Clark County
Department of Air Quality
& Environmental Management

Protecting the air we share

Air Quality

CLARK COUNTY NEVADA

Annual Network Plan Report
June 2010

June 15, 2010

Jared Blumenfeld, Regional Administrator
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105

RE: ANNUAL NETWORK PLAN

Dear Mr. Blumenfeld:

The Clark County Department of Air Quality and Environmental Management (DAQEM) has completed the "Annual Network Plan Report" required by Title 40, Part 58 of the Code of Federal Regulations. The plan has been available for public inspection since April 15, 2010, on our Web site at http://www.accessclarkcounty.com/depts/daqem/aq/Pages/aq_index.aspx. In addition, a newspaper announcement was published, the plan was available at the DAQEM front counter for review, and recipients were notified electronically from a list of environmental contacts.

This report addresses the following objectives, set forth in guidance from the U.S. Environmental Protection Agency:

1. Ambient Air Quality Monitoring Methodology.
2. Network Design.
3. Probe and Path Siting Criteria.
4. Quality Assurance Requirement.
5. Periodic Systems Audits and National Performance Audits.
6. Corrective Action.

DAQEM will continue to evaluate the monitoring network for program effectiveness in the following areas: effectively meeting users' needs, effectively siting monitors, appropriate scale of representation, meeting air monitoring objectives, monitoring National Ambient Air Quality Standards, determining the effectiveness of air pollution control programs, and informing the public of air pollution levels.

If you have any questions related to this report, please contact Yousaf Hameed, Air Quality Monitoring Supervisor, at (702) 379-4465.

Respectfully,

Mike Sword, P.E., CEM
DAQEM Engineering Manager

cc:
Meredith Kurpius, Acting Manager, EPA Region 9
Matthew Lakin, EPA Region 9
Joseph Lapka, EPA Region 9
Michael Flagg, EPA Region 9
Mathew Plate, EPA Region 9
Roy Ford, EPA Region 9 Grant Office
Lewis Wallenmeyer, Director, DAQEM
Tina Gingras, Assistant Director, DAQEM
Yousaf Hameed, Monitoring Supervisor, DAQEM

Executive Summary

This annual plan reports the status of the Clark County Department of Air Quality and Environmental Management (DAQEM) air monitoring network. Reporting standards are outlined in Title 40, Part 58 of the Code of Federal Regulations (40 CFR 58).

The plan focuses on monitoring network changes that occurred in 2009, planned changes and improvements in 2010, efforts to improve data quality, and ways in which the information recorded by the network is disseminated.

The 2009 network review identified potential deficiencies at two monitoring stations, along with options for correction. Shortcomings fell into the following categories:

1. Spacing to roadways.
2. Obstacle distance.

DAQEM is continuing efforts to achieve total network compliance with the requirements outlined in 40 CFR 58. The section "Siting Criteria Deficiencies" contains an implementation schedule for corrective actions.

In addition to network plan requirements, the U.S. Environmental Protection Agency released the revised final National Ambient Air Quality Standard for NO_2 on February 9, 2010. This plan includes a discussion of the regulation changes that affect Clark County and its compliance status.

This plan is an official request for the Region 9 office to determine that this plan meets all applicable requirements of 40 CFR Part 58.

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Acronyms and Abbreviations

Acronyms

AQS	Air Quality System
ARM	Approved Regional Method
BAM	Beta Attenuation Monitor
CFR	Code of Federal Regulations
DAQEM	Clark County Department of Air Quality & Environmental Management
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Monitoring Station
NCore	National Core Monitoring Network
PEP	Performance Evaluation Program
QA	Quality Assurance
QC	Quality Control
QCAS	Quality Control and Assurance System
RAAS	Reference Ambient Air Sampler
SASS	Speciation Air Sampling System
SLAMS	State and Local Air Monitoring System
TTP	Through The Probe
URG	University Research Glassware

Abbreviations

CO	carbon monoxide
m/s	meters per second
mb	millibar
mph	miles per hour
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
O_3	ozone
Pb	lead
$PM_{2.5}$	particulate matter 2.5 microns or less in aerodynamic diameter
PM_{10}	particulate matter 10 microns or less in aerodynamic diameter
ppm	parts per million
SO_2	sulfur dioxide

Introduction

This document is a review of the Clark County Department of Air Quality and Environmental Management (DAQEM) air monitoring network, and serves as a monitoring network plan for future activities. It contains the following elements:

1. Description of the climate of Clark County, Nevada.
2. Documentation of ambient air quality monitoring methodology.
3. Description of monitoring instruments in the network and general station information.
4. Definition of the degree to which the network meets monitoring objectives.
5. Description of probe and path siting compliance.
6. Demonstration that each site monitoring particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$) meets design value standards.
7. Identification of ozone (O_3) monitoring sites that exceed the 2009 ozone design value standard.
8. Review of the Quality Assurance (QA) Program.
9. Confirmation that the agency operates the number of monitors required by Title 40, Part 58 of the Code of Federal Regulations (40 CFR 58).
10. Description of network changes during calendar year 2009.
11. Identification of projected network changes during calendar year 2010 and beyond.
12. Description of the plan to correct guidance conflicts.

During 2009, the following conditions existed:

1. DAQEM operated air quality instruments to measure ambient concentrations of the following criteria pollutants: $PM_{2.5,}$ PM_{10}, ozone, carbon monoxide (CO), and nitrogen oxides (NO, NO_2, NO_x).
2. DAQEM monitored visibility as a special project.
3. DAQEM counted pollen as a special project.
4. DAQEM operated with the following program objectives:
    a. Ensure the network is monitoring representative data, and geographical and population factors are considered in managing the network.
    b. Make monitoring data readily accessible to the U.S. Environmental Protection Agency (EPA), regional and national air quality agencies, the general public, and stakeholders.
    c. Monitor visibility in the Las Vegas Valley using long path technology.
    d. Review analyzer placement for ozone boundaries, considering formation and transport.
    e. Improve forecasting methods for ozone, PM_{10}, and $PM_{2.5}$.
    f. Make efforts to update monitoring equipment when needed.
    g. Revise QCAS standard operating procedures (SOPs).
    h. Prepare National Core Monitoring Network (NCore) site for deployment.
5. Clark County remained designated a serious nonattainment area for two criteria pollutants in Hydrographic Area 212, PM_{10} and CO. Clark County is in a nonattainment area for O_3 and is awaiting an official EPA classification, which is expected in 2011.

- PM_{10}: Clark County has demonstrated compliance with the NAAQS from the end of 2006 through 2009, and is presumed to be in attainment. There was one exceedance in 2007 (not flagged, not deemed questionable data) and two in 2008 (flagged, may be deemed questionable data).
- $PM_{2.5}$: Clark County is presumed to be in attainment of the NAAQS from 2004 through 2009. DAQEM is continuing to assess $PM_{2.5}$ Federal Reference Method (FRM) data to confirm. Currently, Clark County is designated as unclassifiable for $PM_{2.5}$. Hydrographic Areas 212, 216, and 164A are designated attainment for $PM_{2.5}$; all other parts of the county are designated unclassifiable for this pollutant.
- CO: DAQEM has submitted a maintenance plan for CO. EPA's target date for approval is the end of June 2010, at which time Hydrographic Area 212 will be redesignated to attainment for CO. Clark County is requesting redesignation because it has been in attainment of the CO NAAQS since 2000.
- Clark County was designated nonattainment for the 1997 ozone NAAQS (85 ppb) in April 2004. However, based on 2006-2009 monitoring data, Clark County is in attainment of the 1997 NAAQS. DAQEM is preparing a maintenance plan and redesignation request for the 1997 NAAQS; submittal to EPA is expected in late 2010. EPA reconsidered the 2008 NAAQS (75 ppb) in September 2009 and proposed a new primary and secondary standard in January 2010. The final rule will be promulgated on August 10, 2010.

