Ambient Air Report

Beverly Hills High School
241 South Moreno Drive,
Beverly Hills, California 90212

June 3 , 2003

Volume 1 of 2, Report

Prepared for:

Lewis Brisbois Bisgaard & Smith LLP
221 North Figueroa Street, Suite 1200
Los Angeles, California 90012

Prepared by:

CDM
18581 Teller, Suite 200
Irvine, California 92612

Project No. 22293-38613.WPLN

Ambient Air Report

Beverly Hills High School
241 South Moreno Drive,
Beverly Hills, California 90212

June 3, 2003

Volume 1 of 2, Report

Prepared for:

City of Beverly Hills
455 N. Rexford Drive
Beverly Hills, CA 90210

Prepared by:

CDM
18581 Teller, Suite 200
Irvine, California 92612

The information contained in this summary of findings has received appropriate technical review and approval. The approach and methodology are based upon professional judgments founded upon review and interpretation of available data and upon our professional experience and background.

Prepared by:

Thomas D. Blackman, R.G., C.HG
Senior Project Manager

James M. LaVelle, Ph.D.
Associate

Contents

Executive Summary ES-1
ES.1 Conclusions ES-1
ES.2 Discussion ES-1
ES.3 Sampling Details and Data Summary ES-2
Section 1 Introduction 1-1
1.1 Project Objectives 1-1
1.2 Scope of Work 1-1
1.3 Report Organization 1-1
Section 2 Site Description 2-1
Section 3 Previous Investigations 3-1
3.1 Masry and Vititoe Reported Data 3-1
3.2 SCAQMD Investigation 3-3
Section 4 Sampling Activities and Results 4-1
4.1 Sampling Rationale 4-1
4.2 Summary of Field Activities 4-1
4.2.1 Sampling Methods and Procedures 4-1
4.2.2 Decontamination Procedures 4-3
4.2.3 Containment and Disposal of Investigation-Derived Waste 4-3
4.3 Analytical Program and Results 4-3
4.3.1 Analytical Laboratory and Methods 4-3
4.3.2 Analytical Results 4-4
4.4 Weather Data 4-5
4.5 Quality Assurance Activities 4-5
4.5.1 Sample Locations 4-7
4.5.2 Sample Containers 4-7
4.5.3 Sample Collection Procedures 4-7
4.5.4 Sampling Documentation 4-8
4.5.5 Weather Data 4-8
4.5.6 Field Quality Control Samples 4-8
4.5.7 Sample Packing, Storage and Transportation 4-8
Section 5 Incremental Risk Evaluation 5-1
5.1 Evaluation of Potential Sources 5-1
5.1.1 Benzene Evaluation 5-1
5.1.2 Toluene Evaluation 5-2
5.1.3 Acetone and Methyl Ethyl Ketone Evaluation 5-2
5.2 Comparison to Health Goals 5-3
5.3 Incremental Risk Compared to Regional Concentrations 5-4
Section 6 Conclusions 6-1
Section 7 References 7-1

Appendices

Appendix A Previously Collected Data
Appendix B Laboratory Data Sheets and Chain of Custody Documentation
Appendix C Data Validation Sheets
Appendix D Weather Data

List of Figures

Figure ES-1 Benzene Concentrations....ES-3
Figure 1 Site Vicinity Map....1-3
Figure 2 Current Site Plan....1-4
Figure 3 Adjoining Property Map....2-2
Figure 4 Ambient Air Sampling Locations....4-9
Figure 5 Benzene Concentrations, Comparison of CDM and SCAQMD Analytical Results....4-10
Figure 6 Toluene Concentrations, Comparison of CDM and SCAQMD Analytical Results....4-11
Figure 7 Benzene Concentrations in Ambient Air at the High School Compared to Los Angeles Basin Concentrations and Chronic Health Goals....5-5
Figure 8 Toluene Concentrations in Ambient Air at the High School Compared to Los Angeles Basin Concentrations and Chronic Health Goals....5-6

List of Tables

Table ES-1 Summary Statistics – CDM Investigation....ES-4
Table ES-2 Summary Statistics – SCAQMD Investigation....ES-5
Table 1 Summary Statistics Masry and Vititoe Data....3-5
Table 2 Summary Statistics SCAQMD Investigation....3-6
Table 3 Summary Statistics CDM Investigation....5-7
Table 4 Comparison of Maximum Detected Concentrations to OEHHA Reference Exposure Levels....5-8
Table 5 Comparison of Maximum Detected Carcinogen Concentrations to Concentration Ranges in the Los Angeles Basin....5-9

List of Acronyms

ASTM	American Society for Testing and Materials
CalEPA	California Environmental Protection Agency
CEL	Calscience Environmental Laboratories, Inc.
COPC	chemical of potential concern
DOGGR	California Department of Conservation Division of Oil, Gas and Geothermal Resources
DTSC	Department of Toxic Substances Control
GC/MS	gas chromatography/mass spectrometry
GC/FPD	gas chromatography/flame photometric detection
OEHHA	Office of Environmental Health Hazard Assessment
ppb	parts per billion by volume / volume
ppm	parts per million by volume
QA/QC	quality assurance/quality control
SCAQMD	South Coast Air Quality Management District
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compound
95UCL	95 percent upper confidence limit of the arithmetic mean

Executive Summary

ES.1 Conclusions

Results of the investigation performed by Camp Dresser & McKee Inc. (CDM) indicate no basis for believing that ambient air at Beverly Hills High School (the High School) is significantly impacted by oil well operations or that exposure to air on the campus presents any different potential health impact than exposure to air elsewhere in the Los Angeles Basin. These conclusions are consistent with results of previous studies by the South Coast Air Quality Management District (SCAQMD), which have shown that chemical concentrations measured in the air at the High School are well below the health limits established by the State of California.

ES.2 Discussion

CDM conducted an air sampling program during the week of April 14, 2003 at the High School, which is located at 241 South Moreno Drive, Beverly Hills, California. The objective of the sampling program was to obtain additional data to help evaluate whether outdoor air quality at the High School is different than typical air quality in the Los Angeles Basin and, if so, to determine whether that difference presents any health risks to students, staff, or other individuals who use the school's facilities. Outdoor air at the school is a concern because of recent suggestions that it may contain elevated levels of volatile chemicals due to their release from a variety of potential sources including active oil well operations and abandoned oil wells.

The sampling program followed standard U.S. Environmental Protection Agency (USEPA) methods of collection and analysis for volatile organic chemicals in ambient air. Air samples were collected over an 8-hour period during representative school and after-school activity hours. Samples were analyzed for more than 50 different volatile organic chemicals, including those recently suggested to be chemicals of potential concern (COPCs) at the High School. Only eleven chemicals (including methane) were detected in any of the samples and no chemicals linked to cancer were found at levels out of the ordinary for the Los Angeles area. These observations are consistent with the results of previous studies conducted by the SCAQMD, which have shown that chemicals measured in the ambient air at the High School are well below the health limits established by the State of California.

One chemical of particular focus, benzene, was found at concentrations in the air consistent with those commonly reported by SCAQMD for all routine monitoring stations throughout the basin (Figure ES-1). Since these monitoring stations are located in areas where no unusual sources of benzene or other chemicals have been identified, data from these monitoring stations provides a range for typical air quality. No apparent difference between typical background for the Los Angeles Basin and measured benzene concentrations at the High School is observed. Thus available data provide no indication of an unusual source of benzene.

Based on review of CDM and SCAQMD data, we conclude that ambient air at the High School is not measurably impacted by oil well operations and that exposure to air on the campus does not present any different potential health impact than exposure to air elsewhere in the Los Angeles Basin.

ES.3 Sampling Details and Data Summary

A total of nine sampling locations were selected to evaluate the possible influence of on-site and adjacent activities, either current or historical. Two additional sampling locations were selected to be representative of background concentrations of the selected analytes. A summary of sampling results is provided in Table ES-1[1]. For comparison, data reported by the SCAQMD in their evaluation of local air quality are shown in Table ES-2.

Chemicals detected in this investigation are routinely found in the ambient outdoor air throughout Los Angeles due to a variety of sources unrelated to oil well activities. For example, many common activities, such as driving or putting gasoline into a vehicle, having clothes dry-cleaned, etc, release chemicals including those chemicals listed in Tables ES-1 and ES-2 to ambient air throughout the Los Angeles Basin. Vehicle emissions (i.e., driving and fueling vehicles) are responsible for a large percentage of the chemicals detected in Los Angeles Basin air (SCAQMD 1999). Detection of a variety of airborne chemicals in the Los Angeles Basin is, therefore, to be expected.

Many chemicals evaluated in this study also have been the focus of routine monitoring in a variety of regions throughout the Los Angeles area for many years. When ambient air concentrations of these chemicals reported in this study are compared to the regional monitoring data for the same chemicals as depicted in Table ES-1, no obvious differences are observed, indicating that air at the High School is indistinguishable from air elsewhere in the Basin, based on volatile chemical composition[2]. This conclusion is the same when the results of this study are compared with the recently completed study by the SCAQMD at the site as depicted in Table ES-2.

---

[1] Included in Table 1 are the most current results of ambient air testing routinely conducted by the California Air Resources Board in Burbank, the monitoring site closest to the High School.

[2] With the exception of acetone and methyl ethyl ketone, as discussed in the main body of the report.

