CS). The Sunshine Canyon Landfill North site (LN, gray triangle) collected data from December 1, 2015, through May 31, 2017, and has since been decommissioned.

2. Data Completeness

Completeness statistics for all measured variables during the 2017 summer quarter are shown in **Table 1**. Data deemed as suspect are included in subsequent analyses (e.g., regional comparisons), while invalid data are not. The percent data capture for PM₁₀ was 99.9% at the Landfill site and 100.0% at the Community site. Approximately 0.4% and 0.3% of the captured PM₁₀ data were invalidated at the Landfill and Community sites, respectively. No hourly PM₁₀ values were deemed suspect at either of the monitoring sites in this quarter.

Table 1. Data completeness statistics for hourly BC, hourly PM₁₀, and 1-min wind speed and wind direction data for the 2017 summer quarter monitoring period.

| 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 (LS) | 06/01/17-08/31/17 | 99.9 | 91.2 | 97.8 | 99.6 | 100.0 | 97.2 | 0.0 | 0.0 | < 0.1 |
| Community Site (CS) | 06/01/17-08/31/17 | 100.0 | 88.8 | 77.6 | 99.7 | 99.9 | 5.7 | 0.0 | < 0.1 | 0.0 |

^a Percent Data Capture is the number of collected data values divided by the total number of expected data intervals during the date range indicated in the “Dates” column (e.g., for the raw BC 1-hr data, 24 data values per day are expected).

^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.

Hourly BC data capture was 91.2% at the Landfill site and 88.8% at the Community site. No hourly BC data were deemed suspect or invalidated at the Landfill site. Less than 0.1% of the BC data were deemed suspect at the Community site, and less than 0.1% of the data were invalidated.

The wind data capture percentages were 97.8% and 77.6% at the Landfill and Community sites, respectively. Approximately 2.8% of the data were invalidated at the Landfill site, with 0.01% of the data deemed suspect. The significant data loss at the Community site was due to the installation of a new computer after a hardware issue that arose in the previous quarter (Spring 2017). Because of a subsequent software malfunction, approximately 94.3% of the data were invalidated at the Community site.

3. PM₁₀ Exceedances

There were no exceedances of the federal 24-hr PM₁₀ standard of 150 µg/m³ during the 2017 summer quarter at any of the monitoring sites. In this quarter, the percentage of days on which the state PM₁₀ standard of 50 µg/m³ was exceeded was 3% (2 days) at the Community site and 46% (41 days) at the Landfill site. This is the largest proportion of days exceeding the state PM₁₀ standard at the Landfill site during the summer quarter since the baseline year (2002). The federal and state PM₁₀ exceedances for the 2017 summer quarter, the summer quarters of the previous nine years (2008–2016), and the summer quarter of the baseline year are summarized in **Table 2**.

Table 2. Number of exceedances of federal and state 24-hr PM₁₀ standards during the summer quarters of the baseline year (2002) and 2008–2017. In the “Federal 24-hr” column, the values are number of exceedances and the date(s) on which those exceedances occurred. In the “State 24-hr” 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. The most recent summer quarter is shown in bold. The LN site only measured PM₁₀ for one summer quarter.

| Site | Quarter Period | Quarter Name | Exceedances of PM ₁₀ Standard | |
|-------------------------------------|--------------------------|--------------------|--|-------------------------------------|
| | | | Federal 24-hr 150 µg/m ³ | State 24-hr 50 µg/m ³ |
| Sunshine Canyon Landfill (LS) | 06/01/02–08/31/02 | Baseline Year | 0 | 44/67 (66%) |
| | 06/01/08–08/31/08 | 2008 Summer | 0 | 28/92 (30%) |
| | 06/01/09–08/31/09 | 2009 Summer | 0 | 16/87 (18%) |
| | 06/01/10–08/31/10 | 2010 Summer | 0 | 11/91 (12%) |
| | 06/01/11–08/31/11 | 2011 Summer | 0 | 23/92 (25%) |
| | 06/01/12–08/31/12 | 2012 Summer | 0 | 10/76 (13%) |
| | 06/01/13–08/31/13 | 2013 Summer | 0 | 14/91 (15%) |
| | 06/01/14–08/31/14 | 2014 Summer | 0 | 19/91 (21%) |
| | 06/01/15–08/31/15 | 2015 Summer | 0 | 8/92 (9%) |
| | 06/01/16–08/31/16 | 2016 Summer | 2 (07/22/2016 & 07/30/2016) | 16/92 (17%) |
| | 06/01/17–08/31/17 | 2017 Summer | 0 | 41/91 (46%) |
| Sunshine Canyon Landfill North (LN) | 06/01/16–08/31/16 | 2016 Summer | 1 (07/30/2016) | 59/92 (64%) |
| Community Site (CS) | 06/01/02–08/31/02 | Baseline Year | 0 | 5/16 (31%) |
| | 06/01/08–08/31/08 | 2008 Summer | 0 | 25/89 (28%) |
| | 06/01/09–08/31/09 | 2009 Summer | 0 | 13/90 (14%) |
| | 06/01/10–08/31/10 | 2010 Summer | 0 | 27/83 (33%) |
| | 06/01/11–08/31/11 | 2011 Summer | 0 | 11/92 (12%) |
| | 06/01/12–08/31/12 | 2012 Summer | 0 | 10/92 (11%) |
| | 06/01/13–08/31/13 | 2013 Summer | 0 | 9/90 (10%) |
| | 06/01/14–08/31/14 | 2014 Summer | 0 | 22/86 (26%) |
| | 06/01/15–08/31/15 | 2015 Summer | 0 | 0/30 (0%) |
| | 06/01/16–08/31/16 | 2016 Summer | 0 | 4/92 (4%) |
| | 06/01/17–08/31/17 | 2017 Summer | 0 | 2/92 (3%) |