Below is a picture of the Air Quality Monitoring and QA Team. From left to right: Kris Simonian, Air Quality Monitoring Technician II; Pravin Pema, Air Quality Monitoring Technician II; Joe Biebrich, Air Quality Monitoring Technician II; Monte Symmonds, Senior Air Quality Monitoring Technician; Yousaf Hameed, Air Quality Monitoring Supervisor; David Dickens, Air Quality Monitoring Technician II; Matt Nelson, Air Quality Monitoring Technician II; Mickey Turner, Senior Air Quality Monitoring Technician; Phil Wiker, Senior Air Quality Monitoring Technician; and Mickey Palmer, Senior Air Quality Monitoring Technician and QA Officer.

Public Inspection Process

This annual monitoring network plan report was published for public inspection 30 days prior to Clark County Board of County Commission approval and subsequent submittal to EPA, in compliance with 40 CFR 58.10. The plan was published and distributed on the DAQEM Web site, made available at the DAQEM front counter, advertised in the newspaper, and distributed to a list of environmental stakeholders. Public comments on this report may be sent to:

Yousaf Hameed
Air Quality Monitoring Supervisor
Clark County DAQEM
500 South Grand Central Parkway
P.O. Box 555210
Las Vegas, Nevada 89155

Network Review Methodology

This annual monitoring network plan report was written, and the monitoring network was planned, according to "SLAMS / NAMS / PAMS Network Review Guidance," published in 1998 by the EPA Office of Air Quality Planning and Standards (EPA-454/R-98-003). The report team included supervisors, field technicians, data management specialists, planning staff, quality assurance technicians, and managers.

The team completed the following tasks in preparing this network plan:

1. Evaluated each station for pathway and probe siting criteria compliance.
2. Reviewed Air Quality System (AQS) reports.
3. Reviewed topographical maps.
4. Reviewed historical trends in the monitoring network.
5. Reviewed National Weather Service climate resources.
6. Studied traffic count reports prepared by the Nevada Department of Transportation.
7. Reviewed lease agreements.
8. Calculated design values for ozone and $PM_{2.5}$.

Metropolitan Statistical Area

Clark County qualifies as one Metropolitan Statistical Area (40 CFR 81). The Las Vegas Valley contains the majority of the population for Clark County; smaller communities, such as Mesquite and Boulder City, do not qualify as Metropolitan Statistical Areas.

Climatological Information

Information within this section was taken from the National Weather Service, Las Vegas climate book.

1. Topography and History

Las Vegas is located in a broad desert valley in southern Nevada. Mountains surrounding the valley extend 2,000 to 10,000 feet above the valley floor. The Las Vegas Valley comprises about 600 square miles and runs from northwest to southeast. It is bounded on the north by the Sheep Range, while Boulder City and the Lake Mead National Recreation Area are generally considered its southern extent. To the west are the Spring Mountains, which include Mt. Charleston, the region's highest peak at 11,918 feet. Several smaller ranges line the eastern rim of the valley, including the Muddy Mountains, the Black Mountains, and the Eldorado Range. For most of the Las Vegas metropolitan area, the valley floor slopes downward from west to east. This affects local climatology by driving variations in wind, precipitation, and storm runoff.

Official weather observations have been recorded in Las Vegas since 1937, initially at Nellis Field in the northeast part of the valley. In late 1948, the U.S. Weather Bureau moved to McCarran Field (now McCarran International Airport), seven miles south of downtown Las Vegas.

2. General Climatic Summary

The four seasons are actually well defined in Las Vegas, although they differ from the traditional view of seasonal variation. Summers display classic desert Southwest characteristics: daily high temperatures typically exceed 100°F, with lows in the 70s. The summer heat is tempered somewhat by the extremely low relative humidity; however, humidity can increase markedly for several weeks each summer in association with a moist "monsoonal flow" from the south, typically during July and August. These moist winds support the development of spectacular desert thunderstorms associated with significant flash flooding and/or strong downburst winds.

Winters, overall, are mild and pleasant. Afternoon temperatures average near 60°F and skies are mostly clear. Pacific storms occasionally produce rainfall in Las Vegas, but in general, the Sierra Nevada Mountains of eastern California and the Spring Mountains immediately west of the Las Vegas Valley act as effective barriers to moisture.

Snow accumulation is rare in Las Vegas. Flurries are observed once or twice during most winters, but snowfall of an inch or more occurs only once every four to five years. However, freezing temperatures occur regularly each year: the valley has a 30-year average of 24 days with low temperatures at or below 32°. Snowfall is common in the mountains surrounding Las Vegas, with the Spring Mountains receiving between 5 and 10 feet annually. The spring and fall seasons are generally considered ideal. Although sharp temperature changes can occur, outdoor activities are seldom hampered.

Strong winds are the most persistent weather hazard in the area. Winds over 50 miles per hour (mph) are infrequent, but can occur with vigorous storms. Winter and spring wind events often

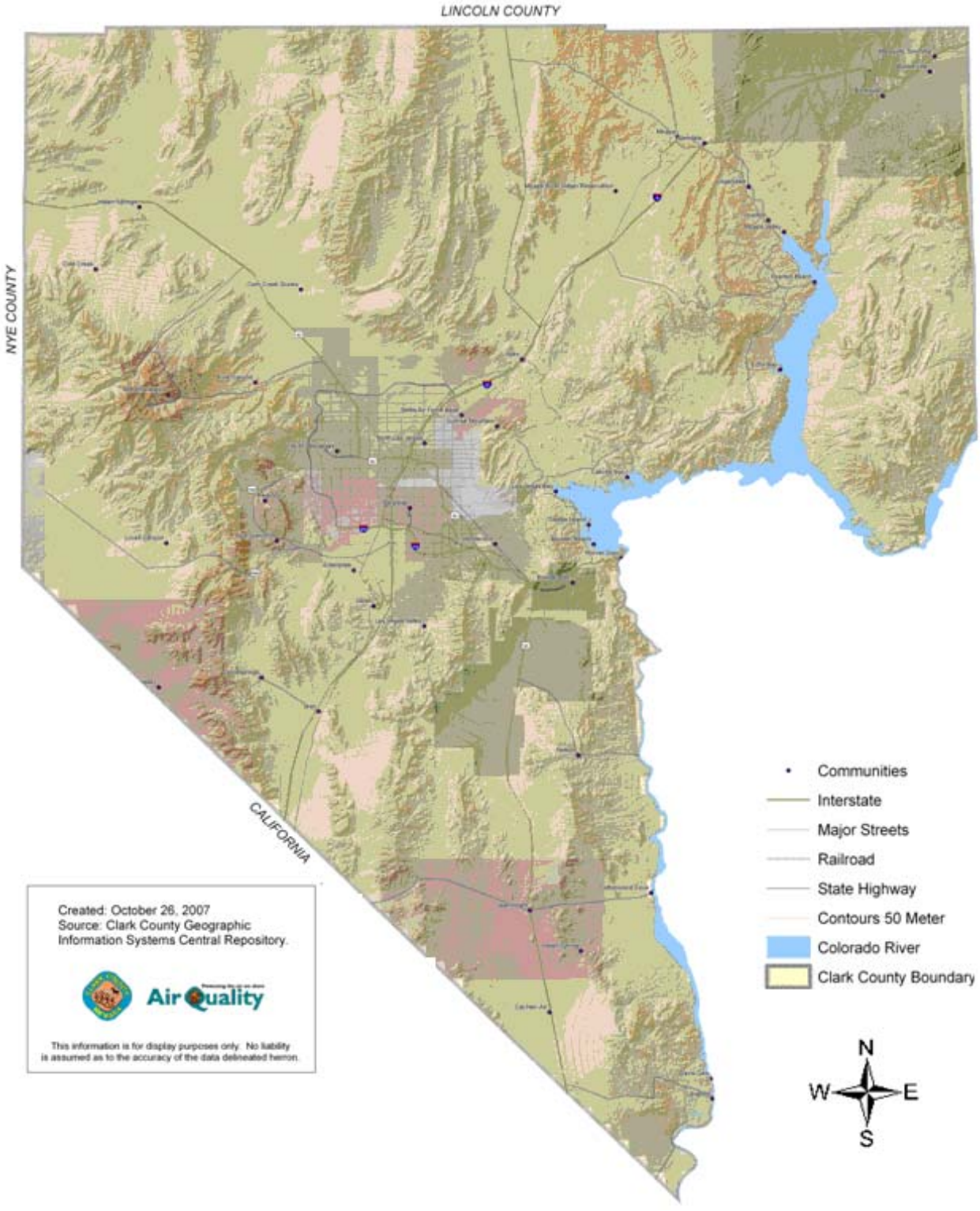
generate widespread areas of blowing dust and sand. Strong wind episodes in the summertime are usually connected with thunderstorms, and are thus isolated and localized. Prevailing wind direction is typically either southwest or north unless associated with a thunderstorm outflow.