Figure ES-1
Benzene Concentrations

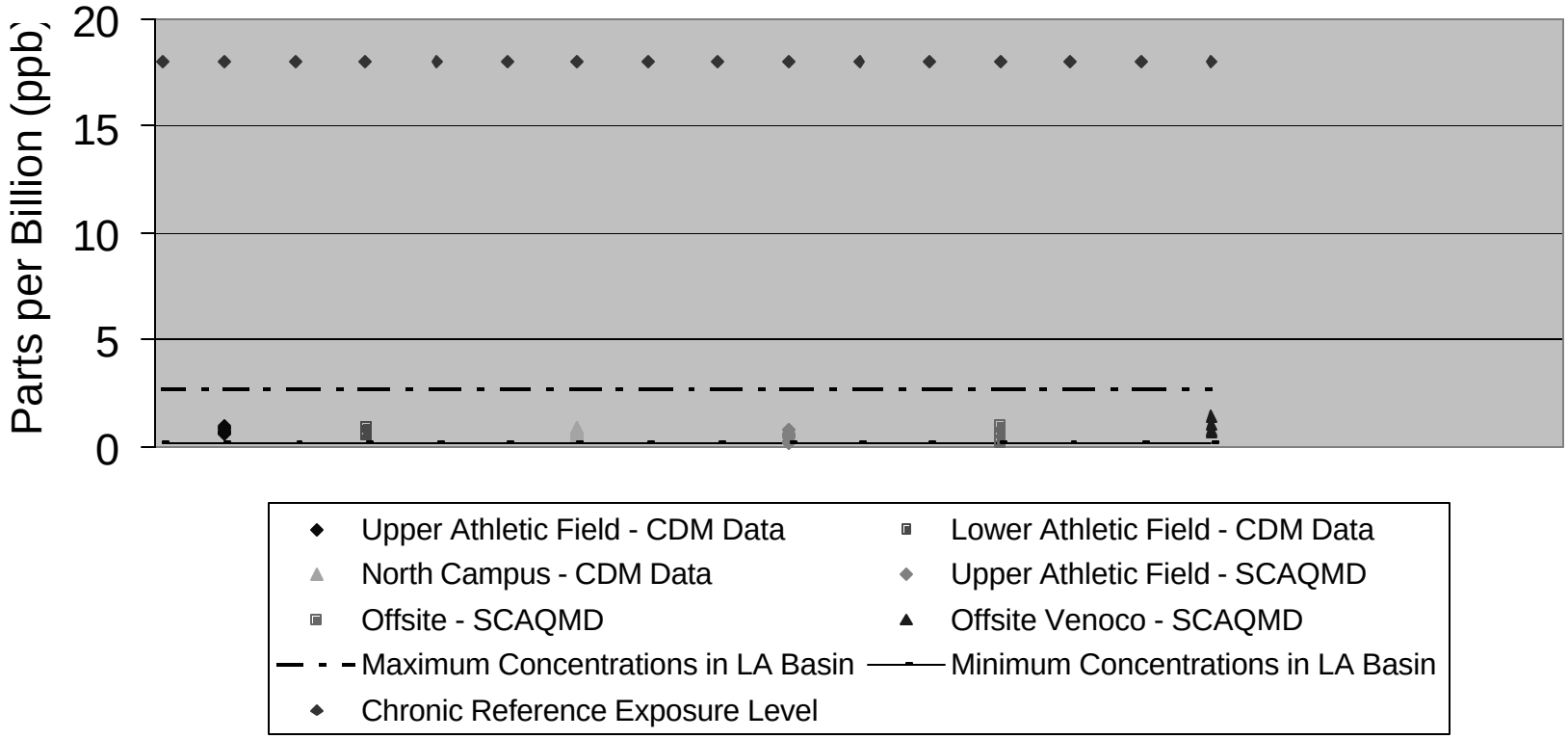


Table ES-1
Beverly Hills High School
Summary Statistics - CDM Investigation

Analyte	Frequency of Detection (number of detects/number of samples)	Frequency of Detection (%)	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean[a]	Range of Backgound Concentrations[b]	Average Concentrations of Analytes Measured at Burbank by ARB/SCAQMD	Range of Analytes Measured by ARB/SCAQMD at Burbank[c]	Units
Hydrocarbons									
Methane	11 / 11	100%	2	2.9	2.19	ND to 2.3	No Data	No Data	ppm
Other Volatile Organic Compounds (VOCs)									
Acetone	30 / 30	100%	3.4	200[f]	16	3.4 to 54	~2.8[d]	No Data	ppb
Benzene	3 / 30	10%	0.57	1.0	0.38	Not detected	1.06[c]	0.4 to 3.8	ppb
2-Butanone (MEK)	12 / 30	40%	1.2	46[f]	3.68	ND to 16 (one detection out of 7 samples)	~5.9[d]	No Data	ppb
Chloromethane	24 / 30	80%	0.7	1.2	0.78	ND to 1.0	0.62[d]	No Data	ppb
Dichlorodifluoromethane	22 / 30	73%	0.68	1.0	0.69	ND to 0.94	No Data	No Data	ppb
2-Hexanone (MiBK)	4 / 30	13%	1.8	7.5	1.03	Not detected	No Data	No Data	ppb
Tetrachloroethene (Perchoroethylene)	1 / 30	3%	1.0	1.0	0.4[e]	Not detected	0.3[c]	0.08 to 1.1	ppb
Toluene	26 / 30	87%	0.76	1.6	1.08	ND to 1.8	3.21[c]	1 to 10	ppb
m,p-Xylenes	4 / 30	13%	1.3	2	0.82	ND to 1.5 (one detection out of 7 samples)	2.06[c]	0.6 to 7.1	ppb
o-Xylene	2 / 30	7%	0.62	1.0	0.37	Not detected	0.54[c]	0.2 to 1.9	ppb

a. Average concentrations include those samples with non-detected concentrations. A value of one-half of the reporting limit was used for non-detected concentrations.
b. Background concentrations as measured at sample point 10 and 11.
c. Source: California Air Resources Board. Annual Toxics Summary. Data for Burbank, year 2001. http://www.arb.ca.gov/aqd/toxics/sitesubstance.html
d. Source: SCAQMD. 1999. Multiple Air Toxics Exposure Study (MATES-II). Concentrations are estimated from figures presenting study results.
e. There was only one detection of tetrachloroethene out of 30 samples. Likewise, it was not detected in the SCAQMD results.
Therefore, the reporting limit drives the average concentration.
f. Two common and widely-used chemicals, acetone and 2-butanone (methyl ethyl ketone), were detected in elevated concentrations, but at concentrations far below levels of health concern established by SCAQMD. Neither of these chemicals causes cancer. Moreover, both chemicals were elevated only sporadically across the site and these locations did not show a consistent downgradient relationship with any known sources. Current data suggest that nearby obvious sources (e.g. the oil production wells) are not the source of these chemicals to air at the High School.
ARB = California Air Resources Board
SCAQMD = South Coast Air Quality Management District
ppm = parts per million
ppb = parts per billion

Table ES-2
Beverly Hills High School
Summary Statistics - SCAQMD Investigation

Analyte	Detection Frequency	Maximum Detected	Minimum Detected	Average Detected	Units
Hydrocarbons					
Methane	22 / 22	3.9	2.1	2.74	ppm
Ethane	25 / 25	61.7	2.9	16.77	ppb
Ethene	25 / 25	12.8	1.9	5.42	ppb
Propane	25 / 25	105.2	1.2	16.68	ppb
Propene	25 / 25	1.9	0.2	0.86	ppb
n-Butane	19 / 19	56.6	0.5	9.37	ppb
iso-Butane	19 / 19	19	0.2	2.66	ppb
n-Pentane	19 / 19	16.3	0.2	2.82	ppb
iso-Pentane	19 / 19	16.9	0.3	3.16	ppb
n-Hexane	24 / 25	3.8	0.1	0.80	ppb
n-Heptane	17 / 19	1.6	0.1	0.40	ppb
n-Octane	15 / 19	1.4	0.1	0.29	ppb
n-Nonane	7 / 19	0.5	0.1	0.19	ppb
n-Decane	7 / 19	0.2	0.1	0.13	ppb
n-Undecane	6 / 19	0.1	0.1	0.10	ppb
n-Dodecane	1 / 19	0.1	0.1	0.10	ppb
Other Volatile Organic Compounds (VOCs)					
Acetone	25 / 25	16.3	2.3	4.77	ppb
Benzene	25 / 25	1.4	0.2	0.56	ppb
2-Butanone (MEK)	15 / 25	0.5	0.1	0.29	ppb
Ethylbenzene	15 / 19	0.6	0.1	0.25	ppb
Methyl tert-Butyl Ether (MTBE)	8 / 25	0.5	0.1	0.26	ppb
Toluene	25 / 25	2.5	0.2	1.20	ppb
m,p-Xylenes	22 / 25	1.7	0.1	0.62	ppb
o-Xylene	18 / 25	0.4	0.1	0.20	ppb

SCAQMD = South Coast Air Quality Management District

ppm = parts per million
ppb = parts per billion

Method reporting limits (MRLs) were not reported on the SC AQMD reports.
Average detections were calculated for detections of compounds only; non-detects not calculated into the average. Concentrations of 0.0 were considered non-detect.

Section 1
Introduction

CDM has prepared this report to summarize results of ambient air sampling conducted at the Beverly Hills High School (the High School, site, or BHHS). This report also presents an evaluation of incremental (i.e., additional) risks. Ambient air sampling was conducted April 15 through 18, 2003 in accordance with CDM's work plan dated April 14, 2003. The work plan was developed based upon review of available data and input received during community meetings conducted on April 8 and 9, 2003, as well as U.S. Environmental Protection Agency (USEPA) and California Environmental Protection Agency (CalEPA) Department of Toxic Substance Control (DTSC) guidance (USEPA 1988 and DTSC 1999).

The High School is located at 241 S. Moreno Drive in Beverly Hills, California. Figure 1 is a USGS Quadrangle map showing the site location. Figure 2 is a site plan showing the existing structures and features.

1.1 Project Objectives

The objective of the sampling program was to obtain additional data to help evaluate whether outdoor air quality at the High School is different than typical air quality in the Los Angeles Basin and, if so, to determine whether that difference presents any incremental health risks to students, staff, or other individuals who use the school's facilities. Outdoor air at the school was investigated because of recent suggestions that it may contain elevated levels of volatile chemicals due to releases from a variety of potential sources including oil well operations and abandoned oil wells.

1.2 Scope of Work

The ambient air investigation was performed as described in the work plan prepared by CDM (CDM 2003). The scope of work consisted of collection of ambient air samples at 11 locations across the High School. Air samples were analyzed for volatile organic compounds (VOCs), methane, and hydrogen sulfide. Two of the locations sampled were representative of cross-wind or upwind conditions from potential sources at the south end of the high school.

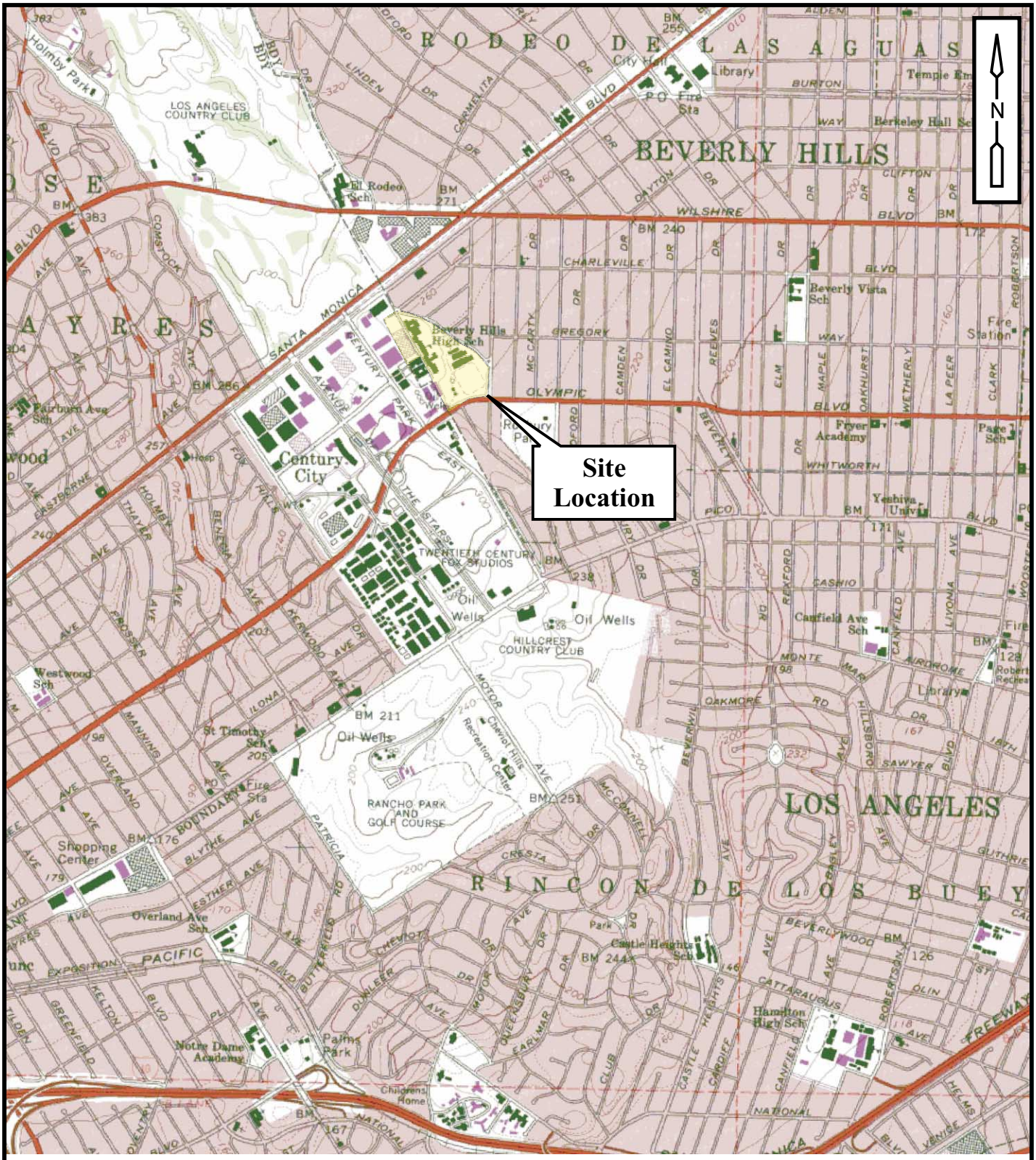
1.3 Report Organization

This report is organized into seven sections and four appendices, as follows:

- Section 1 – Introduction
- Section 2 – Site Description
- Section 3 – Previous Investigations
- Section 4 –Sampling Activities and Results

- Section 5 – Incremental Risk Evaluation
- Section 6 – Conclusions
- Section 7 – References
- Appendix A – Previously Collected Data
- Appendix B – Laboratory Data Sheets and Chain of Custody Documentation
- Appendix C – Data Validation Sheets
- Appendix D – Weather Data

Figures and tables are provided at the end of each section where they are first discussed.



