Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

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

(December 1, 2010 – February 28, 2011)

Quarterly Report
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This document contains blank pages to accommodate double-sided printing.

Table of Contents

Section **Page**

List of Figures

Figure **Page**

List of Tables

Table **Page**

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_{10} (particulate matter less than 10 microns in aerodynamic diameter) is measured hourly, and wind speed, wind direction, and black carbon (BC, a surrogate for diesel particulate matter) are measured as 5-minute averages and reported as hourly averages. The collected data undergo quarterly validation and are evaluated for completeness. PM_{10} concentrations are compared with federal and state PM_{10} standards. When PM_{10} exceedances occur, additional comparisons are made with the historical, regional, and annual ambient PM_{10} concentrations. At least annually, the PM_{10} 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 Thirteenth 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, 2010, through February 28, 2011, was 100% for PM_{10}, BC, and wind parameters at both sites. Approximately 1% of the captured PM_{10} data were invalidated due to filter tape errors (tape breaks). There was one exceedance of the 150 $\mu g/m^3$ 24-hr federal PM_{10} standard at the Landfill site on January 20, 2011. No exceedances of the Federal standard were recorded at the Van Gogh School site. The more stringent 24-hr California state PM_{10} standard (50 $\mu g/m^3$) was exceeded during this period on 8% of the days at the Landfill site and on only 1% of the days (1 of 88 days) at the Van Gogh School site. Average 24-hr BC concentrations at both monitoring sites were nearly identical for this quarterly period, as were the maximum BC concentrations at the two monitoring sites. Average BC concentrations were among the lowest recorded to date for the winter quarterly period.

ES-3. Landfill Gas Sampling

One-hour integrated ambient air samples for landfill gas (LFG) and hazardous air pollutants (HAPs) were obtained on January 21, 2011. All concentrations during the January 21 sampling event were among the lowest of the median historical concentrations observed elsewhere in the Los Angeles and Ventura County areas.

1. Introduction

This report provides a summary of data completeness, ambient PM_{10} (particulate matter less than 10 microns in aerodynamic diameter) concentrations, average and maximum black carbon (BC) concentrations, concentrations of methane and non-methane organic compounds (NMOCs) from landfill gas (LFG) sampling, instrument flow rate verification (quality control) data, and field operations for the quarterly period of December 1, 2010, through February 28, 2011. Data from this quarterly period represent the fourth 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 the period December 1, 2010, through February 28, 2011. Data capture rates for $PM_{10,}$ BC, and wind speed/wind direction (WS/WD) were near 100% at both sites. About 1% of the PM_{10} data were invalidated due to occurrences of filter tape breakages. These breaks were quickly repaired.

Table 1. Data completeness statistics for the recent monitoring quarter, December 1, 2010, through February 28, 2011.

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	12/1/10-2/28/11	100%	100%	99.9%	99.6%	100%	100%	0.0%	0.0%	0.0%
Van Gogh Elem. School	12/1/10-2/28/11	100%	100%	100%	98.9%	100%	100%	0.0%	0.0%	0.0%

[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.

3. PM_{10} Exceedances

The federal and state PM_{10} exceedances for the current quarter, the corresponding quarters of the previous three years (2007–2008, 2008–2009, and 2009–2010), and the baseline year (November 22, 2001, to November 21, 2002), are summarized in **Table 2**. There was one exceedance of the 24-hr federal PM_{10} standard during this winter quarter at the Sunshine Canyon Landfill, occurring on January 20, 2011 (207 $\mu g/m^3$). This exceedance is attributed to locally derived landfill emissions under high wind conditions, impacting the landfill-

based PM_{10} monitor only. On that date, the Van Gogh School PM_{10} 24-hr average was 28 $\mu g/m^3$, and the SCAQMD continuous PM_{10} monitors at Burbank (W Palm Avenue) and Los Angeles (N Main Street) reported concentrations of 25 and 44 $\mu g/m^3$, respectively. The percentage of days exceeding the state standard of 50 $\mu g/m^3$ for the December–February quarter was 1% for the Van Gogh School site and 8% for the Sunshine Canyon Landfill site.