Regional transport and local influences produce higher ozone concentrations on the west and northwest sides of the valley. Ozone episodes in the Las Vegas Valley are generally characterized by a surface (thermal) low pressure system extending over Arizona, southern California, and Nevada; ridging of 500 millibars (mb) over the southwest or central United States; and southwesterly surface flow during the afternoon hours, accompanied by ample sunshine and high temperatures. Superimposed on the synoptic-scale meteorological conditions are the local, terrain-induced mesoscale meteorological features. Together, these determine the horizontal and vertical advection and dispersion of pollutants and their eventual removal from the Las Vegas Valley.

3. Synoptic Meteorology

Based on a National Meteorological Center modeling analysis at 500 mb, a broad, flat ridge of pressure over the central U.S. is dominant during the summer season. Winds at this level, as indicated by the Mercury/Desert Rock Weather Service Meteorological Observatory radiosonde, are normally westerly and characterized by moderate (10-15 m/s) wind speeds. The center's surface analyses indicate that southern Nevada is enveloped by a thermal low-pressure system.

Figure 1 – Topographic Map



Ambient Air Quality Monitoring Methodology

DAQEM's Monitoring Section operated 16 monitoring stations in Clark County during 2009. The types of monitors vary from station to station. The network primarily consists of State and Local Air Monitoring Stations (SLAMS), with a neighborhood-scale focus intended to assess exposure levels of the general population. The network also characterizes pollution transport and background levels. It contains subnetworks for the EPA criteria pollutants PM_{10}, $PM_{2.5}$, CO, O_3, and NO_2.

Continuous Particulate Matter Monitors

The sampling methodology employs the continuous Thermo Electron FH 62 C14 series monitor, which uses carbon-14 as the beta source. All continuous $PM_{2.5}$ monitors have a Very Sharp Cut Cyclone as their second stage separator.

Particulate Matter of 10 Microns or Less

During 2009, 13 continuous PM_{10} monitors operated in Clark County. Nine operated within the Las Vegas Valley; the Jean, Boulder City, Apex, and Mesquite monitors operated outside the valley. The maps in the section titled "Continuous PM_{10} Monitoring Locations" show the locations of the monitors in the PM_{10} monitoring network (Figures 25-27).

A quality control (QC) flow rate verification is conducted on the continuous PM_{10} monitors every two weeks, exceeding the EPA requirement of once per month. A QA flow rate audit is conducted on the monitors once every six months.

The following table shows the spatial scale and monitoring objective for each PM_{10} monitor.

Site	Spatial Scale	Objective
Green Valley	Middle	Population exposure
Mesquite	Middle	Population exposure
Palo Verde	Middle	Population exposure
Jean	Regional	Background
Apex	Regional	Source
Craig Road	Neighborhood	Highest concentration
All others	Neighborhood	Population exposure

Particulate Matter of 2.5 Microns or Less

In 2009, DAQEM operated six continuous $PM_{2.5}$ monitors in Clark County. The maps in the section titled "Continuous $PM_{2.5}$ Monitoring Locations" show the locations of the monitors in the continuous $PM_{2.5}$ monitoring network (Figures 28 and 29).

In accordance with 40 CFR 58.30, DAQEM has determined that all $PM_{2.5}$ monitoring sites are representative of area-wide concentrations and not directly impacted by unique sources. The Apex Monitoring Station may be an exception due to the close proximity of emission sources.

A QC flow rate verification is conducted on the continuous $PM_{2.5}$ monitors every two weeks, exceeding EPA requirements. A QA flow rate audit is conducted on the monitors once every six months.

The following table shows the spatial scale and monitoring objective for each $PM_{2.5}$ monitor.

Site	Spatial Scale	Objective
Craig Road	Neighborhood	Population exposure
J.D. Smith	Neighborhood	Population exposure
Sunrise Acres	Neighborhood	Highest concentration
Green Valley	Middle	Population exposure
Jean	Regional	General/background
Apex	Regional	Source-oriented

Filter-Based Particulate Matter Samplers

The $PM_{2.5}$ FRM and the $PM_{2.5}$ Speciation samplers, the latter of which includes the University Research Glassware (URG) carbon channel sampler, are the only filter-based monitoring instruments DAQEM employs. The maps in the section titled "Filter-Based $PM_{2.5}$ Monitoring Locations" show the locations of the samplers in the $PM_{2.5}$ FRM monitoring network (Figures 30 and 31). Sampling methodology employs the filter-based FRM Andersen Model 300 Reference Ambient Air Sampler (RAAS).

DAQEM operates a gravimetric laboratory that weighs $PM_{2.5}$ FRM filters.

Particulate Matter of 2.5 Microns or Less

In 2009, three filter-based $PM_{2.5}$ FRM samplers operated as listed in the table below.

Site	Schedule
Sunrise Acres	One in three days
Sunrise Acres (collocated)	One in six days
Jean	One in three days
J.D. Smith	One in three days

A QC flow rate verification is conducted on the filter-based $PM_{2.5}$ FRM samplers once a month; a QA flow rate audit is conducted on the samplers once every six months.

The following table shows the spatial scale and monitoring objective for each routine filter-based $PM_{2.5}$ FRM sampler.

Site	Spatial Scale	Objective
Jean	Regional	Background
Sunrise Acres	Neighborhood	Highest concentration
J.D. Smith	Neighborhood	Population exposure

In accordance with 40 CFR 58.10, DAQEM will notify the public if a $PM_{2.5}$ monitor violates the NAAQS, or if a community monitoring zone (as defined in the *Federal Register*) is created or changed. DAQEM will use a two-part process, similar to the current network plan public inspection process, to provide notification of a proposed monitoring zone change: (1) post to its Web site a review of the $PM_{2.5}$ monitoring network with the changes being considered, and (2) solicit feedback from the community. DAQEM will respond to any public comments and take all comments into consideration before making changes to the $PM_{2.5}$ monitoring network. The only exceptions to this process will be a lost lease or a 30-day notice from the property owner to vacate the site.

40 CFR 58.30 describes certain types of microscale $PM_{2.5}$ sites as unsuitable for comparison to the annual NAAQS. DAQEM does not operate a microscale $PM_{2.5}$ site, so all its FRM $PM_{2.5}$ monitors are suitable for NAAQS comparisons.

Speciation

DAQEM operates a speciation sampler in conjunction with a carbon channel sampler at the East Craig Road site (32-003-0022). Under an EPA contract, the Research Triangle Institute analyzes speciation samples and reports the results to the AQS.