Scale: 1 in. = 2,000 ft.

Sources: USGS 7.5 minute Beverly Hills Quadrangle Topographic Map 1994.

BEVERLY HILLS HIGH SCHOOL
241 S. MORENO DRIVE

Site Vicinity Map

CDM

Figure 1

P:\22293_Bev Hills\386130_Cad\BVHLS-Fig-1.cdr Apr 12, 2003 Negretegd

APPROXIMATE LOCATION OF CHEVRON "TWENTIETH CENTURY FOX" DRILL SITE I ABANDONED WELLS (25 TOTAL)

"WOLFSKILL" WELL #36

"WOLFSKILL" WELL #23

"WOLFSKILL" WELL #1

N

1" = 160'

80 0 160

APPROX. LOCATION OF FORMER DIESEL UST

HEATH AVENUE

HISTORICAL AREA OF OIL EXPLORATION/ PRODUCTION (APPROX)

VENOCO FACILITY (EXIST DERRICK AND FACILITIES)

"RODEO" WELL #107

"RODEO" WELL #105

OLYMPIC BLVD

WELL # 2

WELL # 1

"RODEO" WELL #106

S. MORENO DRIVE

"RODEO" WELL #112

"RODEO" WELL #114

"RODEO" WELL #116

"RODEO" WELL #115

SPALDING DRIVE

YOUNG DRIVE

S. LASKY DRIVE

LEGEND

- COMPLETED ABANDONED OIL WELL
- BURIED IDLE OIL WELL
- APPROXIMATE SITE BOUNDARY

NOTES

1. ALL FORMER OIL WELL LOCATIONS ARE APPROXIMATE AND BASED ON MUNGER AND DOGGR MAPS.

BEVERLY HILLS HIGH SCHOOL
241 S. MORENO DRIVE

Current Site Plan

Figure 2

CDM

DATE: Jun 03, 2003 1:41pm XREFS: BEVHLS-MF-GENSITEwUtils
DWG: P:\22293_Bev Hills\38613\0_Cad\Sheet\BEVHLS-SF-Fig2.dwg USER: negretegd

Section 2
Site Description

This section presents information regarding site conditions that are pertinent to the ambient air investigation. Initial construction of the High School took place in approximately 1927, with subsequent renovations, and additions. The nearest major intersection is Santa Monica Boulevard and Moreno Drive. The site is bounded by South Moreno Drive on the north, Spalding Drive on the east, Olympic Boulevard, on the south and Century City on the west. Land use of the surrounding area is primarily residential to the northeast, east, and south and primarily commercial to the west and north. Figure 3 shows adjoining properties.

The subject property consists of three parcels with the following Assessors Parcel Numbers (APNs) and acreage:

- APN 4319-001-900: 18.99 acres
- APN 4319-001-901: 0.80 acres
- APN 4319-001-902: 5.32 acres

The three parcels total 25.11 acres and are occupied by the High School and Venoco Inc. (Venoco). Venoco leases an area of land approximately 265 feet (east-west) by 120 feet (north-south) in the southwest corner of parcel 900 (Figure 2). The Venoco facility consists of an oil derrick and 19 directional oil and injection wells manifolding into a common well cellar. Oil and gas extracted from the wells is distributed offsite through underground piping. For purposes of this report, the site is defined as the land occupied by the High School campus while Venoco is considered as a neighboring property.

Review of site maps indicates that the site is situated at varying elevations of about 240 to 260 feet above mean sea level. The topography declines to the southeast.

Historic oil and gas wells at the site and in the vicinity were identified from maps obtained from Munger and California Department of Conservation Division of Oil, Gas and Geothermal Resources (DOGGR). As many as six abandoned oil wells are believed to be present within the site boundaries (excluding Venoco facility) (Figure 2). Three of these six wells were located in the upper athletic field west of the bleachers in an area approximately 180 feet by 90 feet. The approximate locations of these wells are shown on Figure 2. In addition, the DOGGR maps showed the presence of as many as 31 abandoned oil and gas wells in Century City and on the immediately surrounding properties (Figure 3).

CONSTELLATION

CENTURY PARK EAST

2070 2052 2010 1950 1940 1888 1880 1840 1800

APPROXIMATE LOCATION OF CHEVRON "TWENTIETH CENTURY FOX" DRILL SITE I ABANDONED WELLS (25 TOTAL)

VACANT LOT

PACIFIC BELL FACILITY

MULTI-STORY OFFICE BUILDINGS

MULTI-STORY OFFICE BUILDINGS

SOUTH ("LITTLE") SANTA MONICA BLVD

OLYMPIC BLVD

"WOLFSKILL" WELL #36

"WOLFSKILL" WELL #23

"WOLFSKILL" WELL #1

CENTURY CITY HOSPITAL

SEMPRA HEATING AND COOLING PLANT

RESIDENTIAL

VENOCO

"RODEO" WELL #105

RESIDENTIAL

"RODEO" WELL #116

RESIDENTIAL

SPALDING DRIVE

RESIDENTIAL

RESIDENTIAL

S. LASKY DRIVE

RESIDENTIAL

DURANT DRIVE

RESIDENTIAL

"RODEO" WELL #112

S. MORENO DRIVE

ROBBINS DRIVE

RESIDENTIAL

SITE

BHUSD BOARD OF EDUCATION

10000

N

1" = 200'

100 0 200

LEGEND

- COMPLETED ABANDONED OIL WELL
- BURIED IDLE OIL WELL

NOTES

1. ALL FORMER OIL WELL LOCATIONS ARE APPROXIMATE AND BASED ON MUNGER AND DOGGR MAPS.
2. ONLY OFF-SITE FORMER OIL WELL LOCATIONS ARE SHOWN HERE.

BEVERLY HILLS HIGH SCHOOL
241 S. MORENO DRIVE

Adjacent Property Map

Figure 3

CDM

DATE: May 21, 2003 4:15pm XREFS:
DWG: P:\22293_Bev Hills\38613\O_Cad\Misc Files\BEVHLS-SF-Fig03-PH1.dwg USER: negretegd

Section 3
Previous Investigations

Previously conducted investigations at the High School pertinent to the ambient air investigation consist of sampling performed in late 2002 and early 2003 by Masry and Vititoe, and focused investigations performed by SCAQMD in early 2003. Data collected by Masry and Vititoe are discussed below; however, insufficient information has been provided to evaluate the quality of these data. For this reason, data collected by Masry and Vititoe are not included in the project database used to evaluate incremental risks at the High School.

3.1 Masry and Vititoe Reported Data

A total of 8 ambient air samples were collected by Masry and Vititoe. These samples were collected on 5 separate days over the course of 4 months (November and December of 2002 and January and February of 2003). Seven of these samples were apparently collected at the High School and one sample was apparently a background sample, based on sample identifications. Samples were either 8-hour composite or grab samples collected in Summa or Silco canisters and analyzed by one or more of several methods, including USEPA Method TO-15 (VOC analysis), USEPA Method TO-3 (hydrocarbons and total gaseous non-methane organics), SCAQMD Method 307-91 and American Society for Testing and Materials (ASTM) D 504-01 (sulfur compounds), and USEPA modified Method 25C (total gaseous non-methane organics). In addition, a low volume PUF/XAD sample container was analyzed for polycyclic aromatic hydrocarbons (PAHs) by USEPA Method TO-13a and tentatively identified compounds by USEPA Method 8270C.

Important information such as exact sample locations (with the exception of samples collected on February 6), sampling methodologies, field quality assurance/quality control (QA/QC) procedures, and environmental conditions during sampling were not provided by Masry and Vititoe. The many gaps in information about their analytical results do not justify inclusion of these data in the database used to evaluate incremental risk. These information gaps combined with the small number of samples collected dictate that these data cannot be used alone to describe air quality at the high school. Some additional difficulties in evaluating the Masry and Vititoe data are listed below:

- CDM is unable to verify, from the information provided, that sampling methods utilized standards designed to ensure sample and data integrity. For example, field blanks or trip blanks, which are used to confirm the quality of the field sampling process, were apparently not used by Masry and Vititoe during their data collection activities.

- Several questions regarding sampling procedures remain. For example, why Masry & Vititoe waited until the afternoon of the day after sample collection to submit the samples to the laboratory is unclear. Samples are typically submitted

immediately after collection or, at least, by the following morning. In addition, the laboratory noted that inappropriate containers were used to collect two non-air samples, raising additional questions about the adequacy of their sampling procedures.

- Masry and Vititoe requested only a Level 1 quality data package, which provides minimal quality control data for analyzed data. Why they did not request a higher level of data quality package and other information critical to analyze the veracity of the data is not clear.

- Analytical method reporting limits (MRL) were unusually high for some analyses. The laboratory did not provide any explanation regarding this issue; whether the high MRL was a function of methodological problems is unclear.

- Whether samples collected in November were grab samples or 8-hour samples is also unclear, due to incomplete entries on the Chain of Custody forms. This ambiguity, combined with the unusually high reporting limits, compounds uncertainties associated with concentrations detected in these samples.

Analytical results indicate that several VOCs were detected in ambient air. Analyses for sulfur-containing compounds and SVOCs were presumably conducted to evaluate impacts from petroleum operations. Neither class of chemicals was detected in the samples collected by Masry and Vititoe. Summary statistics are provided in Table 1 for the detected VOCs for the combined rounds of sampling; however, these data are not included in the database used to evaluate incremental risk for the reasons mentioned above. Results for each sampling event, as provided to CDM, are included in Appendix A.

Samples of material other than air were also submitted to a laboratory for analysis. Two liquid samples labeled "Slops Pit – Venoco (oily phase)" and "Slops Pit – Venoco (aqueous phase)" were collected on February 18, 2003 and submitted to Columbia Analytical on February 19th for VOC and metal analysis (aqueous phase only) and semi-volatile organic compound (SVOC) analysis. While the Venoco facility does not have a "slops pit", there is a WEMCO skim tank in the facility that could be the source of the samples. However, this tank is totally enclosed. The laboratory reported that the sample labeled "Slops Pit-Venoco (aqueous phase) was delivered in an inappropriate sample container and was compromised due to the presence of a headspace in the container, raising questions as to the adequacy of the field sampling methodologies. Low levels (e.g., less than a part per million by volume [ppm]) of acetone, benzene, toluene, ethylbenzene, total xylenes and several other petroleum related chemicals were detected in the aqueous phase. The sample also contained minimal levels (e.g. less than 1 ppm except for zinc at 2.4 ppm) of arsenic, chromium, lead, nickel, vanadium and zinc. No SVOCs were detected in the oily phase, although the detection limit was elevated due to the laboratory's need to dilute the sample.

The relevancy of these non-air results to measured chemicals in air at the school is unknowable, although given the low levels of chemicals detected, it would be reasonable to conclude that the "Slops Pit" samples, regardless of their location would not be expected to contribute in any significant manner to levels of the same chemicals detected in ambient air.

3.2 SCAQMD Investigation

SCAQMD collected ambient air samples at the High School on February 6, 15, and 28, 2003, and April 6 and 19, 2003. Summary statistics for the combined rounds of sampling are provided in Table 2. Each sampling event is discussed below and results for each sampling event are provided in Appendix A.

SCAQMD collected ambient air samples on February 6, 2003 from locations within the athletic field as well as off-site locations. Samples were collected and analyzed for VOCs. Venoco was reportedly under a situation of "venting", i.e., no oil or gas production and with the well gas being vented at the top of the oil rig adjacent to the athletic field, when the samples were collected.