Table 2. Number of exceedances of federal and state 24-hr PM_{10} standards during the current quarter and the December through February quarterly periods of the baseline year, 2007–2008, 2008–2009, and 2009–2010. 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 possible days* and below that, the *percentage of exceedances* out of total possible days.

Site	Quarterly Period	PM_{10} Standard	
		Federal 24-hr 150 $\mu g/m^3$	State 24-hr 50 $\mu g/m^3$
Van Gogh School	12/1/01–2/28/02	0	6/69 (9%)
	12/1/07–2/28/08	0	2/71 (3%)
	12/1/08–2/28/09	0	6/84 (7%)
	12/1/09–2/28/10	0	0
	12/1/10–2/28/11	0	1/88 (1%)
Sunshine Canyon Landfill	12/1/01–2/28/02	0	8/55 (15%)
	12/1/07–2/28/08	1 (2/14/08)	9/81 (11%)
	12/1/08–2/28/09	1 (1/9/09)	3/50 (6%)
	12/1/09–2/28/10	0	0
	12/1/10–2/28/11	1 (1/20/11)	7/90 (8%)

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 in an attempt to quantify the relative amounts of DPM in ambient air.

Table 3 provides the 24-hr average and maximum 24-hr BC concentrations for December 1, 2010, through February 28, 2011, and compares these concentrations with data from corresponding quarters of the three most recent years and the baseline year. The BC concentrations at both monitoring sites during the 2010–2011 winter quarter were near the low end of the range of concentrations measured during preceding winter quarters. The maximum 24-hr BC concentrations were midway between the high and low historical ranges at both sites.

Table 3. Comparison of 24-hr BC concentrations for the current quarter with those measured in the December 1 through February 28 quarterly periods of the baseline year and of 2007–2008, 2008–2009, and 2009–2010.

Site	Quarterly Period	BC Concentrations (µg/m^3)	
		Average 24-hr	Maximum 24-hr
Van Gogh School	12/1/01–2/28/02	0.75	3.72
	12/1/07–2/28/08	0.46	1.49
	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
Sunshine Canyon Landfill	12/1/01–2/28/02	0.85	3.49
	12/1/07–2/28/08	0.54	1.91
	12/1/08–2/28/09	0.57	2.02
	12/1/09–2/28/10	0.72	2.38
	12/1/10–2/28/11	0.55	2.44

5. Landfill Gas Sampling

The ambient air quality monitoring work conducted during 2008–2010 at these sites has demonstrated that landfill impacts on the neighboring communities have seasonal, as well as diurnal, components. With the limited number of LFG samples (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 down-slope air flow patterns that may carry pollutants from the landfill to the community. The complaint registry at the South Coast Air Quality Management District (SCAQMD) indicates that odor complaints from the community are most frequent from October to January, suggesting transport from the landfill may be occurring.

LFG gas was sampled on January 21, 2011. 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 NMOCs 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

The January 21, 2011, sample exhibited methane concentrations at or below the average ambient concentration for the northern hemisphere of 1.8 ppmV (**Table 4**). The 1.3 ppmV values in Table 5-1 are at the lower range for acceptable laboratory quality control (± 30%).

Table 4. Ambient concentrations of methane measured at the Landfill monitoring site and the Van Gogh School site on January 21, 2011.

Site	Methane Concentration (ppmV)	
	7:00–8:00 a.m.	8:00–9:00 a.m.
Sunshine Canyon Landfill	1.8	1.3
Van Gogh School	1.3	1.3

5.2 Non-Methane Organic Compounds (NMOCs)

Figure 1 illustrates how the concentrations of NMOC from the January 21 samples compare to annually averaged Los Angeles and Ventura county data from 2006–2009, obtained from the U.S. Environmental Protection Agency's (EPA's) Airdata system. Averages are based on the methodology described by McCarthy et al. (2007).[1] The figures also allow comparison of the sample data with the method detection limit (MDL) for the compounds. All measured concentrations in the January 21 samples were low.