Carbon Monoxide

The map in the section titled “Carbon Monoxide Monitoring Locations” shows the locations of the monitors in the CO monitoring network (Figure 20). DAQEM uses API 300 Series monitors with gas filter correlation.

DAQEM conducts a three-point QC check on the CO monitors every week and calibrates them quarterly. Twenty-five percent of the CO monitors undergo a QA audit every quarter, and all CO monitors undergo an audit at least once each year.

The following table shows the spatial scale and monitoring objective for each CO monitor.

Site	Spatial Scale	Objective
Sunrise Acres	Neighborhood	Highest concentration
All others	Neighborhood	Population exposure

Ozone

In 2009, DAQEM operated 13 ozone monitors in Clark County. Nine operated within the Las Vegas Valley; the Jean, Apex, Boulder City, and Mesquite monitors operated outside the valley. The maps in the section titled “Ozone Monitoring Locations” show the locations of monitors in

the ozone monitoring network (Figures 21-23). Clark County uses API 400 Series ultraviolet absorption monitors.

The majority of the ozone network in Clark County was designed for the one-hour ozone standard. That is now used to calculate eight-hour (rolling average) values for comparison to the current ozone NAAQS.

DAQEM's ozone projects include:

- "Ozone Characterization Study."
- "Clark County Regional Ozone & Precursor Study."
- "Southwest Desert Las Vegas Ozone Transport Study."
- Biogenic emissions inventory.
- Emission inventory of volatile organic compounds from consumer products.
- Establishment of upper air wind measurements in Clark County.
- Characterization of 2009 wildfire impacts on air quality in Clark County.

DAQEM is planning another wildfire study in the summer of 2010 to evaluate how smoke plumes affect Clark County with respect to ozone precursors and ozone formation. The goal is to further characterize smoke plume impacts on ozone concentrations by showing a quantifiable relationship between ozone, $PM_{2.5}$, and levoglucosan, a chemical marker for wildfires. DAQEM anticipates these wildfire studies will contribute to successful exceptional event demonstration packages. In addition, there is evidence that introducing smoke into the analytical bench of ozone analyzers can cause an artificial positive bias. Thus far DAQEM has not been able to establish this relationship, but it will continue to investigate. DAQEM may deploy a chemiluminescence ozone analyzer in the 2010 study, since it uses a measurement principle that is not affected by particulate interference. All instrumentation deployed as part of the wildfire study will be operated as special purpose monitoring (SPM).

DAQEM conducts a three-point QC check on the ozone monitors every week and calibrates them quarterly. Twenty-five percent of the ozone monitors undergo a QA audit every quarter, and all ozone monitors undergo an audit at least once each year.

The following table shows the spatial scale and monitoring objective for each monitor.

Site	Spatial Scale	Objective
Apex	Regional	Regional transport
Joe Neal	Neighborhood	Highest concentration
Jean	Regional	Regional transport
All others	Neighborhood	Population exposure

Nitrogen Oxides

In 2009, DAQEM operated two nitrogen oxide monitors in Clark County. All nitrogen oxide monitors were operated within the Las Vegas Valley. The map in the section titled "Nitrogen

Oxide Monitoring Locations" shows the locations of monitors in the nitrogen oxide monitoring network (Figure 24). DAQEM uses API 200 Series monitors with gas phase chemiluminescence.

DAQEM conducts a three-point QC check on the nitrogen oxide monitors every week and calibrates them quarterly. Twenty-five percent of the nitrogen oxide monitors undergo a QA audit every quarter, and all nitrogen oxide monitors undergo an audit at least once each year.

The table below shows the spatial scale and monitoring objective for each monitor.

Site	Spatial Scale	Objective
J.D. Smith	Neighborhood	Highest concentration
Joe Neal	Neighborhood	Population exposure

Siting Criteria Deficiencies

DAQEM identified the following deficiencies in the 2009 review of the network.

Site	Roadway	Obstacle Distance
E. Sahara	CO	
Walter Johnson		Water cooling tower 15' from inlet

The table below shows the schedule to correct the identified siting deficiencies.

Deficiency	Site/Monitor	Corrective Action	Schedule
Spacing from roads	E. Sahara/CO	Move to Jerome Mack Middle School	2010
Obstacle distance	Walter Johnson/O_3	DAQEM will monitor data for impacts from cooling tower	2010

Spacing from roads:
DAQEM will evaluate spacing and attempt to comply with 40 CFR 58, Appendix E. DAQEM will consider one or more of the following options:

1. Relocate the site.
2. Shut down the site.

Obstacle distance:
DAQEM will evaluate the obstacle distance problem and will attempt to comply with 40 CFR 58, Appendix E. DAQEM will consider the following options:

1. Increase the height of the probe so the obstacle is no longer an issue.
2. Relocate the site.
3. Shut down the site.

Design Values for 2009

The following table compares ozone design values with the NAAQS standard.

Station	Ozone Design Value (ppm)	NAAQS Standard (ppm)
E. Craig Road	0.072	.075
Winterwood	0.072	.075
Apex	0.074	.075
Lone Mountain	0.076	.075
Palo Verde	0.075	.075
Jean	0.076	.075
Paul Meyer	0.077	.075
Boulder City	0.072	.075
J.D. Smith	0.073	.075
Walter Johnson	0.078	.075
Joe Neal	0.078	.075
Mesquite	.0.065	.075
Orr	0.074	.075

Note: ppm = parts per million.

The following table compares annual $PM_{2.5}$ design values with the NAAQS standard.

Station	$PM_{2.5}$ Design Value ($\mu g/m^3$)	NAAQS Standard ($\mu g/m^3$)
Sunrise Acres	9.4	15
Jean	4.1	15
J.D. Smith	8.5	15

The following table compares 24-hour $PM_{2.5}$ design values with the NAAQS standard.

Station	$PM_{2.5}$ Design Value ($\mu g/m^3$)	NAAQS Standard ($\mu g/m^3$)
Sunrise Acres	21	35
Jean	11	35
J.D. Smith	18	35

40 CFR 58.30 describes certain types of microscale $PM_{2.5}$ sites as unsuitable for comparison to the annual NAAQS. DAQEM does not operate a microscale $PM_{2.5}$ site, so all its FRM $PM_{2.5}$ monitors are suitable for NAAQS comparisons.

Site and Instrument Information

Site Information

Apex (32-003-0022). The site is located in Apex Valley, approximately 25 miles northeast of Las Vegas. Its primary purpose is to monitor ambient impacts of emissions from nearby gravel processing and power plants, and pollutant flow out of the Las Vegas Valley. This monitoring site is generally downwind from Las Vegas and serves as an indicator of pollutant transport flow out of the Las Vegas Valley; this site is the only DAQEM monitoring station in the Apex Valley.

Boulder City (32-003-0601). The site is located in Boulder City, approximately 25 miles southeast of Las Vegas. It was established at the request of Boulder City government officials and residents. The primary pollutants of interest are O_3 and PM_{10}.

Craig Road (32-003-0020). The site is located in the city of North Las Vegas. It was established to comply with permit conditions related to potentially high emissions of O_3 precursors. Although that emission source no longer exists, the site continues to monitor O_3, PM_{10}, and $PM_{2.5}$; it periodically violates the PM_{10} 24-hour standard. Because of other DAQEM efforts and the periodic PM_{10} exceedances, the speciation sampler was moved to this site in March 2007 from the Sunrise Acres site. This site has not experienced a PM_{10} exceedance since May 2008.

Green Valley (32-003-0298). The site is located in Henderson. It was established because of citizen complaints about dust emissions from a gravel processing plant, and continues to monitor PM_{10} and $PM_{2.5}$.

J.D. Smith (32-003-2000). The site is located in the City of North Las Vegas. It replaced the old McDaniel and Post Office PM sites. The site monitors gaseous (NO_x, CO, and O_3) and particulate (PM_{10} and $PM_{2.5}$) pollutants using both filter-based and continuous methodologies.