Subsequent ambient air samples were collected by SCAQMD on February 15 and 28, 2003. Samples were collected from the middle bleacher section of the stadium and the middle of the upper softball field. In addition, samples were collected from the Venoco facility near the oil well cluster on the side of the facility adjacent to Olympic Boulevard and from Roxbury Park on the eastern edge of the lawn bowling facility. The Venoco facility was not operating (i.e., not producing oil or gas) when the samples were collected on February 15 but was reportedly producing natural gas at the time of the February 28, 2003 sampling. Samples collected on February 15, 2003 therefore represent "baseline" conditions for Venoco operations. For both sampling events, a total of 9 samples were collected over an integrated 8-hour duration (except for the Roxbury Park samples on February 15, 2003 which were 4 to 6-hour integrated samples). These samples were analyzed for VOCs by gas chromatography/ mass spectrometry (GC/MS) and for C1 to C12 hydrocarbons using GC with flame ionization detector (FID) and total combustion analysis (TCA).

Evaluations performed by SCAQMD indicated that concentrations of benzene, hexane, and toluene were typical of background levels found in the Los Angeles Basin. In addition, their evaluation indicated that chemical concentrations were below the CalEPA Office of Environmental Health Hazard Assessment (OEHHA) chronic and acute reference exposure levels (RELs). Concentrations were also less than maximum allowable dose levels for reproductive toxicity and less than significant risk levels for cancer risk.

In an attempt to evaluate ambient air conditions when the Venoco facility was in the full production mode, ambient air samples were collected by SCAQMD on April 6, 2003 at five different locations. These included: Venoco facility; the middle of the upper softball field (center field); middle bleacher section of the stadium; the third base; and Roxbury Park. At the time of sampling, the Venoco facility was producing

both oil and natural gas (based on communication between CDM and Venoco foreman, Mr. Bill Giardino, during CDM's visit to Venoco on April 4, 2003). The samples were collected over an 8-hour integrated period and analyzed for VOCs by GC/MS and for C1 to C12 hydrocarbons using GC with FID and TCA. The results are summarized in Table 2. Concentrations of benzene, hexane, and other air toxics levels were not abnormal for the Los Angeles Basin and chemical concentrations were below OEHHA chronic and acute RELs.

On Saturday, April 19, SCAQMD collected ambient air samples at five locations: three locations within the High School, the Venoco property, and Roxbury Park. An 8-hour sample (from 8:00 a.m. to 4:00 p.m.) was collected at each location. The Venoco facility was in full production, processing both natural gas and producing oil at the time of sampling. The samples were analyzed for VOCs by GC/MS and for C1 to C12 hydrocarbons using GC with FID and TCA. Results were generally consistent with grab samples and 8-hour samples taken earlier in February 2003 and April 6, 2003. Concentrations of ethane, propane, and some other chemical species at the Venoco facility reflect the influence of the gas and oil operation compared to sampling in February 2003; concentrations were slightly higher than those detected in February when oil wells were not in production. However, evaluations performed by SCAQMD indicated that sampling results for benzene, hexane, and other air toxics levels are not considered abnormal for the Los Angeles Basin. In addition, their evaluation indicated that chemical concentrations were below OEHHA chronic and acute RELs.

Table 1
Beverly Hills High School
Summary Statistics - Masry and Vititoe Data

Analyte	Detection Frequency	Maximum Detected	Minimum Detected	Average Detected	Maximum Reporting Limit	Minimum Reporting Limit	units
Hydrocarbons							
2-Methyl-1-propene	1 / 1	109	109	109	NA	NA	ppbv
2-Methylbutane	2 / 2	14	10	12	NA	NA	ppbv
2-Methylhexane	1 / 1	1	1	1	NA	NA	ppbv
2-Methylpentane	3 / 3	2.8	2	2.3	NA	NA	ppbv
3-Methylhexane	2 / 2	1.4	1	2	NA	NA	ppbv
3-Methylpentane	3 / 3	2	1.4	1.6	NA	NA	ppbv
C1 as Methane	3 / 3	5600	3700	4700.0	1090	740	ppbv
C6+ as n-hexane	1 / 3	38000	38000	13300.0	2200	1500	ppbv
Isobutane	3 / 3	25	4	15.0	NA	NA	ppbv
Iso-octane	1 / 1	1.3	1.3	1	NA	NA	ppbv
n-Butane	3 / 3	37	8	24	NA	NA	ppbv
n-Heptane	2 / 2	1.9	1.2	1.6	NA	NA	ppbv
n-Hexane	2 / 2	2.2	1.2	1.7	0.6	0.4	ppbv
n-Octane	1 / 1	1.3	1.3	1.3	NA	NA	ppbv
n-Pentane	3 / 3	6.7	3	4	NA	NA	ppbv
Methylcyclohexane	2 / 2	2	1.2	1.6	NA	NA	ppbv
Methylcyclopentane	3 / 3	2.9	1.1	2.0	NA	NA	ppbv
Propane	2 / 2	109	55	82	NA	NA	ppbv
Propene/Propane	1 / 1	11	11	11	NA	NA	ppbv
Other Volatile Organic Compounds (VOCs)							
Acetone	3 / 6	53.8	11.2	21	31	0.7	ppbv
Benzaldehyde	1 / 1	1.1	1.1	1	NA	NA	ppbv
Benzene	5 / 7	17	7	5	4.6	0.5	ppbv
2-Butanone (Methyl Ethyl Ketone, MEK)	4 / 6	14	1.2	6	5	0.5	ppbv
Chloromethane	1 / 6	0.9	0.9	1.4	1.1	0.7	ppbv
Dichlorodifluoromethane	2 / 2	0.6	0.6	1	0.5	0.4	ppbv
Ethanol	2 / 2	4.4	4.3	4	1.2	0.8	ppbv
Ethylbenzene	2 / 7	3.9	0.5	1	3.4	0.3	ppbv
3-Ethyltoluene	1 / 1	1	1	1	NA	NA	ppbv
2-Methyl-2-Propanol	1 / 1	114	114	114	NA	NA	ppbv
Methyl tert-butyl ether	3 / 6	3.3	0.4	2	4.1	0.4	ppbv
Toluene	7 / 7	26	2.1	13	4	0.4	ppbv
Total Gaseous Non-Methane Organics (as Methane)	3 / 4	230	2.3	59	2.2	1.5	ppmv
Trichlorofluoromethane	1 / 6	0.4	0.4	1	3.5	0.35	ppbv
Xylene; o-	2 / 7	3.9	0.6	1	3.4	0.3	ppbv
Xylenes; m,p-	7 / 7	8.4	0.8	4	3.4	0.3	ppbv

ppbv = parts per billion by volume
ppmv = parts per million by volume
NA = not available

For the average calculation, the concentration of nondetected compounds was considered half the reporting limit
Only detected compounds are shown
Unidentified compounds (i.e. C12H26 alkane) are not included.

Table 2
Beverly Hills High School
Summary Statistics - SCAQMD Investigation

Analyte	Detection Frequency	Maximum Detected	Minimum Detected	Average Detected	Units
Hydrocarbons					
Methane	22 / 22	3.9	2.1	2.74	ppm
Ethane	25 / 25	61.7	2.9	16.77	ppb
Ethene	25 / 25	12.8	1.9	5.42	ppb
Propane	25 / 25	105.2	1.2	16.68	ppb
Propene	25 / 25	1.9	0.2	0.86	ppb
n-Butane	19 / 19	56.6	0.5	9.37	ppb
iso-Butane	19 / 19	19	0.2	2.66	ppb
n-Pentane	19 / 19	16.3	0.2	2.82	ppb
iso-Pentane	19 / 19	16.9	0.3	3.16	ppb
n-Hexane	24 / 25	3.8	0.1	0.80	ppb
n-Heptane	17 / 19	1.6	0.1	0.40	ppb
n-Octane	15 / 19	1.4	0.1	0.29	ppb
n-Nonane	7 / 19	0.5	0.1	0.19	ppb
n-Decane	7 / 19	0.2	0.1	0.13	ppb
n-Undecane	6 / 19	0.1	0.1	0.10	ppb
n-Dodecane	1 / 19	0.1	0.1	0.10	ppb
Other Volatile Organic Compounds (VOCs)					
Acetone	25 / 25	16.3	2.3	4.77	ppb
Benzene	25 / 25	1.4	0.2	0.56	ppb
2-Butanone (MEK)	15 / 25	0.5	0.1	0.29	ppb
Ethylbenzene	15 / 19	0.6	0.1	0.25	ppb
Methyl tert-Butyl Ether (MTBE)	8 / 25	0.5	0.1	0.26	ppb
Toluene	25 / 25	2.5	0.2	1.20	ppb
m,p-Xylenes	22 / 25	1.7	0.1	0.62	ppb
o-Xylene	18 / 25	0.4	0.1	0.20	ppb

SCAQMD = South Coast Air Quality Management District

ppm = parts per million
ppb = parts per billion

Method reporting limits (MRLs) were not reported on the SC AQMD reports.
Average detections were calculated for detections of compounds only; non-detects not calculated into the average. Concentrations of 0.0 were considered non-detect.

Section 4
Sampling Activities and Results

4.1 Sampling Rationale

The sampling rationale was based on the objective of the sampling program, i.e., to obtain additional data to evaluate whether outdoor air quality at the school is different than typical air quality in the Los Angeles Basin and, if so, to determine whether that difference presents any increased health risks to students, staff, or other individuals who use the school's facilities.

The majority of sampling locations were focused in the upper and lower athletic fields at the High School. Students are expected to spend a significant amount of non-classroom time in these areas. In addition, the upper athletic field is directly adjacent to Venoco and, depending on wind conditions, air samples from this area may reflect emissions from Venoco or other potential sources on the south end of the High School. Samples were also collected near the center of the site to provide data at some distance from the Venoco facility and from the northern and western portions of the campus. Since the predominant daytime wind direction is from the southwest, these locations are generally cross-wind of potential sources near Century City. Sample locations are presented in Figure 4. Information regarding meteorological conditions during sampling activities is provided in Section 4.4.

4.2 Summary of Field Activities

4.2.1 Sampling Methods and Procedures

Ambient air samples were collected in Summa canisters from 11 sampling locations identified in Figure 4 over a period of four days mid-week. Nine sampling locations were selected to evaluate the possible influence of on-site and adjacent activities, either current or historical. Two additional on-site sampling locations were selected to be representative of background concentrations of the selected analytes. The sampling program followed USEPA guidance as described in CDM's work plan (CDM 2003) for sample collection and analysis of VOCs in ambient air by USEPA Method TO-15. Analytical results for n-hexane were also provided from the Method TO-15 scans. Samples were collected over an 8-hour period during representative school and after-school activity hours. Integrated samples were also collected in Summa canisters from up to four of these locations for methane analysis on a daily basis. In addition, a total of three grab samples were collected each day at three different times from the same four locations for hydrogen sulfide analysis. Field personnel remained on-site during the entire sample collection period to monitor the sampling equipment and maintain security over the sampling containers.

Ambient air samples were collected at these 11 sampling locations as described within Section 4 (Field Sampling Plan) and in accordance with procedures described in Section 6 (Quality Assurance Project Plan) of the work plan (CDM 2003), with the following exceptions:

April 15, 2003
Samples for VOC analysis were collected as specified in the work plan from all locations except for locations 3, 7, and 9 as well as a duplicate sample at location 2. Samples were not collected at these locations because the flow controllers on the Summa canisters at these locations failed to operate. Flow controllers are used to restrict the rate of air flow into the sample container to the calibrated rate. The trip blank canister was used as a test container to determine the source of the equipment problem when it was noted; therefore, the trip blank was not submitted to the analytical laboratory on this sample date.

Samples for methane analysis were collected from all locations except for location 9 due to flow controller failure.

All samples for hydrogen sulfide analysis were collected as specified in the work plan.

April 16, 2003
Samples for VOC analysis were collected as specified in the work plan from all locations except for location 3 and duplicate samples at locations 2 and 6. The flow controller on the Summa canisters for the duplicate samples at locations 2 and 6 failed to operate. The analytical laboratory discarded the sample from location 3 due to conflicting sample labels on the container.