4. Average and Maximum Black Carbon Concentrations and PM₁₀ 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 (South Coast Air Quality Management District, 2015).

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 (Drinovec et al., 2015; Allen, 2014). Instrument response is dampened with heavier loading (i.e., higher concentrations) of BC aerosol. This artifact can cause BC concentration readings to be lower than the true concentration. 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, Landfill North, and Community sites have been adjusted to compensate for this tape saturation effect; this compensation had not been performed in quarterly reports prior to the 29th Quarterly Report (winter 2015). 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 do not match concentrations reported prior to the 29th Quarterly Report. All BC data shown in this Quarterly Report have been compensated, with the exception of data from the baseline year; raw data for the baseline year are unavailable for compensation.

The 24-hr average and maximum compensated BC concentrations collected during the 2017 summer quarter, the compensated BC data from the summer quarters of the nine previous years, and the uncompensated data from the baseline year are provided in **Table 3**. The 2017 summer quarter maximum 24-hr BC value at the Landfill site is the lowest on record. All other BC metrics at the Landfill and Community sites are lower than previous summer quarters.

Notched box-whisker plots¹ of summer quarter 24-hour average BC and PM₁₀ data for summer quarters during all ten monitoring years (2008–2017) are shown for the Landfill site and the Community site in **Figures 2 and 3**, respectively.

¹ A notched box-whisker plot shows the entire distribution of concentrations for each year. Each box illustrates the 25th (lower box extent), 50th (median, midline), and 75th (upper box extent) percentiles. The extent of the box indicates the interquartile range (IQR), where 50% of the data lie. The whiskers indicate values that are up to 1.5 times the IQR from the 25th or 75th percentile. Data outside of the IQR are referred to as “outliers” and are plotted individually. The boxes are notched (narrowed) at the median and return to full width at the 95% lower- and upper-confidence interval values (i.e., the extents of the notches indicate the range in which the median falls with 95% confidence). If the 95% confidence interval of the median is beyond the 25th or 75th percentile, then the notches extend beyond the box (hence a “folded” appearance). If the notches of any two boxes do not overlap, there is strong evidence that the medians are statistically different at the 95% confidence level.

Table 3. Twenty-four-hour BC concentrations for the summer quarter of the baseline year (2002) and each year from 2008 through 2017. Asterisks (*) denote uncompensated BC values. The most recent summer quarter is shown in bold. The LN site only measured BC for one summer quarter.