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 compounds.[2] Sample concentrations are compared to cancer benchmarks in the figure. Exposure to concentrations at the benchmark 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.

[1] 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

[2] http://www.epa.gov/ttn/atw/toxsource/table1.pdf

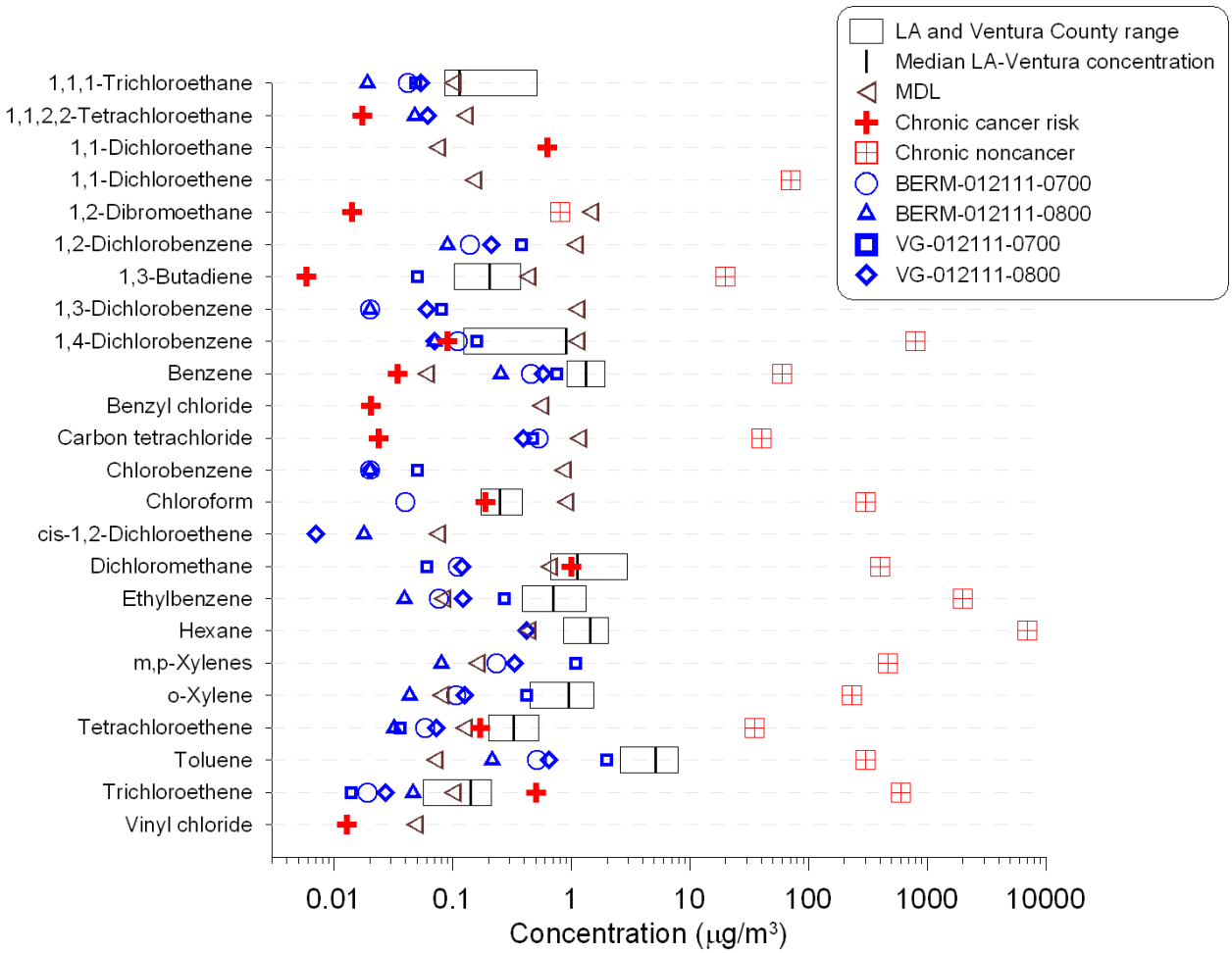

Figure 1. Ranges of the 10th to 90th percentile quarterly averages and median values for Los Angeles and Ventura county NMOC data from 2006–2009, as available. Shown are MDLs; chronic cancer risk; chronic noncancer hazard levels; and concentrations determined from samples collected at the Landfill site (BERM) and Van Gogh Elementary School site (VG) on January 21, 2011. For the January 21 sample, any data not shown were not detected by the analytical laboratory. Data below MDL that were reported are shown.

6. Field Operations

Tables 5 and 6 list dates and major tasks associated with visits to the Sunshine Canyon Landfill and Van Gogh School sites, respectively, between December 1, 2010, and February 28, 2011. **Table 7** shows the PM_{10} and BC monitors' flow rates as reported by the monitors and measured with a NIST-traceable flow standard.

Table 5. Sunshine Canyon Landfill monitoring site visits and field maintenance and operations from December 1, 2010, through February 28, 2011.

Date of Site Visit	Description of Work
Wednesday, December 1, 2010	Regular preventive maintenance. High winds prevented roof access, so flow checks on PM_{10} and BC samplers were postponed. Clean the Beta Attenuation Monitor's (BAM) capstan, roller, nozzle, and vane. Collect PM_{10} and BC data.
Thursday, January 13, 2011	Regular preventive maintenance. Flow checks on PM_{10} and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM_{10} and BC data. Install new BAM tape.