All samples for methane analysis were collected as specified in the work plan.

All samples for hydrogen sulfide analysis were collected as specified in the work plan.

April 17, 2003
All samples for VOC, methane, and hydrogen sulfide analysis were collected as specified in the work plan.

April 18, 2003
Samples were collected for VOC analysis at locations 3, 7, and 9 to correct for the work plan deviations on April 15 and April 16, 2003. Field duplicates were also collected at locations 3 and 9. In addition, a sample was collected from location 11 to provide on-site background data for this sample day.

Samples were collected for methane analysis at location 9 (original and field duplicate sample) to correct for the work plan deviation on April 15, 2003.

No sample collection was necessary for hydrogen sulfide analysis.[3]

Following collection, each sample was uniquely identified, labeled, and logged on the Chain of Custody forms as specified in the work plan. Copies of the Chain of Custody records are included with the laboratory reports in Appendix B.

4.2.2 Decontamination Procedures

The containers for collection of air samples were provided pre-cleaned by the analytical laboratory. No other decontamination was necessary. Trip blanks were used to verify that sample containers were properly cleaned, as well as to verify that field processes and sample transport did not introduce contamination into the sample containers.

4.2.3 Containment and Disposal of Investigation-Derived Waste

Based on the nature of the investigation, on-site equipment decontamination was not necessary. Investigation-derived waste generated during field activities consisted of used personal protective equipment such as gloves as well as miscellaneous items. These items were double-bagged using plastic trash bags and then disposed as solid waste.

4.3 Analytical Program and Results

4.3.1 Analytical Laboratory and Methods

Ambient air samples were analyzed by Calscience Environmental Laboratories, Inc. (CEL), located in Garden Grove, California. CEL is certified through California Department of Health Services' Environmental Laboratory Accreditation Program. Samples were analyzed for more than 50 different VOCs using USEPA Method TO-15. In addition, analytical results for n-hexane were provided by CEL from the Method TO-15 scans. Samples were also analyzed for methane using SCAQMD Method 25.1 and hydrogen sulfide using GC/ flame photometric detection (FPD), which is a GC method coupled with a sulfur specific detector.

[3] Although CDM was unable to collect all of the samples at location 3 as specified in the work plan, no further sampling was conducted subsequent to April 18, 2003. Sample design was intended to characterize chemical concentrations in ambient air spatially as well as over time. Collection of a sample from one location would not provide spatial characterization and would not provide sufficient temporal characterization to justify the action. As discussed in Section 6 of the work plan, data parameters consisting of precision, accuracy, representativeness, completeness, comparability, and sensitivity were used as indicators of data quality. Lack of data for one location does not jeopardize the ability to use the data to make conclusions about ambient air conditions at the High School. Representativeness and completeness of the sampling program was maintained by sample collection on April 18, 2003. A completeness goal of 90 percent was projected for the sampling program; the actual completeness of the program was 97 percent.

4.3.2 Analytical Results

Only eleven VOCs (including methane) were detected in any of the ambient air samples. These consist of acetone, benzene, chloromethane, dichlorodifluoromethane, 2-hexanone, methane, methyl ethyl ketone (MEK, also known as 2-butanone), tetrachloroethene, toluene, m,p-xylene, and o-xylene. No chemicals believed to be associated with increased cancer risk were found at levels out of the ordinary for the Los Angeles area. This finding is consistent with results of previous SCAQMD investigations, which showed that airborne chemicals in ambient air at the High School are well below the health limits established by the State of California.

Methane was detected in ambient air samples at concentrations far below (i.e., several orders of magnitude) the typical action level of 5,000 ppmv, which is 10 percent of its lower explosive limit. Hydrogen sulfide was not detected in any of the ambient air samples. A summary of the analytical results is presented in Table 3 for those chemicals which were detected in at least one sample. Summary statistics are not provided for chemicals which were not detected in any of the samples (e.g., n-hexane). The laboratory reports and chain-of-custody documents are included as Appendix B.

As discussed in the work plan (CMD 2003), sample collection, handling, and analysis must be performed in a consistent manner in order to effectively compare results. This investigation collected and analyzed samples using standard USEPA and nationally recognized methods and QC procedures designed to ensure that results are suitable for comparison with results from investigations performed in a similar manner. Data resulting from this sampling effort are suitable for comparison to SCAQMD data collected at the site in February and April 2003. Data reported by the SCAQMD in their evaluation of local air quality are shown in Table 2 for comparison. When the ambient air concentrations of chemicals reported in this study are compared to the results of the SCAQMD investigation, there is no apparent difference between the levels of chemicals detected on school grounds. Comparisons are shown graphically in Figures 5 and 6 for benzene and toluene, respectively.

Two exceptions to the conclusion of comparable results were noted; acetone and MEK were detected in a few samples at concentrations higher than observed in the SCAQMD results. Neither of these chemicals was previously identified as a chemical of potential concern (COPC); neither cause cancer and they are not typically associated with oil production. Both chemicals were detected only sporadically at these higher concentrations and these detections were at different locations, including on-site background locations, that did not show a consistent relationship with any known source. The highest concentrations were detected in the lower athletic field, near the adjacent road. Although the source or sources of these readings are not known, such readings could result from common off site activities such as the use of paint removers or cleaning solvents, if these products were being used while air sampling was taking place.

4.4 Weather Data

A Climatronics F460 utility weather station to measure wind speed and direction was installed on April 11, 2003 on the rooftop of the restroom building north of the bleachers as shown on Figure 4. Another weather station equipped to provide measurements of temperature, relative humidity, and barometric pressure was also installed on April 11, 2003 at the site, southeast of the portables near Building H (Figure 4). The weather stations were continuously operated from April 11 through April 28, 2003. Weather station data was downloaded periodically and is provided in Appendix D along with calibration and quality control information.

The predominant wind patterns for each of the four sampling days between 7:00 a.m. and 7:00 p.m. (i.e., approximate hours of sample collection) was as follows:

- April 15: the wind was predominantly out of the southeast from 7:00 a.m. to 5:00 p.m. After 5 p.m. the predominant wind direction was northwesterly.

- April 16 and 17: from 7:00 a.m. to noon, the predominant wind direction was southeast/south. After noon, the wind was predominantly out of the northwest/north.

- April 18: the wind was predominantly out of the southeast/south for the entire 12-hour period.

The average wind speed ranged from 4 to 6 mph. The temperature over the sampling period ranged from 54 to 70 degrees Fahrenheit (°F). Average temperatures each sampling day ranged from 61 to 65 °F. Relative humidity over the sampling period ranged from 28 to 60 percent, while the barometric pressure ranged from 29.96 and 30.22 inches.

4.5 Quality Assurance Activities

QA/QC measures included field measures such as collection and analysis of field quality control samples and laboratory measures such as analysis of method blanks and laboratory control samples. Field quality control samples, used to evaluate the quality of the field sampling process, consisted of duplicate (co-located) samples and trip blanks. Field sampling quality control procedures were completed in accordance with the work plan (CDM 2003).

Formal data validation was used to evaluate the technical usability of the data. Results of the data validation determine the level of uncertainty associated with the analytical results to be used in the decision-making process. Laboratory Data Consultants (LDC), located in Carlsbad, California, performed all data validation activities.

One hundred percent of the data from the ambient air samples were subjected to a Level 3 data validation in accordance with laboratory-specific limits, methodology, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 1999) and industry standards. In addition, 20 percent of the ambient air data were reviewed in accordance with Level 4 validation criteria. Data validation sheets are provided in Appendix C. Items reviewed as part of the data validation process included the following:

GC/MS Level "3" Deliverables

Item #	Deliverable
1	Chain of Custody
2	Sample results with analysis and extraction/preparation dates
3	Summary of MS/MSD/Duplicate recoveries and control limits, as applicable
4	Summary of LCS/LCSD recoveries and control limits
5	Method blanks
6	Summary of surrogate recoveries
7	Summary of initial calibration data (RRF and %RSD, or r if applicable)
8	Summary of continuing calibration (%D and RRF)
9	Summary of internal standards (area response and retention time)
10	Summary of instrument tuning
11	Injection logs , canister logs (pressure readings, as applicable)
12	Extraction/preparation logs
13	Case narrative to discuss anomalies

In addition to formal data validation, analytical results were evaluated to ensure that they met data quality objective requirements. Based on results of the data validation and evaluation, none of the data were rejected and the overall data quality appears to be very good.

A few minor laboratory QC issues were reported, however, their impact on the project data is minimal and all data were retained for project use. Non-detected hexachlorobutadiene and 1,2,4-trichlorobenzene reporting limits were qualified with a "J" to indicate that the reporting limit was an estimated concentration. These qualifications do not impact the usability of the data.

In addition to data validation and evaluation activities, CDM conducted a field QA audit on Tuesday, April 15, 2003 at the High School to evaluate and document the field sampling activities performed during the ambient air sampling. This field audit was performed in accordance with the Quality Assurance Project Plan included as Section 6 of the Work Plan. Specifically, the unscheduled site visit was conducted to determine if elements of the field sampling program were being performed in accordance with specified procedures in the project document. The following components of the field sampling were evaluated:

- Sample locations
- Sample containers – VOCs, H_2S and methane
- Sample collection procedures
- Sampling documentation
- Weather data
- Field quality control samples
- Sample packing/storage

4.5.1 Sample Locations

All sample locations were visited and verified to be those specified in the work plan. Also, the positions of the sample containers were confirmed. The work plan specified that Summa canisters used to collect 8-hour ambient air samples for VOCs and methane were to be placed at breathing-height level. Summa canisters were suspended from a metal fence post so that they were approximately 5 feet above ground surface. Grab samples for hydrogen sulfide analyses were also collected at breathing-height level at each of the specified sample locations. All sample locations were therefore confirmed and no deviations from the project work plan were observed.

4.5.2 Sample Containers

Ambient air samples for VOC and methane analyses were collected in 6-liter, stainless steel Summa canisters as specified in the work plan. A flow controller was attached at the top of each Summa canister, which was pre-calibrated at the laboratory prior to shipment to the project site. Grab samples for hydrogen sulfide analyses were collected in 1-liter Tedlar bags. No deviations from the project work plan were noted for sample containers.

4.5.3 Sample Collection Procedures

Sample collection procedures were witnessed at the site to verify they were in accordance with the project work plan. Prior to the start of the Summa canister sampling, each container was visually inspected for signs of damage or problems. No indications of canister damage were observed. Pressure readings were also recorded in the field logbook to ensure that a vacuum was noted for each canister. After suspending each canister at the appropriate sample location, the valves were slowly opened to allow ambient air to enter into the canister. The start time of sample collection for each location was recorded in the field logbook. At approximate 15-minute intervals, a round of inspections was performed and the vacuum gauge on each canister was inspected. After several rounds of inspection, it was determined that the vacuum measurement on several canisters was not changing, which indicated that ambient air was not being drawn into the canister. At each of the locations where

no change in vacuum was observed, the sampling was aborted. The aborted canisters were taken out of service and tested to identify the cause of the problem. Although testing of the canisters could not positively identify the source of the problem, either the vacuum gauge or the flow controller device was probably not functioning properly. The laboratory was contacted and informed of the problems. Although problems were noted during the sampling, they were related to equipment and not due to sample collection deviations. This issue is discussed above in Section 4.2.1 as well.

Grab samples for hydrogen sulfide analyses were collected in 1-liter Tedlar bags, which were placed inside a vacuum chamber. An air sampling pump was attached to the vacuum chamber so that a negative pressure was applied to the vacuum chamber. Grab samples for hydrogen sulfide analyses were collected in accordance with the work plan and no deficiencies in sample collection procedures were noted.

4.5.4 Sampling Documentation

All sampling activities were documented in a permanently bound field logbook. Labels with sample identification were affixed to each sample container. The custody of each sample was tracked on a chain of custody form. No deviations from the work plan were noted with respect to sample documentation, labeling or custody.