Jean (32-003-1019). The site is located in Jean, approximately 30 miles south of Las Vegas. Its primary purpose is to monitor transport pollutants from southern California: O_3, PM_{10}, and continuous and filter-based $PM_{2.5}$.

Joe Neal (32-003-0075). The site is located in the northwest part of Las Vegas. Its primary objective is to monitor O_3, although a NO_x monitor has also been operating at this location since January 2008. The topography is such that the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. The primary reason for this installation was to monitor O_3 precursors in a high O_3 concentration area, and to support DAQEM modeling efforts. PM_{10} was initially deployed at this site due to population growth in this part of the valley; this site continues to serve its intended population.

Lone Mountain (32-003-0072). The site is located in the northwest part of Las Vegas. Its primary objective is to monitor O_3. The topography is such that the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. DAQEM initiated PM_{10} monitoring here because of gravel processing to the west/northwest of the monitoring site.

East Sahara (32-003-0539). The site, centrally located in the Las Vegas Valley, is one of the oldest sites. Its primary objective is to monitor CO.

Mesquite (32-003-0023). The site is located in Mesquite, approximately 70 miles north of Las Vegas; it monitors O_3 and PM_{10}. This station is located along a transport and exit corridor for jurisdictional boundaries.

Orr (32-003-1021). The site is the replacement for the East Flamingo site, which was terminated because the lease was lost and it was too close to the road to meet its original O_3 monitoring objective. DAQEM began monitoring O_3 at Orr in April 2006, and continues monitoring CO and PM_{10} there.

Paul Meyer (32-003-0043). The site is located in the southwest part of Las Vegas. Its primary objective is to monitor O_3. The topography is such that the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. PM_{10} is also monitored at this location.

Palo Verde (32-003-0073). The site is located in the west part of Las Vegas. Its primary objective is to monitor O_3. The topography is such that the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. The site also monitors PM_{10}.

Sunrise Acres (32-003-0561). The site is near the center of the Las Vegas Valley. Monitoring began here as part of a CO study in the 1990s, and its primary objective is still to monitor CO. After the lease for the East Charleston site was lost, all monitoring activities at that site were transferred to Sunrise Acres. This site monitors particulate pollutants (PM_{10} and $PM_{2.5}$) using both filter-based and continuous methodologies. The site also utilizes $PM_{2.5}$ FRM samplers as the primary and collocated sampling site.

Walter Johnson (32-003-0071). The site is located on the west side of Las Vegas. Its primary objective is to monitor O_3. The topography is such that the summertime loft brings high O_3 and precursor levels towards this site from the east end of the Las Vegas Valley.

Winterwood (32-003-0538). The site is located on the east side of Las Vegas, and is one of the oldest sites. Its primary objective is to monitor CO and O_3.

None of the DAQEM monitoring sites are located near furnaces or incinerators.

Instrument Information

Items monitored:

1. CO
2. O_3
3. NO_x
4. PM_{10} continuous
5. $PM_{2.5}$ continuous
6. $PM_{2.5}$ FRM, manual method
7. $PM_{2.5}$ species, manual method
8. Visibility
9. Meteorological parameters

Monitor type:

1. CO: gas filter correlation (non-dispersive infrared).
2. O_3: ultraviolet absorption.
3. NO_x: chemiluminescent gas phase reaction of NO_x and O_3.
4. PM_{10} and $PM_{2.5}$ C-14 continuous monitor: Beta Attenuation Monitor (BAM).
5. $PM_{2.5}$ RAAS manual method: filter-based.
6. $PM_{2.5}$ Speciation Air Sampling System (SASS) and URG manual methods: filter-based.
7. Visibility: transmissometer.

The table below shows DAQEM fulfillment of FRM and NAAQS instrumentation requirements.

Pollutant	Instrument	FRM	FEM	SPM	Comparable to NAAQS
CO	API 300 Series	X			Yes
O_3	API 400 Series		X		Yes
NO_2	API 200 Series	X			Yes
SO_2	Monitor Lab ML9850		X		Yes
PM_{10}	Thermo Electron C14		X		Yes
$PM_{2.5}$	Thermo Electron C14			X	No
$PM_{2.5}$	Thermo Andersen RAAS	X			Yes

Note: FRM = Federal Reference Method; FEM = Federal Equivalence Method; SPM = Special Purpose Monitor.

Most DAQEM air monitoring stations are equipped with a 10-meter meteorological tower that has an ultrasonic wind speed and wind direction sensor and an ambient temperature sensor at 10 meters. Some meteorological monitoring stations also have relative humidity, precipitation, and solar radiation sensors.

Monitoring Start Dates in AQS

The table below shows monitoring start dates in AQS.

Site Name	Site ID	Parameter Description	AQS Parameter Code	POC	Date Sampling Began
Apex	0022	Nitrogen dioxide	42602	1	01-Jan-1998
Apex	0022	Ozone	44201	1	01-Jan-1998
Apex	0022	PM_{10} total 0-10 µm STP[1]	81102	1	01-Jan-1998
Apex	0022	$PM_{2.5}$ - local conditions C-14	88502	3	23-Jan-2007
Boulder City	0601	Ozone	44201	1	01-Jul-1998
Boulder City	0601	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
E. Craig Road	0020	Ozone	44201	1	01-Jan-1992
E. Craig Road	0020	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
E. Craig Road	0020	$PM_{2.5}$ - local conditions C-14	88101	3	01-Jan-2003
E. Craig Road	0020	$PM_{2.5}$ - speciation	88101	5	---
E. Sahara	0539	Carbon monoxide	42101	1	01-Jan-1998
E. Sahara	0539	Sulfur dioxide	42401	1	01-Jan-1998
E. Sahara	0539	Nitrogen dioxide	42602	1	01-Jan-1998
E. Sahara	0539	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1995
Green Valley	0298	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
Green Valley	0298	$PM_{2.5}$ - local conditions C-14	88101	3	01-Jan-2003
J.D. Smith	2002	Nitrogen dioxide	42602	1	01-Oct-1998
J.D. Smith	2002	Carbon monoxide	42101	1	01-Oct-1998
J.D. Smith	2002	Ozone	44201	1	01-Oct-1998
J.D. Smith	2002	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
J.D. Smith	2002	$PM_{2.5}$ - local conditions	88101	1	01-Jan-1999
J.D. Smith	2002	$PM_{2.5}$ - local conditions C-14	88502	3	01-Jan-2003
Jean	1019	Ozone	44201	1	01-Aug-1998
Jean	1019	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1995
Jean	1019	$PM_{2.5}$ - local conditions	88101	1	01-Jan-1999
Jean	1019	$PM_{2.5}$ - local conditions C-14	88502	3	26-May-2007
Joe Neal	0075	Ozone	44201	1	01-Jul-2000
Joe Neal	0075	PM_{10} total 0-10 µm STP	81102	1	01-Jan-2001
Joe Neal	0075	Nitrogen dioxide	42602	1	01-Jan-2008
Lone Mountain	0072	Ozone	44201	1	01-Jan-1998
Lone Mountain	0072	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
Mesquite	0023	Nitrogen dioxide	42602	1	01-Nov-2001
Mesquite	0023	Ozone	44201	1	01-Oct-2001
Mesquite	0023	PM_{10} total 0-10 µm STP	81102	1	01-Nov-2001
Orr	1021	Carbon monoxide	42101	1	01-Oct-2002
Orr	1021	Ozone	44201	1	01-Apr-2006
Orr	1021	PM_{10} total 0-10 µm STP	81102	1	01-Oct-2002