| Site | Quarterly Period | Quarter Name | BC Concentrations ($\mu\text{g}/\text{m}^3$) | |
|-------------------------------------|--------------------------|--------------------|--|---------------|
| | | | Average 24-Hr | Maximum 24-Hr |
| Sunshine Canyon Landfill (LS) | 06/01/02–08/31/02 | Baseline Year | 1.09* | 2.69* |
| | 06/01/08–08/31/08 | 2008 Summer | 1.41 | 3.01 |
| | 06/01/09–08/31/09 | 2009 Summer | 1.26 | 2.45 |
| | 06/01/10–08/31/10 | 2010 Summer | 1.06 | 1.88 |
| | 06/01/11–08/31/11 | 2011 Summer | 0.99 | 1.78 |
| | 06/01/12–08/31/12 | 2012 Summer | 0.93 | 1.79 |
| | 06/01/13–08/31/13 | 2013 Summer | 0.98 | 1.98 |
| | 06/01/14–08/31/14 | 2014 Summer | 0.79 | 1.34 |
| | 06/01/15–08/31/15 | 2015 Summer | 0.76 | 1.58 |
| | 06/01/16–08/31/16 | 2016 Summer | 0.70 | 1.33 |
| | 06/01/17–08/31/17 | 2017 Summer | 0.77 | 1.28 |
| Sunshine Canyon Landfill North (LN) | 06/01/16–08/31/16 | 2016 Summer | 0.86 | 2.17 |
| Community Site (CS) | 06/01/02–08/31/02 | Baseline Year | 1.40* | 2.33* |
| | 06/01/08–08/31/08 | 2008 Summer | 0.98 | 1.71 |
| | 06/01/09–08/31/09 | 2009 Summer | 1.03 | 2.23 |
| | 06/01/10–08/31/10 | 2010 Summer | 1.08 | 1.75 |
| | 06/01/11–08/31/11 | 2011 Summer | 0.86 | 1.43 |
| | 06/01/12–08/31/12 | 2012 Summer | 0.81 | 1.63 |
| | 06/01/13–08/31/13 | 2013 Summer | 0.76 | 1.31 |
| | 06/01/14–08/31/14 | 2014 Summer | 0.86 | 1.50 |
| | 06/01/15–08/31/15 | 2015 Summer | 0.92 | 1.48 |
| | 06/01/16–08/31/16 | 2016 Summer | 0.79 | 1.42 |
| | 06/01/17–08/31/17 | 2017 Summer | 0.81 | 1.48 |