4.5.5 Weather Data

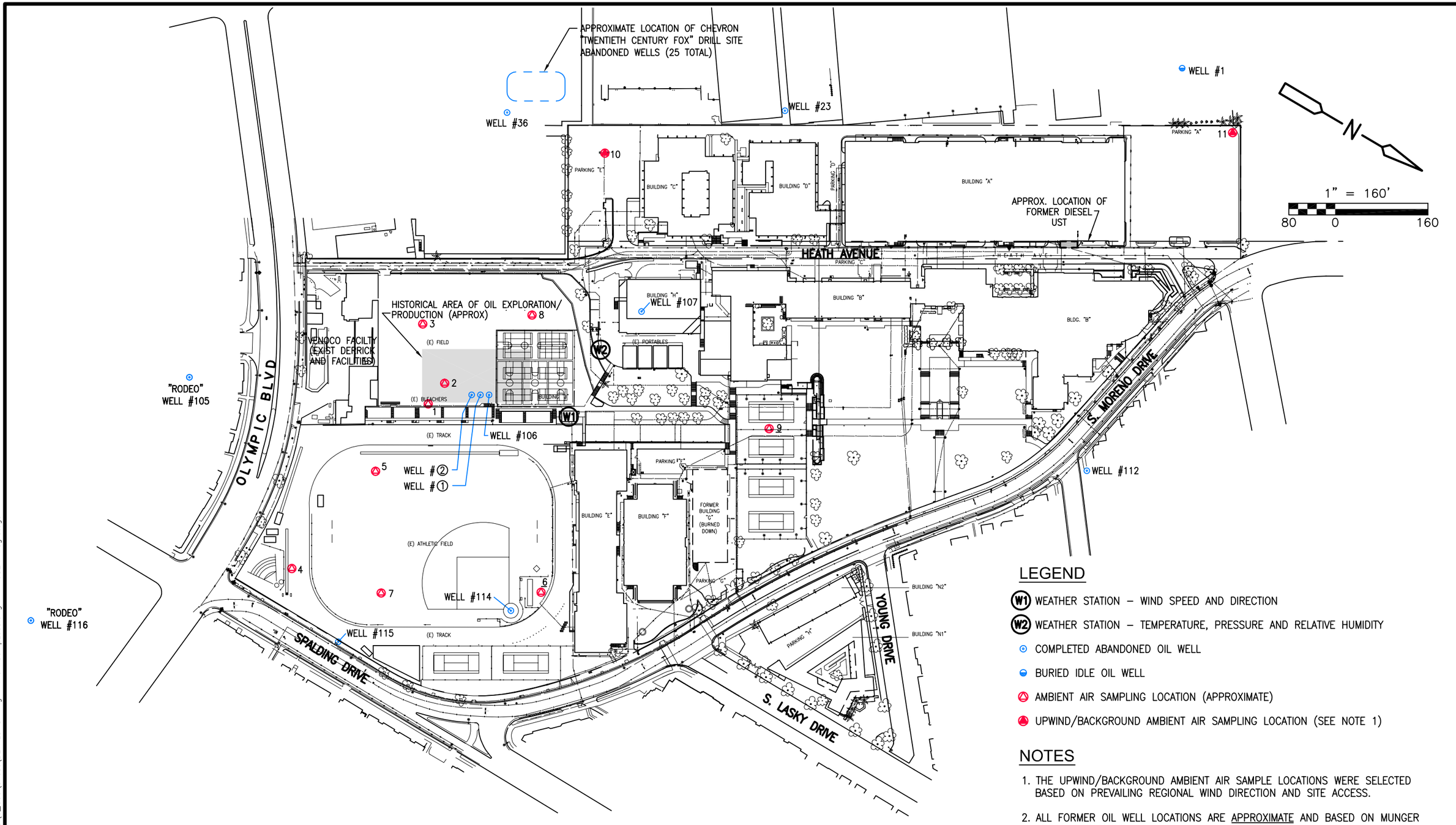
Two weather stations were located at the site as specified in the work plan.

4.5.6 Field Quality Control Samples

The work plan specified that one trip blank be submitted for each day of sampling. Due to the equipment problems encountered in the field (as discussed in the sample collection subsection), the trip blank canister was used as a test container to determine the source of the equipment problem. Therefore, no trip blank was submitted on April 15 of sampling. Trip blanks were submitted each following day of sampling.

4.5.7 Sample Packing, Storage and Transportation

Summa canisters do not require any special storage (e.g., no chilling) procedures. Summa canisters remained with the sampling personnel until transferred to laboratory personnel. Tedlar bags used to collect the hydrogen sulfide samples were placed in an unchilled cooler to minimize possible affects from sunlight. Laboratory personnel picked all samples up at the site each day. No deviations from the work plan were noted for sample packing, storage or transportation.



LEGEND

- (W1) WEATHER STATION – WIND SPEED AND DIRECTION
- (W2) WEATHER STATION – TEMPERATURE, PRESSURE AND RELATIVE HUMIDITY
- COMPLETED ABANDONED OIL WELL
- BURIED IDLE OIL WELL
- AMBIENT AIR SAMPLING LOCATION (APPROXIMATE)
- UPWIND/BACKGROUND AMBIENT AIR SAMPLING LOCATION (SEE NOTE 1)

NOTES

1. THE UPWIND/BACKGROUND AMBIENT AIR SAMPLE LOCATIONS WERE SELECTED BASED ON PREVAILING REGIONAL WIND DIRECTION AND SITE ACCESS.
2. ALL FORMER OIL WELL LOCATIONS ARE APPROXIMATE AND BASED ON MUNGER AND DOGGR MAPS.

BEVERLY HILLS HIGH SCHOOL
241 S. MORENO DRIVE

Ambient Air Sample Locations

Figure 4

CDM

DATE: Jun 03, 2003 1:48pm XREFS: BEVHLS-MF-GENSITEwUtils
DWG: P:\22293_Bev Hills\38613\0_Cad\Sheet\BEVHLS-SF-Fig4-AmbAirSampLocs.dwg USER: negretegd

Figure 5
Benzene Concentrations
Comparison of CDM and SCAQMD Analytical Results

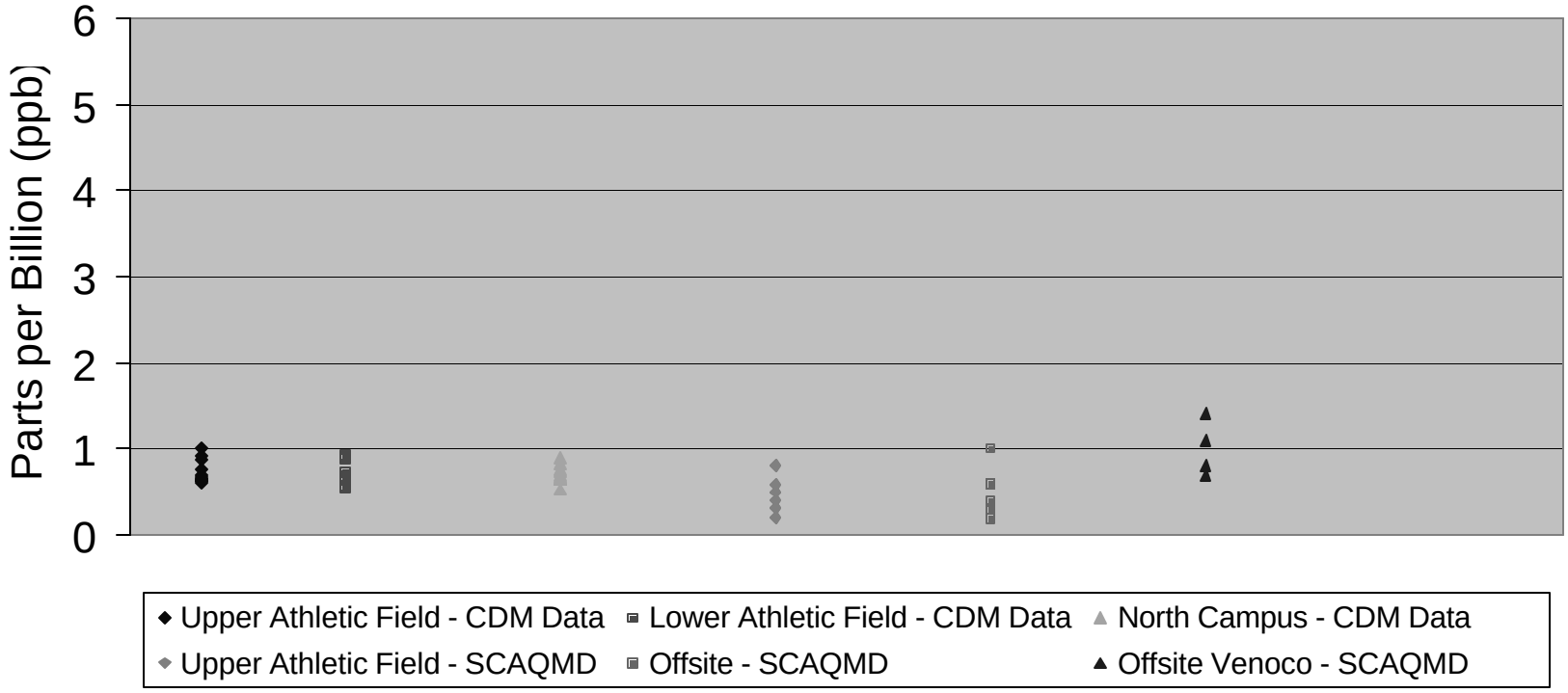
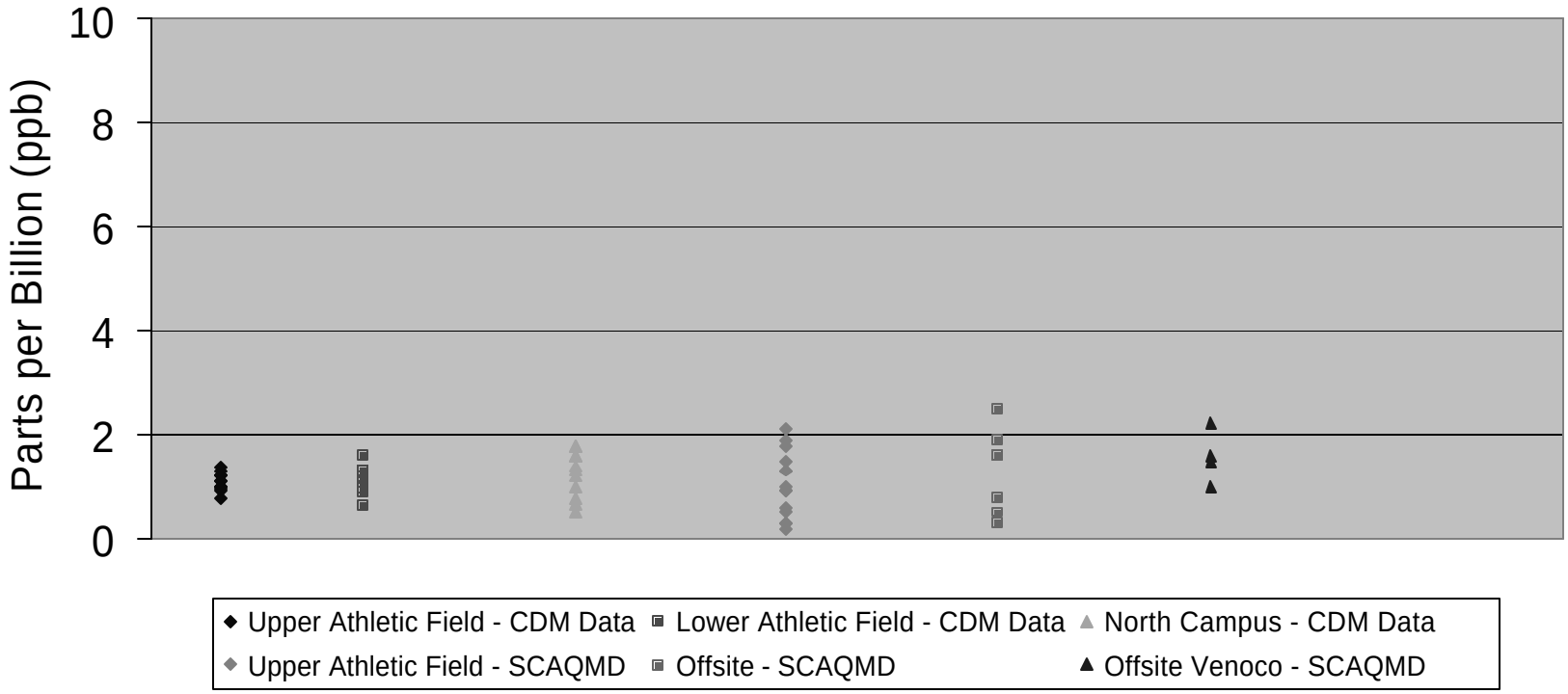


Figure 6
Toluene Concentrations
Comparison of CDM and SCAQMD Analytical Results



Section 5
Incremental Risk Evaluation

As discussed above, the objective of the sampling program was to obtain additional data to help evaluate whether outdoor air quality at the High School is different than typical air quality in the Los Angeles Basin and, if so, to determine whether that difference presents any health risks to students, staff, or other individuals who use the school's facilities. Ancillary objectives include evaluating potential sources based on the data and comparison of chemical concentrations to State of California health goals.