Friday, January 21, 2011	Hourly integrated landfill gas samples obtained at 07:00 and 08:00 PST. PM_{10} inlet removed and cleaned.
Friday, January 28, 2011	Wind sensor mast adjusted to provide additional reinforcement against strong winds.
Tuesday, February 15, 2011	Regular preventive maintenance. Flow checks on PM_{10} and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM_{10} and BC data.

Table 6. Van Gogh School monitoring site visits and field maintenance and operations from December 1, 2010, through February 28, 2011.

Date of Site Visit	Description of Work
Wednesday, December 1, 2010	Regular preventive maintenance. High winds prevented roof access, so flow checks on PM_{10} and BC samplers were postponed. Clean the BAM capstan, roller, nozzle, and vane. Install new BAM tape. Collect PM_{10} and BC data.
Thursday, January 13, 2011	Regular preventive maintenance. Clean the BAM capstan, roller, nozzle, and vane. Install new BAM tape. Collect PM_{10} and BC data.
Friday, January 21, 2011	Hourly integrated landfill gas samples obtained at 07:00 and 08:00 PST.
Saturday, February 5, 2011	Unscheduled visit: BAM tape break. Replaced tape.
Tuesday, February 15, 2011	Regular preventive maintenance. Flow checks on PM_{10} and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM_{10} and BC data.

Table 7. Flow rates for the BAM PM_{10} monitors and Aethalometer BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites from December 1, 2010, through February 28, 2011. 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	12/1/10	16.5	--[a]	16.5	--[a]	3.2	--[a]
	1/13/11	16.6	16.7	16.6	16.7	3.1	3.4
	2/15/11	16.8	16.7	16.8	16.7	3.1	3.3
Van Gogh Elementary School	12/1/10	16.7	--[a]	16.7	--[a]	3.5	--[a]
	1/13/11	16.7	15.5	16.7	15.5	3.4	3.1
	2/15/11	16.7	16.6	16.7	16.6	3.4	3.0

[a]Not measured because high winds prevented roof access.