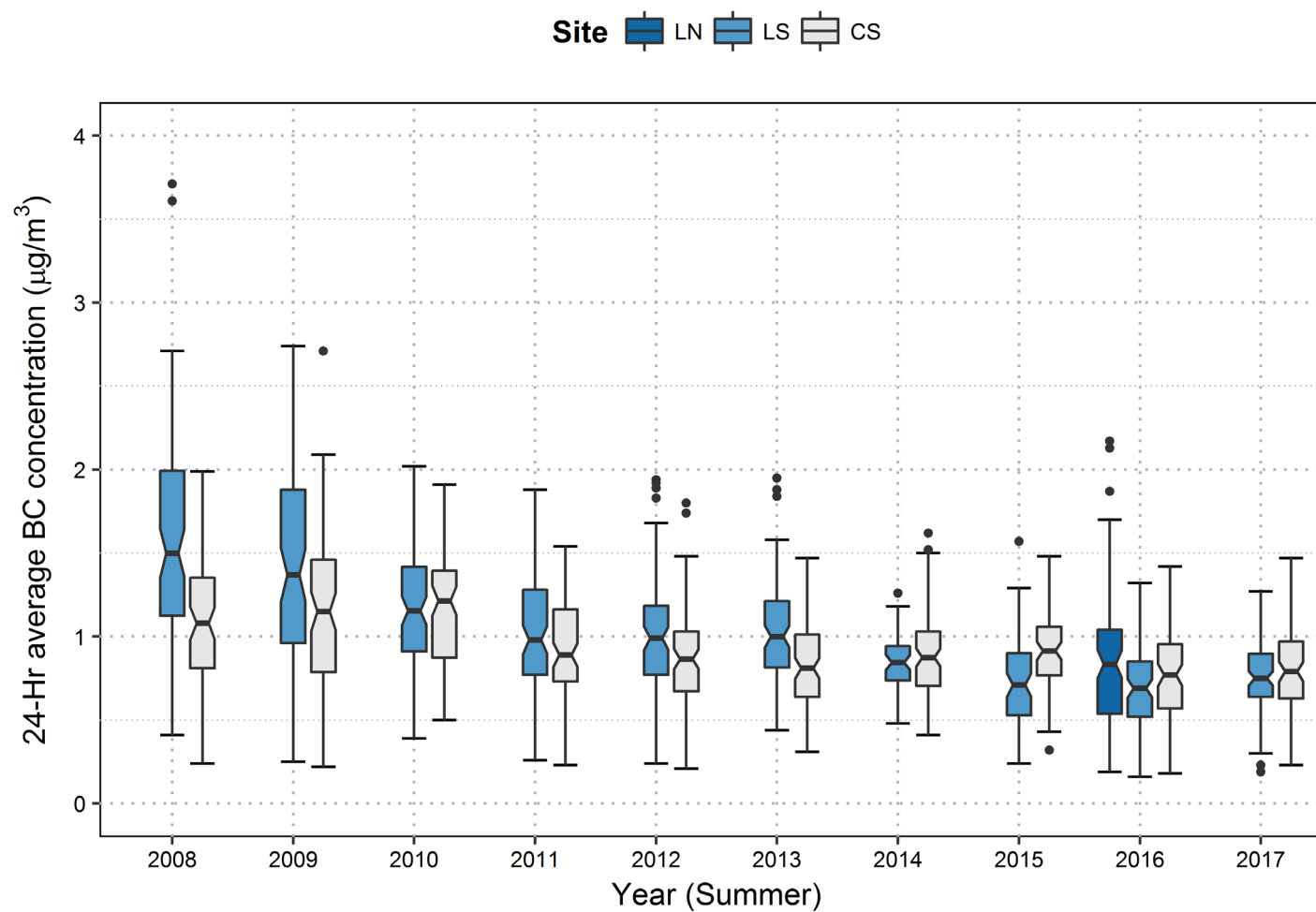


Figure 2. Notched box-whisker plot of daily 24-hr average concentrations of BC at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during summer (June-August) quarters from 2008 to 2017.

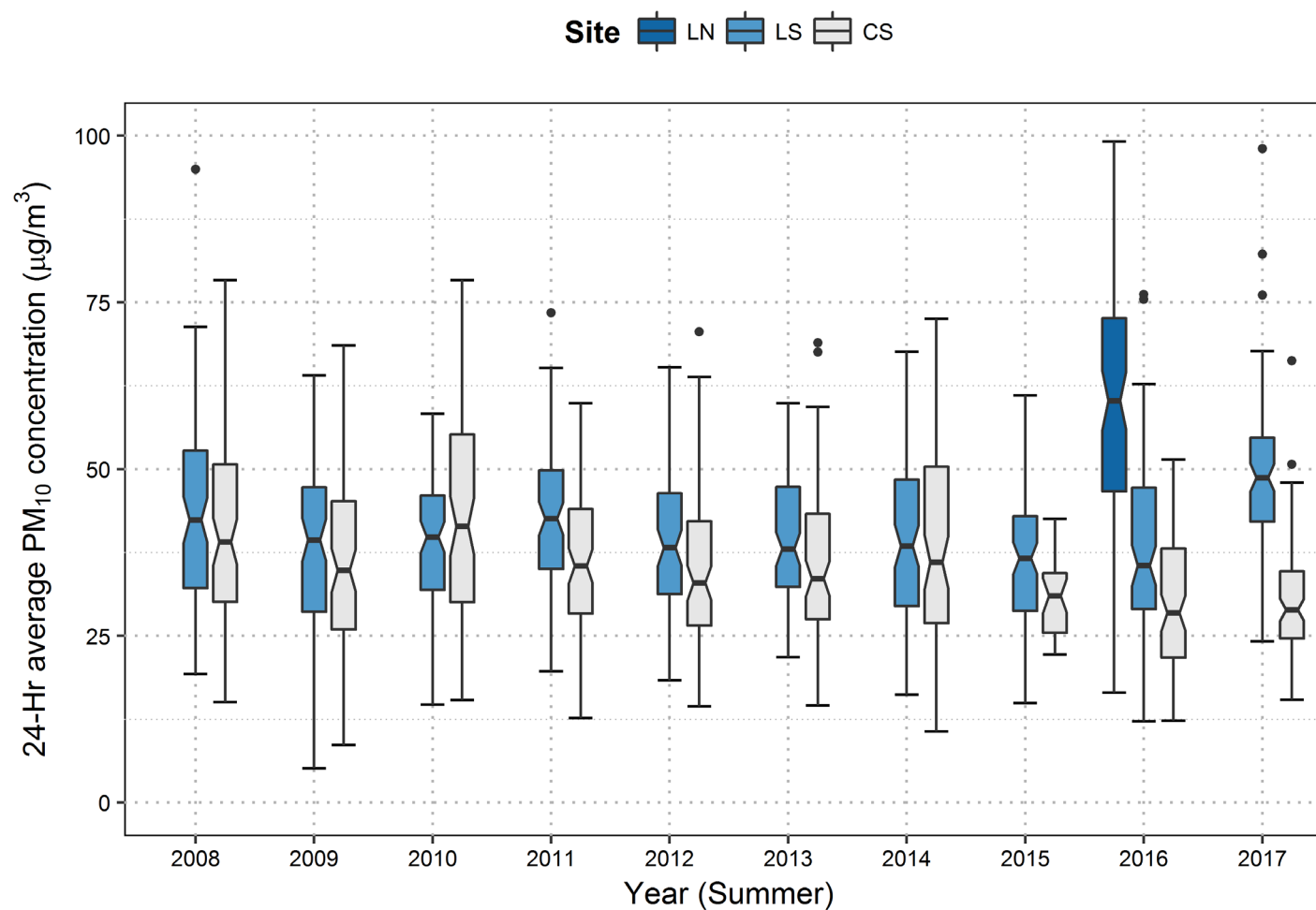


Figure 3. Notched box-whisker plot of daily 24-hr average concentrations of PM₁₀ at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during summer (June-August) quarters from 2008 to 2017.