This section presents three tiers of evaluations based on the objectives. The first tier is an evaluation of detected chemical concentrations with regards to sample locations and wind direction to determine whether the data indicate the presence of a significant source of contamination to the High School. The second tier compares chemical concentrations to State of California health goals. The third tier compares chemical concentrations detected in the CDM and SCAQMD investigations to chemicals detected in the Los Angeles Basin, to evaluate whether there is any difference in concentrations detected at the High School compared to ambient air in the Los Angeles Basin. If site concentrations are greater than concentrations typical of the Los Angeles Basin, the incremental risk associated with that difference is evaluated.

5.1 Evaluation of Potential Sources

The purpose of this evaluation is to determine whether detected chemical concentrations can be correlated with potential sources based on range of detections, sample location, and wind direction. Benzene and toluene are selected for more detailed evaluation due to recent claims that these are COPCs in ambient air at the High School. N-Hexane was not detected in CDM's sampling program and the SCAQMD investigation did not indicate the presence of unusual concentrations of n-hexane; therefore, it is not included in this or subsequent evaluations. Acetone and MEK are included in this evaluation due to the sporadic detections of concentrations comparatively greater than observed by SCAQMD during their investigation. Results of the evaluations discussed below indicate that Venoco is not a significant source of chemicals in ambient air at the High School. In addition, ambient air at the High School does not appear to be any different than air elsewhere in Beverly Hills, based on comparison of detected concentrations with wind direction.

5.1.1 Benzene Evaluation

Benzene was detected in only 3 out of 30 samples at concentrations ranging from 0.57 to 1.0 parts per billion by volume (ppb). All detected concentrations were from samples collected on April 17. All detected concentrations were near the minimum amount that can be detected by the laboratory. Sample locations where benzene was detected consist of two in the upper athletic field (locations 1 and 3) and one in the lower field (location 7). Weather data for April 17 indicate that the predominant wind

direction was southeast/south from 7:00 a.m. until noon. After noon, the wind was predominantly out of the northwest/north. Thus, if air quality was significantly worse at the High School due to emissions from a source at the south end of campus, one would expect that relatively clean air coming from the north/northwest in the afternoon would dilute benzene concentrations and result in lower concentrations. Since the opposite was true on this day, a reasonable conclusion is that air blowing from either the south or north ends of the campus contains roughly the same concentrations of benzene and likely reflects local benzene in air due to emissions from mobile sources. All of the existing data and information collected by CDM, including information on wind direction and sampling location, suggest that oil well operations are not a significant source of benzene to ambient air at the High School.

To further support this conclusion, wind patterns on April 16 were equivalent to those observed on April 17, yet benzene was not detected in ambient air samples collected that day. This observation is consistent with the conclusion that benzene detections are not the result of a steady source of emissions, such as the Venoco facility during normal operations.

5.1.2 Toluene Evaluation

Toluene was detected in 26 out of 30 samples at concentrations ranging from 0.76 to 1.6 ppb. The minimum detected concentration was observed in the upper athletic field on April 18, when the wind direction was predominantly from the south (i.e., from Venoco towards the school). The maximum detected concentration was observed at two locations: the lower athletic field on April 16 and the tennis courts on April 17. On both of these days, the wind was blowing from the north/northwest for approximately the latter half of the sampling period. For the latter half of these days, winds would have taken any emissions from Venoco away from the High School. Since toluene concentrations were perhaps somewhat higher on these days, the conclusion that levels of toluene represent background within Beverly Hills due to mobile sources is supported. Toluene data indicates that there is no significant or unusual source of toluene to ambient air. Importantly, benzene and toluene data are entirely consistent, as would be expected if they had the common source in exhaust from cars.

5.1.3 Acetone and Methyl Ethyl Ketone Evaluation

The acetone and MEK evaluation is combined into one discussion because the higher detections were co-located. Acetone was detected in all samples at concentrations ranging from 3.4 to 200 ppb. MEK was detected in 12 out of 30 samples at concentrations ranging from 1.2 to 46 ppb.

The maximum concentration of both acetone and MEK were detected on April 16 at sample location 4 in the lower athletic field. Concentrations greater than previously detected by SCAQMD were also observed on April 16 in the upper athletic field at sample location 2, the lower athletic field at sample location 5, the tennis courts at sample location 9, and one of the on-site background locations (sample location 10).

Other than sample location 9, comparatively high concentrations were not observed at any of these locations on any other sampling day. Weather data for April 16 indicate that the predominant wind direction was southeast/south from 7:00 a.m. until noon. After noon, the wind was predominantly out of the northwest/north. The sporadic locations of the comparatively high detections on April 16, i.e., across the site, including background and locations cross-wind to Venoco, detection of the maximum concentration at a location in the lower athletic field cross-gradient to Venoco, combined with the information on wind direction (both upwind and downwind of Venoco) and the fact that acetone and MEK are not typically associated with oil production, indicates that oil well operations are not the source of acetone and MEK to ambient air at the High School.

The next highest concentrations of both chemicals were approximately 3 orders of magnitude lower and were detected on April 18 at sample location 9 in the tennis courts. The only other comparatively high detection of these chemicals, although significantly lower than the maximum detection, was on April 15 at sample location 8. The wind direction on April 15 and 18 was predominantly blowing from Venoco towards the High School; therefore, one would expect to observe the highest concentrations of acetone and MEK at the site on those days rather than on April 16 if the oil wells were a significant source of these chemicals to ambient air at the High School. These observations support the conclusion that Venoco is not a significant source of acetone and MEK to ambient air at the High School. The source of acetone and MEK is unknown; however, potential sources could include the nearby use of paints or common cleaning products.

5.2 Comparison to Health Goals

The State of California Office of Environmental Health Hazard Assessment has developed reference exposure levels (RELs) to assess non-cancer impacts to people's health from short-term (acute) and long-term (chronic) exposure to chemicals in ambient air. Acute RELs are protective of short-term exposure to airborne chemicals; therefore, maximum detected concentrations are appropriate for comparison to these health goals. This comparison is presented in Table 4. As shown in Table 4, the maximum chemical concentrations detected in either the SCAQMD or CDM investigations do not exceed acute RELs for any chemicals detected in ambient air at the High School, indicating that chemicals in ambient air at the High School do not pose an acute health concern.

Chronic RELs are protective of long-term exposure to airborne chemicals. As such, the average concentration is appropriate for comparison to these health goals. As a conservative measure, maximum concentrations are used in this evaluation to compare to chronic RELs. Table 4 also presents a comparison of maximum concentrations to chronic RELs. As shown in Table 4, chemical concentrations do not exceed chronic health goals, indicating that chemicals in ambient air at the High School do not pose a chronic non-cancer health concern. Figures 7 and 8 provide

graphical comparisons of benzene and toluene concentrations to health goals for the State of California.

5.3 Incremental Risk Compared to Regional Concentrations

To evaluate whether outdoor air quality at the High School is different than typical air quality in the Los Angeles Basin, chemical concentrations detected in the CDM and SCAQMD sample programs are compared to chemicals detected in the Los Angeles Basin. As discussed in Section 5.2, chemical concentrations detected in ambient air at the High School do not pose an acute or chronic risk. Therefore, the evaluation presented in this section is limited to those chemicals identified as having the potential to cause cancer (carcinogens). Chemicals included in this evaluation consist of benzene, methyl-tert butyl ether, and tetrachloroethene. If results of the evaluation indicate that any of these chemicals are present in ambient air at the High School in concentrations greater than those typical to the Los Angeles Basin, the incremental (i.e., additional) risk associated with that difference is evaluated.

Maximum concentrations detected in either the CDM or SCAQMD programs are compared to chemical concentrations typical of the Los Angeles Basin. Data provided by the California Air Resources Board (CARB) was used for the evaluation when available. These data are available electronically on CARB's website at: http://www.arb.ca.gov/aqd/toxics/sitesubstance.html. CARB's website also provides information regarding sampling frequency, sample containers, and analytical methods. Samples for air toxics are collected every 12 days at sites throughout California. There is usually a maximum of 31 values for a given toxics substance at a given site each year. Data are suitable for the comparison presented herein.

Monitoring stations are sited to achieve specific objectives. Objectives include characterization of the highest concentration or source impact, characterization of concentrations representative to urban areas, and characterization of background levels (CARB 2002). CARB's toxics monitoring equipment is located in areas that do not have undue influence from nearby sources or activities (CARB 1994). Therefore, chemical concentrations should not reflect emissions from nearby point sources. Table 5 compares maximum carcinogen concentrations detected in ambient air at the High School to a range of concentrations typical to the Los Angeles Basin. Figures 7 and 8 present a graphical comparison of benzene and toluene concentrations to concentrations detected throughout the Los Angeles Basin. Health goals are also included on these figures for comparison. As indicated by Table 5 as well as these figures, potentially cancer-causing chemicals were detected at concentrations less than those reported for the Los Angeles Basin; therefore, exposure to ambient air on the campus does not present any different potential health risk due to exposure to the identified carcinogens.