Site Name	Site ID	Parameter Description	AQS Parameter Code	POC	Date Sampling Began
Palo Verde	0073	Nitrogen dioxide	42602	1	01-Aug-1998
Palo Verde	0073	Ozone	44201	1	01-Jul-1998
Palo Verde	0073	PM_{10} total 0-10 µm STP	81102	1	01-Jul-1998
Paul Meyer Park	0043	Ozone	44201	1	01-Jul-1998
Paul Meyer Park	0043	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
Southeast Valley	0007	Ozone	44201	1	01-Jan-1980
Southeast Valley	0007	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
Sunrise Acres	0561	Carbon monoxide	42101	1	01-Oct-1996
Sunrise Acres	0561	PM_{10} total 0-10 µm STP	81102	1	17-Apr-2004
Sunrise Acres	0561	$PM_{2.5}$ - local conditions	88101	1	14-Apr-2004
Sunrise Acres	0561	$PM_{2.5}$ - local conditions	88101	2	14-Apr-2004
Sunrise Acres	0561	$PM_{2.5}$ - local conditions C-14	88101	3	01-Jul-2005
Walter Johnson	0071	Ozone	44201	1	01-Aug-1998
Walter Johnson	0071	PM_{10} total 0-10 µm STP	81102	1	01-Jul-1995
Winterwood	0538	Carbon monoxide	42101	1	01-Jan-1998
Winterwood	0538	Ozone	44201	2	01-Jul-1979

Note: POC = parameter occurrence code; STP = standard temperature and pressure.

Monitoring Site Traffic Count Summary

The table below provides traffic count information near monitoring sites.

Site Name	Distance to Nearest Roadway[1]	Traffic Study Counts from Nearest Roadway[2]	Traffic Counts Estimated by Operator	Maximum Traffic Counts for Distance to Roadway[3]
Apex	108 meters to U.S. Hwy. 93	2,100		70,000/30,000
Boulder City	57 meters to Industrial	18,000		40,000/20,000
E. Craig Road	34 meters to Mitchell	4,400		20,000/15,000
E. Sahara	48 meters to Sahara	25,000		20,000/20,000
Green Valley	12.2 meters to Santiago	4,600		10,000/10,000
J.D. Smith	180 meters to Bruce	7,200		70,000/60,000
Jean	1287 meters to State Hwy. 161	2,000		110,000/60,000
Joe Neal	12.2 meters to Rebecca	Not available	4,200	10,000/10,000
Lone Mountain	50 meters to Valadez	5,400		40,000/20,000
Mesquite	9.2 meters to Old Mill Rd.	Not available	1,000	≤1,000/≤10,000
Orr	11.9 meters to Katie	Not available	5,000	10,000/10,000
Palo Verde	14.7 meters to Pavilion	Not available	7,800	10,000/10,000
Paul Meyer	102 meters to New Forrest Dr.	Not available	5,200	70,000/30,000
Sunrise Acres	128 meters to Sunrise	Not available	3,000	70,000/40,000
Walter Johnson	13 meters to Villa Monterrey	11,000		10,000/≤10,000
Winterwood	33.8 meters to Club House Dr.	Not available	400	20,000/15,000

[1]Distance from monitoring path to edge of roadway.
[2]Traffic study counts taken or derived from nearest study performed by the Nevada Department of Transportation.
[3]Tables E-1 & E-2 in 40 CFR 58, Appendix E, are used to determine the minimum and maximum distance from the edge of the roadway to the monitoring path or probe. Table E-1 = ozone and nitrogen oxides for urban and neighborhood scale; Table E-2 = CO for neighborhood scale.

Probe and Path Siting for 2009

1. Apex
2. Boulder City
3. East Craig Road
4. East Sahara
5. Green Valley
6. J.D. Smith
7. Jean
8. Joe Neal
9. Lone Mountain
10. Mesquite
11. Orr
12. Palo Verde
13. Paul Meyer
14. Sunrise Acres
15. Walter Johnson
16. Winterwood

Figure 2 – Apex

Type: SLAMS
Apex (AP) (32-003-0022)
Location: 12101 U.S. Highway 93, Las Vegas, NV 89030
Closest Roads: I-15, U.S. Highway 93
UTM X-Coordinate: 667652.800; UTM Y-Coordinate: 4004823.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: South
Photograph Direction: South

	PM_{10}	**$PM_{2.5}$ Continuous**	**O_3**
Spatial scale	Neighborhood	Neighborhood	Regional
Monitoring objective	Source-oriented	Source-oriented	Regional transport
Vertical probe placement	4.8 m	4.9 m	3.8 m
Unrestricted airflow	360°	360°	360°
Spacing from trees	None	None	None
Spacing from station to road	108 m	108 m	108 m
Distance between collocated monitors	1.4 m	1.4 m	—
Ground cover	Native desert	Native desert	—
Spacing from supporting structure	—	—	1.3 m

	PM_{10}	$PM_{2.5}$ Continuous	O_3
Obstructions on roof	None	None	—
Obstacle distance	None	None	None
Probe material	—	—	Teflon
Residence time	—	—	1.9 s

Figure 3 – Boulder City

Type: SLAMS
Boulder City (BC) (32-003-0601)
Location: 1005 Industrial Rd., Boulder City, NV 89005
Closest Roads: U.S. Hwy. 93, Industrial Rd.
UTM X-Coordinate: 694175.800; UTM Y-Coordinate: 3983670.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400E
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: Southwest
Photograph Direction: Northwest

	PM_{10}	**O_3**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	5.2 m	4.1 m
Unrestricted airflow	360°	360°
Spacing from trees	None	None
Spacing from station to road	58.0 m	58.0 m
Distance between collocated monitors	Not applicable	—
Ground cover	Paved, native desert	—
Spacing from supporting structure	—	1.0 m
Obstructions on roof	None	—
Obstacle distance	None	None
Probe material	—	Teflon
Residence time	—	4.9 s