There is no statistically significant trend in the median 24-hour average PM₁₀ concentrations for summer quarters over the past ten years at the Landfill site or the Community site (Figure 3). At this time of year, the median 24-average PM₁₀ concentrations measured at the Community site are usually lower than those measured at the Landfill site. In the 2017 summer quarter, the median 24-hour PM₁₀ concentration is much lower at the Community site than at the Landfill site. As indicated by the non-overlapping notches in the box-whisker plot, the difference between the median 24-hour PM₁₀ concentrations at the Community and the Landfill site is statistically significant; the concentrations at the Community site are generally lower.

Table 3 and Figure 2 suggest that, while there is some year-to-year variability, there is no statistically significant trend in summer quarter median 24-hr average BC over the past ten years at any of the monitoring sites, although the range of 24-hr average BC values generally decreased over time at each site. The median 24-hr average BC concentrations are not significantly different among the Landfill and Community sites. The average 24-hour BC concentration at the Landfill and Community sites are both slightly higher in the 2017 summer quarter than in the 2016 summer quarter.

5. Field Operations

Tables 4 and 5 list dates and major tasks associated with visits to the Landfill site and the Community site during the 2017 summer quarter.

Table 4. Landfill monitoring site visits, field maintenance, and operations.

| Date of Site Visit | Description of Work |
|--------------------|---|
| 06/01/17 | Collected PM ₁₀ and BC data. Checked Aethalometer tape supply. Cleaned BAM roller, vane, and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers. |
| 07/21/17 | Collected PM ₁₀ and BC data. Replaced Aethalometer tape supply. Restarted Aethalometer. Checked BAM tape supply. Cleaned BAM roller, vane, and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers. |
| 08/16/17 | Collected PM ₁₀ and BC data. Replaced Aethalometer tape supply. Restarted Aethalometer. Cleaned BAM roller, vane, and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers. |

Table 5. Community site visits, field maintenance, and operations.

| Date of Site Visit | Description of Work |
|--------------------|--|
| 06/01/17 | Re-installed computer. Collected BC data. Checked Aethalometer and BAM tape supplies. Restarted Aethalometer. Cleaned BAM roller, vane, and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers. |
| 06/12/17 | Visited site. |
| 06/21/17 | Re-started computer due to communications issue. |
| 07/21/17 | Collected BC data. Checked Aethalometer and BAM tape supplies. Restarted Aethalometer. Cleaned BAM roller, vane, and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers. Noted issue with wind speed and direction data incorrectly collected by data logging system. Could not record shelter temperature on new computer. |
| 08/16/17 | Collected PM ₁₀ and BC data. Checked Aethalometer tape supplies. Replaced BAM tape supply. Restarted Aethalometer. Cleaned BAM roller and vane, and performed leak check. Performed flow check on Aethalometer and BAM samplers. |

Aethalometer and BAM flow rates measured with a NIST-traceable flow standard are shown in **Table 6**. 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 lpm to 17.3 lpm. The Aethalometer has no size cut point.

Table 6. Flow rates for the BAM PM₁₀ and Aethalometer BC monitors at the Landfill and Community sites. “Ref.” is the Reference and “Aeth.” is the Aethalometer.

| Location | Date | Flow Rate (lpm) | | | | | |
|-------------------------------|----------|-----------------|-------|---------|-------|----------|------|
| | | As Found | | As Left | | As Found | |
| | | BAM | Ref. | BAM | Ref. | Aeth. | Ref. |
| Sunshine Canyon Landfill (LS) | 06/01/17 | 16.7 | 16.94 | 16.7 | 16.94 | 3.0 | 3.0 |
| | 07/21/17 | 16.7 | 17.01 | 16.7 | 17.01 | 2.9 | 3.1 |
| | 08/16/17 | - | 17.02 | - | 17.02 | 2.9 | 2.8 |
| Community Site (CS) | 07/21/17 | 16.7 | 16.97 | 16.7 | 16.97 | 3.0 | 3.6 |
| | 08/16/17 | 16.7 | 16.87 | 16.7 | 16.87 | 3.1 | 3.3 |

6. References

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