Figure 7
Benzene Concentrations in Ambient Air at the High School
Compared to Los Angeles Basin Concentrations and Chronic Health Goals

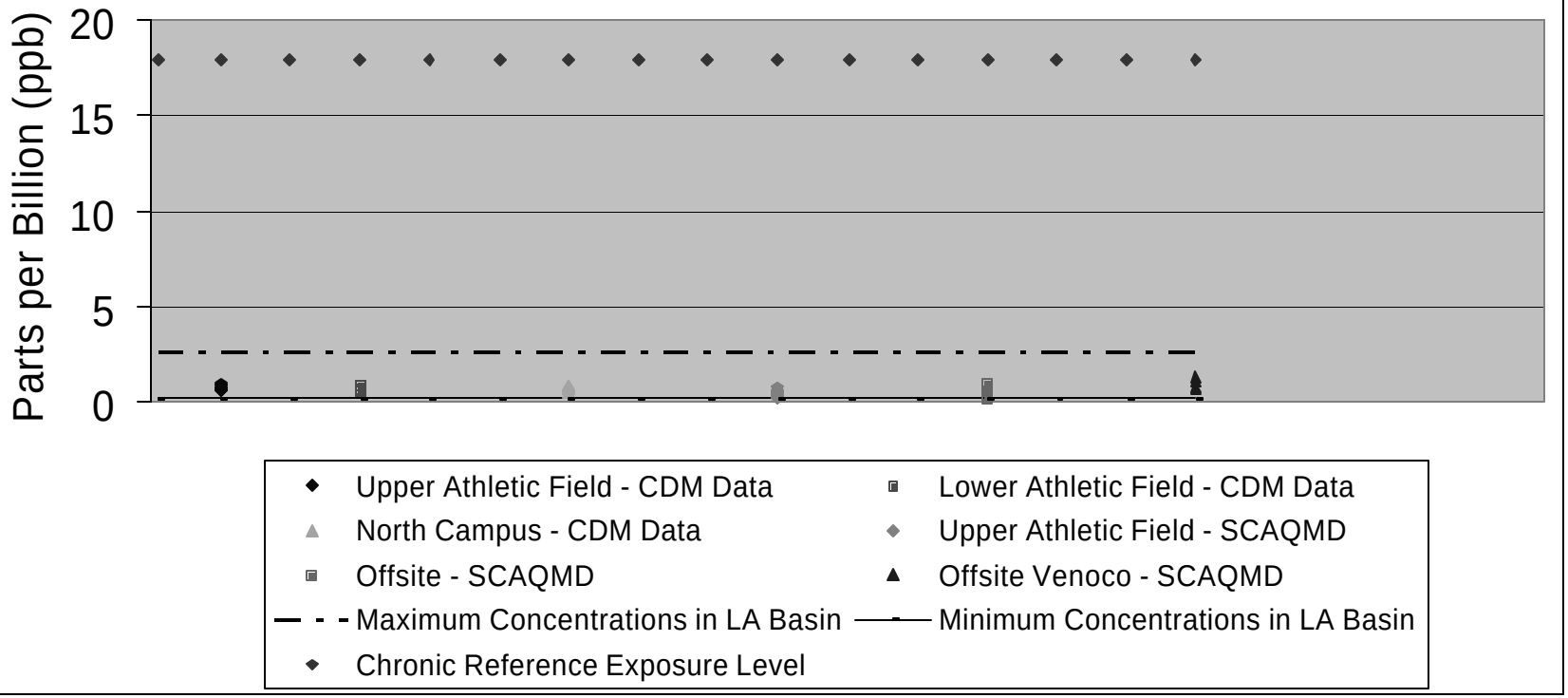


Figure 8
Toluene Concentrations in Ambient Air at the High School
Compared to Los Angeles Basin Concentrations and Chronic Health Goals

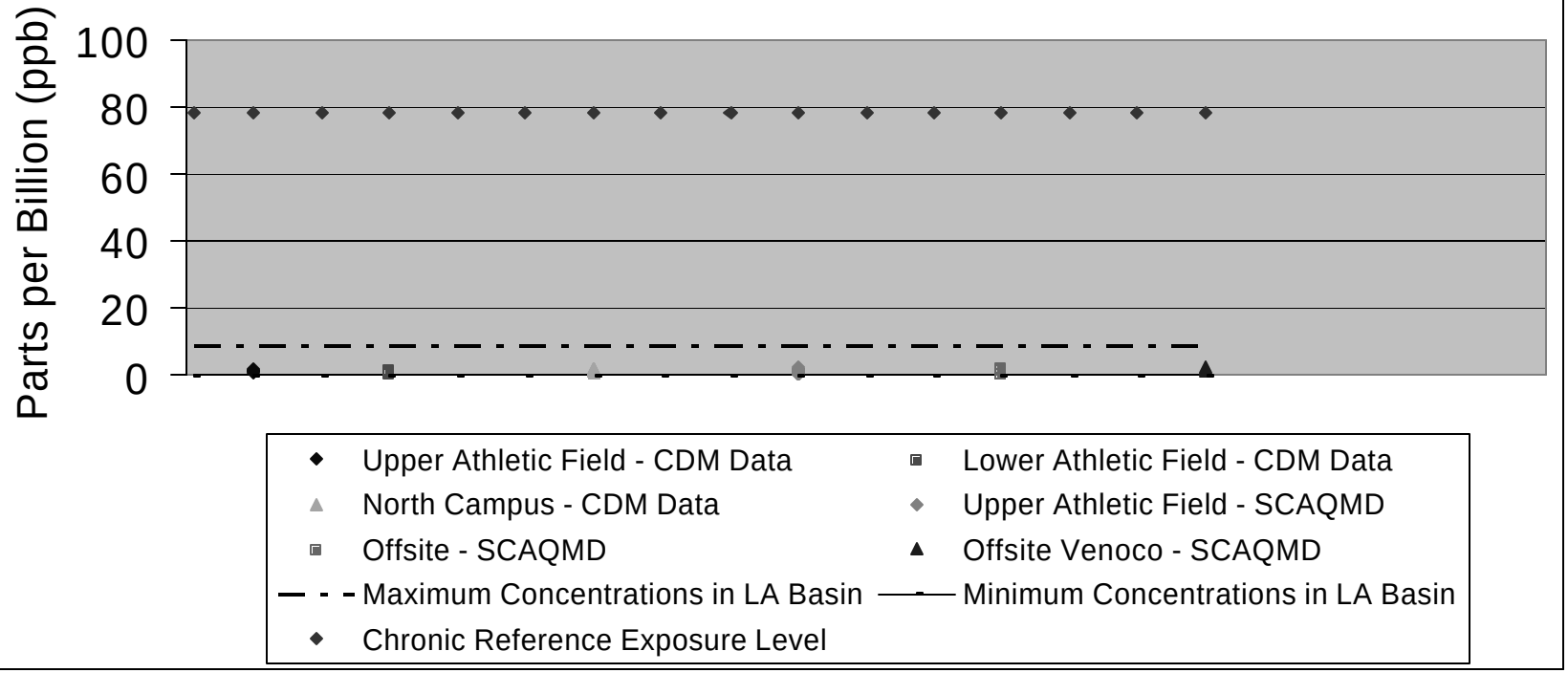


Table 3
Beverly Hills High School
Summary Statistics - CDM Investigation

Analyte	Frequency of Detection (number of detects/number of samples)	Frequency of Detection (%)	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean[a]	Range of Backgound Concentrations[b]	Units
Hydrocarbons							
Methane	11 / 11	100%	2	2.9	2.19	ND to 2.3	ppm
Other Volatile Organic Compounds (VOCs)							
Acetone	30 / 30	100%	3.4	200[d]	16	3.4 to 54	ppb
Benzene	3 / 30	10%	0.57	1.0	0.38	Not detected	ppb
2-Butanone (MEK)	12 / 30	40%	1.2	46[d]	3.68	ND to 16 (one detection out of 7 samples)	ppb
Chloromethane	24 / 30	80%	0.7	1.2	0.78	ND to 1.0	ppb
Dichlorodifluoromethane	22 / 30	73%	0.68	1.0	0.69	ND to 0.94	ppb
2-Hexanone (MiBK)	4 / 30	13%	1.8	7.5	1.03	Not detected	ppb
Tetrachloroethene (Perchoroethylene)	1 / 30	3%	1.0	1.0	0.4[c]	Not detected	ppb
Toluene	26 / 30	87%	0.76	1.6	1.08	ND to 1.8	ppb
m,p-Xylenes	4 / 30	13%	1.3	2	0.82	ND to 1.5 (one detection out of 7 samples)	ppb
o-Xylene	2 / 30	7%	0.62	1.0	0.37	Not detected	ppb

a. Average concentrations include samples with non-detected concentrations. A value of one-half of the reporting limit was used for non-detects.
b. Background concentrations as measured at sample point 10 and 11.
c. There was only one detection of tetrachloroethene out of 30 samples. Likewise, it was not detected in the SCAQMD results.
Therefore, the reporting limit drives the average concentration.
d. Two common and widely-used chemicals, acetone and 2-butanone (methyl ethyl ketone), were detected in elevated concentrations, but at concentrations far below levels of health concern. Neither of these chemicals causes cancer. Moreover, both chemicals were elevated only sporadically across the site and these locations did not show a consistent downgradient relationship with any known sources. Current data suggest that nearby obvious sources (e.g. the oil production wells) are not the source of these chemicals to air at the High School.
ppm = parts per million
ppb = parts per billion

Table 4
Comparison of Maximum Detected Concentrations
to OEHHA Reference Exposure Levels

Analyte	Maximum Detected*	OEHHA Acute REL	OEHHA Chronic REL	Units
Hydrocarbons				
Methane	3.9	NA	NA	ppb
Ethane	61.7	NA	NA	ppb
Ethene	12.8	NA	NA	ppb
Propane	105.2	NA	NA	ppb
Propene	1.9	NA	1714	ppb
n-Butane	56.6	NA	NA	ppb
iso-Butane	19	NA	NA	ppb
n-Pentane	16.3	NA	NA	ppb
iso-Pentane	16.9	NA	NA	ppb
n-Hexane	3.8	NA	1954	ppb
n-Heptane	1.6	NA	NA	ppb
n-Octane	1.4	NA	NA	ppb
n-Nonane	0.5	NA	NA	ppb
n-Decane	0.2	NA	NA	ppb
n-Undecane	0.1	NA	NA	ppb
n-Dodecane	0.1	NA	NA	ppb
Other Volatile Organic Compounds (VOCs)				
Acetone	200	NA	NA	ppb
Benzene	1.4	400	18	ppb
2-Butanone (MEK)	46	4337	NA	ppb
Chloromethane	1.2	NA	NA	ppb
Dichlorodifluoromethane	1	NA	NA	ppb
Ethylbenzene	0.6	NA	453	ppb
2-Hexanone (MiBK)	7.5	NA	NA	ppb
Methyl tert-Butyl Ether (MTBE)	0.5	NA	2183	ppb
Tetrachloroethene (PCE)	1	2900	5	ppb
Toluene	2.5	9660	78	ppb
m,p-Xylenes	2	4964	158	ppb
o-Xylene	1	4964	158	ppb

*Maximum detection from CDM and SCAQMD investigations
OEHHA: Office of Environmental Health Hazard Assessment
REL: Reference Exposure Level

Table 5
Comparison of Maximum Detected Carcinogen Concentrations to Concentration Ranges in the Los Angeles Basin

Analyte	Maximum Detected*	Range of Concentrations in LA Basin	Units
Benzene	1.4	0.18 to 2.6	ppb
MTBE	0.5	0.4 to 7.0	ppb
Tetrachloroethene (PCE)	1	0.005 to 1.0	ppb

*Maximum detected in CDM and SCAQMD investigations.
Based on monitoring stations in Azusa, Burbank, Fontana, Los Angeles, N. Long Beach, Riverside, Santa Barbara, and Simi Valley.
ppb: parts per billion
NA: data not available in annual toxics summary database.
Source of data: http://www.arb.ca.gov/aqd/toxics/sitesubstance.html

Section 6
Conclusions

The following conclusions are based on the findings of CDM's ambient air sampling as well as data resulting from the SCAQMD investigation. Results of the investigation performed by Camp Dresser & McKee Inc. (CDM) indicate no basis for believing that ambient air at Beverly Hills High School (the High School) is significantly impacted by oil well operations or that exposure to air on the campus presents any different potential health impact than exposure to air elsewhere in Beverly Hills or the Los Angeles Basin. These conclusions are consistent with results of previous studies of the South Coast Air Quality Management District (SCAQMD), which have shown that chemical concentrations measured in the air at the High School are well below the health limits established by the State of California.

Section 7
References

California Air Resources Board. 1994. *Siting Requirements for Toxics Monitoring Equipment*. Volume II. August.

California Air Resources Board. 2002. *State and Local Air Monitoring Network Plan*.

California Environmental Protection Agency, Department of Toxic Substances Control. 1999. *Preliminary Endangerment Assessment Guidance Manual*.

CDM. 2003. *Final Work Plan - Ambient Air Sampling and Incremental Risk Evaluation*. April.

USEPA. 1999. *National Functional Guidelines for Organic Data Review*. October.

USEPA. 1992. *Supplemental Guidance to RAGS: Calculating the Concentration Term*. Publication 9285.7-081. Office of Solid Waste and Emergency Response. May 1992.

USEPA. 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Interim Final. OSWER Directive 9355.3-01. EPA/540/G-89/004. Office of Emergency and Remedial Response*. October 1988.