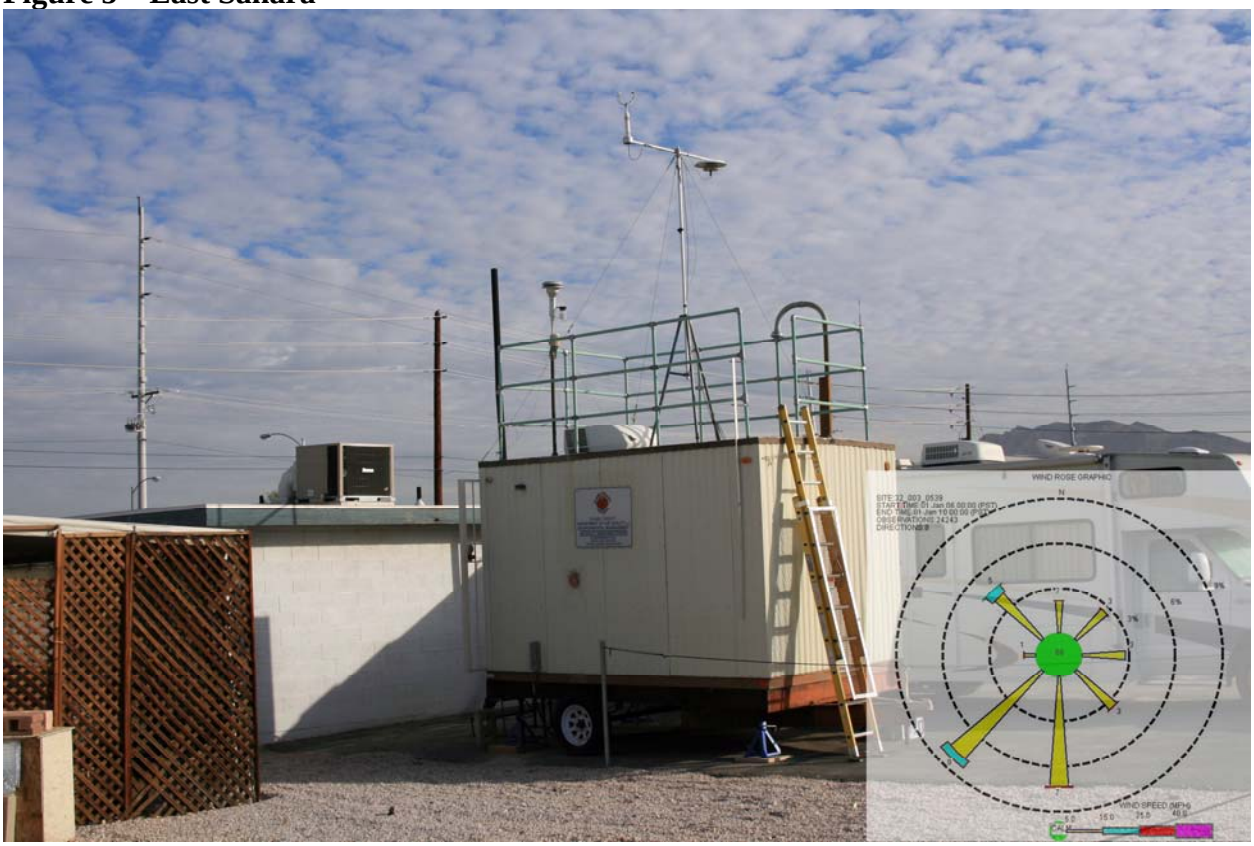
Figure 4 – East Craig Road

Type: SLAMS
E. Craig Rd (CR) (32-003-0020)
Location: 4701 Mitchell St., North Las Vegas, NV 89081
Three Closest Roads: N. Walnut Rd., E. Craig Rd., Mitchell St.
UTM X-Coordinate: 671333.900; UTM Y-Coordinate: 4012829.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400A
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C14
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
$PM_{2.5}$: Speciation, MetOne SASS and URG 3000
Predominant Wind Direction: South
Photograph Direction: West

	PM_{10}	**O_3**	**Speciation**	**$PM_{2.5}$ Continuous**
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring objective	Highest concentration	Population exposure	Population exposure	Population exposure
Vertical probe placement	5.7 m	4.6 m	5.7 m	5.7 m
Unrestricted airflow	360°	360°	360°	360°
Spacing from trees	None	None	None	None
Spacing from station to road	34.0 m	34.0 m	34.0 m	34.0 m
Distance between collocated monitors	1.5 m	—	1.9 m	1.5 m

	PM_{10}	O_3	Speciation	$PM_{2.5}$ Continuous
Ground cover	Paved, unpaved	—	Paved, unpaved	Paved, unpaved
Spacing from supporting structure	—	1.2 m	—	—
Obstructions on roof	None	—	None	None
Obstacle distance	15 m	60 m	15 m	15 m
Probe material	—	Teflon	—	—
Residence time	—	5.0 s	—	—

Figure 5 – East Sahara



Type: SLAMS
East Sahara (ES) (320030539)
Location: 4001 E. Sahara Ave., Las Vegas, NV 89104
Three Closest Roads: S. Lamb Blvd., S. Sandhill Rd., S. Walnut Rd.
UTM X-Coordinate: 672250.100; UTM Y-Coordinate: 4001593.000
Operative Schedule: 24 hours
Sampling Method: Carbon Monoxide: Gas Filter Correlation API 300E
Predominant Wind Direction: Southwest
Photograph Direction: East
Changes: Proposed move to Jerome Mack Middle School and new shelter, candidate for NCore operations

	CO
Spatial scale	Neighborhood
Monitoring objective	Population exposure
Vertical probe placement	4.3 m
Unrestricted airflow	360°
Spacing from trees	39.5 m
Spacing from station to road	45.7 m
Distance between collocated monitors	—
Ground cover	Asphalt, gravel
Spacing from supporting structure	1.3 m
Obstructions on roof	—

	CO
Obstacle distance	—
Probe material	—
Residence time	2.7 s

Figure 6 – Green Valley

Type: SLAMS
Green Valley (GV) (32-003-0298)
Location: 298 Arroyo Grande Blvd., Henderson, NV 89014
Three Closest Roads: Arroyo Grande Blvd., Santiago Dr., N. Stephanie St.
UTM X-Coordinate: 675390.700; UTM Y-Coordinate: 3991108.000
Operative Schedule: 24 hours
Sampling Method: $PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C14
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: Southwest
Photograph Direction: Southeast

	PM_{10}	**$PM_{2.5}$ Continuous**
Spatial scale	Middle	Middle
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.8 m	4.9 m
Unrestricted airflow	360°	360°
Spacing from trees	4.8 m	2.2 m
Spacing from station to road	12.2 m	12.2 m
Distance between collocated monitors	2.5 m	2.5 m
Ground cover	Paved, gravel	Paved, gravel
Spacing from supporting structure	—	—

	PM_{10}	$PM_{2.5}$ Continuous
Obstructions on roof	—	—
Obstacle distance	7.1 m	6.6 m
PM Probe material	Stainless steel	Stainless steel
Residence time	—	—

Figure 7 – J.D. Smith

Type: NAMS/SLAMS
J.D. Smith (JD) (32-003-2002)
Location: 1301B Tonopah Ave., North Las Vegas, NV 89030
Three Closest Roads: E. Owens Ave., N. Bruce St., E. Lake Mead Blvd.
UTM X-Coordinate: 668778.300; UTM Y-Coordinate: 4006793.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400A
Carbon Monoxide: Gas Filter Correlation Analyzer, API 300E
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C14
$PM_{2.5}$: Andersen RAAS2.5-300 FRM
Nitrogen Dioxide: Gas Phase Chemiluminescence, API 200E
Predominant Wind Direction: Southwest
Photograph Direction: North

	PM_{10}	**CO**	**$PM_{2.5}$ (FRM)**	**NO_2**	**O_3**	**$PM_{2.5}$ Continuous**
Spatial scale	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood
Monitoring objective	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure
Vertical probe placement	4.7 m	3.7 m	3.6 m	3.7 m	3.7 m	4.8 m
Unrestricted airflow	360°	360°	360°	360°	360°	360°

	PM_{10}	CO	$PM_{2.5}$ (FRM)	NO_2	O_3	$PM_{2.5}$ Continuous
Spacing from trees	35 m	32.8 m	35 m	32.8 m	32.8 m	35 m
Spacing from station to road	135 m	135 m	141 m	135 m	135 m	135 m
Distance between collo-cated monitors	2.6 m	—	NA	—	—	2.6 m
Ground cover	Paved, grass	—	Paved, grass	—	—	Paved, grass
Spacing from supporting structure	—	1.2 m	—	1.2 m	1.2 m	—
Obstructions on roof	None	—	None	—	—	None
Obstacle distance	3.3 m to wall	—	5.1 m to wall	4.2 m to wall	4.2 m to wall	5.9 m to wall
Probe material	—	—	—	Teflon	Teflon	—
Residence time	—	5.3 s	—	5.3 s	5.3 s	—

Figure 8 – Jean

Type: SLAMS
Jean (JN) (32-003-1019)
Location: 1965 State Highway 161, Jean, NV 89019
Roads: State Highway 161, I-15
UTM X-Coordinate: 648490.100; UTM Y-Coordinate: 3961425.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400E
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C14
$PM_{2.5}$: Andersen RAAS2.5-300 FRM
Predominant Wind Direction: Southwest
Photograph Direction: Southwest

	PM_{10}	**$PM_{2.5}$ Continuous**	**O_3**	**$PM_{2.5}$ (FRM)**
Spatial scale	Regional	Regional	Regional	Regional
Monitoring objective	Background	Background	Transport	Background
Vertical probe place-ment	4.8 m	4.8 m	4 m	2.1 m
Unrestricted airflow	360°	360°	360°	360°
Spacing from trees	—	—	—	—
Spacing from station to road	1,287 m	1,287 m	1,287 m	1,287 m
Distance between collocated monitors	2.7 m	2.7 m	—	10 m
Ground cover	Native desert, gravel	Native desert, gravel	—	Native desert, gravel

	PM_{10}	$PM_{2.5}$ Continuous	O_3	$PM_{2.5}$ (FRM)
Spacing from supporting structure	—	—	1.4 m	—
Obstructions on roof	—	—	—	—
Obstacle distance	—	—	—	—
Probe material	—	—	Teflon	—
Residence time	—	—	1.6 s	—

Figure 9 – Joe Neal

Type: SLAMS
Joe Neal (JO) (32-003-0075)
Location: 6651 W. Azure Way, Las Vegas, NV 89130
Three Closest Roads: Ann Rd., N. Tenaya Way, W. Azure Way
UTM X-Coordinate: 658246.700; UTM Y-Coordinate: 4015402.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400A
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Nitrogen Dioxide: Gas Phase Chemiluminescence, API 200E
Predominant Wind Direction: Northwest
Photograph Direction: North

	PM_{10}	**O_3**	**NO_2**
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Highest concentration	Population exposure
Vertical probe placement	4.7 m	3.8 m	3.8 m
Unrestricted airflow	360°	360°	360°
Spacing from trees	8.2 m	5.7 m	5.7 m
Spacing from station to road	12.6 m	12.6 m	12.6 m
Distance between collocated monitors	—	—	—
Ground cover	Gravel, grass, natural desert	—	—
Spacing from supporting structure	—	0.5 m	2.62 m
Obstructions on roof	None	—	—
Obstacle distance	None	None	None
Probe material	—	Teflon	Teflon
Residence time	—	2.1 s	2.1 s

Figure 10 – Lone Mountain

Type: SLAMS
Lone Mountain (LM) (32-003-0072)
Location: 3525 N. Valadez St., Las Vegas NV 89129
Three Closest Roads: N. Cimarron Rd., W. Gowan Rd., N. Buffalo Dr.
UTM X-Coordinate: 655656.400; UTM Y-Coordinate: 4010319.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: Northwest
Photograph Direction: West

	PM_{10}	**O_3**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.9 m	4.4 m
Unrestricted airflow	360°	360°
Spacing from trees	9.0 m	12.1 m
Spacing from station to road	50.0 m	50.0 m
Distance between collocated monitors	None	—
Ground cover	Gravel	—
Spacing from supporting structure	—	0.5 m
Obstructions on roof	None	—
Obstacle distance	18.0 m	15.5 m
Probe material	—	Teflon
Residence time	—	10.7 s

Figure 11 – Mesquite

Type: SLAMS
Mesquite (MQ) (32-003-0023)
Location: 465 E. Old Mill Rd., Mesquite, NV 89027
Three Closest Roads: I-15, N. Sandhill Blvd., Old Mill Rd.
UTM X-Coordinate: 762202.400; UTM Y-Coordinate: 4077598.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400A
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: Southwest
Photograph Direction: West

	PM_{10}	**O_3**
Spatial scale	Middle	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.7 m	3.6 m
Unrestricted airflow	360°	360°
Spacing from trees	24 m	24.0 m
Spacing from station to road	5.9 m	7.7 m
Distance between collocated monitors	—	—
Ground cover	Adjacent raised dirt field	—
Spacing from supporting structure	—	0.5 m
Obstructions on roof	None	—
Obstacle distance	None	None

	PM_{10}	O_3
Probe material	—	Teflon
Residence time	—	10.3 s

Figure 12 – Orr

Type: SLAMS
Orr (OR) (32-003-1021)
Location: 1562D E. Katie Ave., Las Vegas, NV 89119
Three Closest Roads: E. Katie Ave., S. Maryland Pkwy., E. Flamingo Rd.
UTM X-Coordinate: 667832.143; UTM Y-Coordinate: 3998918.690
Operative Schedule: 24 hours
Sampling Method: Carbon Monoxide: Gas Filter Correlation CO Analyzer, API 300E
Ozone: Ultraviolet Absorption, API 400E
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: Southwest
Photograph Direction: Northwest

	PM_{10}	**CO**	**O_3**
Spatial scale	Middle	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure	Population exposure
Vertical probe placement	4.6 m	4.4 m	4.4 m
Unrestricted airflow	360°	360°	360°
Spacing from trees	30.0 m	28.0 m	28.0 m
Spacing from station to road	11.2 m	11.2 m	11.2 m
Distance between collocated monitors	—	—	—
Ground cover	Paved, grass, gravel	—	—
Spacing from supporting structure	—	—	0.5 m
Obstructions on roof	None	—	—

	PM_{10}	CO	O_3
Obstacle distance	No obstacles	—	—
Probe material	—	—	Teflon
Residence time	—	—	3.5 s

Figure 13 – Palo Verde

Type: SLAMS
Palo Verde (PV) (32-003-0073)
Location: 333 Pavilion Center Dr., Las Vegas, NV 89144
Three Closest Roads: W. Alta Dr., S. Town Center Dr., W. Charleston Blvd.
UTM X-Coordinate: 649914.700; UTM Y-Coordinate: 4004542.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400E
PM_2PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: Southwest
Photograph Direction: East

	PM_{10}	**O3**
Spatial scale	Middle	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.9 m	3.7 m
Unrestricted airflow	360°	360°
Spacing from trees	16.7 m	19.9 m
Spacing from station to road	14.7 m	14.7 m
Distance between collocated monitors	NA	—
Ground cover	Paved	Paved
Spacing from supporting structure	—	0.5 m
Obstructions on roof	—	—
Obstacle distance	—	—

	PM_{10}	O3
Probe material	—	Teflon
Residence time	—	2.1 s

Figure 14 – Paul Meyer

Type: SLAMS
Paul Meyer (PM) (32-002-0043)
Location: 4525 New Forest Dr., Las Vegas, NV 89147
Three Closest Roads: S. Rainbow Blvd., W. Tropicana Ave., S. Buffalo Dr.
UTM X-Coordinate: 657221.200; UTM Y-Coordinate: 3997162.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400A
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C14
Predominant Wind Direction: South
Photograph Direction: Southwest

	PM_{10}	**O_3**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	6.3 m	4.0 m
Unrestricted airflow	360°	360°
Spacing from trees	17.1 m	21 m
Spacing from station to road	102.0 m	102.0 m
Distance between collocated monitors	—	—
Ground cover	Paved, grass, concrete	—
Spacing from supporting structure	—	0.6 m
Obstructions on roof	None	—
Obstacle distance	None	—
Probe material	—	Teflon
Residence time	—	2.93 s

Figure 16 – Sunrise Acres

Type: SLAMS
Sunrise Acres (SA) (32-003-0561)
Location: 2501 Sunrise Ave., Las Vegas, NV 89101
Three Closest Roads: N. Eastern Ave., Sunrise Ave., N. 26th St.
UTM X-Coordinate: 669664.653; UTM Y-Coordinate: 4003698.329
Operative Schedule: 24 hours
Sampling Method: Carbon Monoxide: Gas Filter Correlation, API 300E
PM_{10}: Beta Attenuation, Thermo Andersen FH 62 C14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C14
$PM_{2.5}$: Andersen RAAS2.5-300 FRM
$PM_{2.5}$ Collocated: Andersen RAAS2.5-300 FRM
Predominant Wind Direction: South
Photograph Direction: Northeast

	PM_{10}	**CO**	**$PM_{2.5}$ (FRM)**	**$PM_{2.5}$ FRM Collocated**	**$PM_{2.5}$ Continuous**
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring objective	Population. exposure	Highest concentration	Highest concentration	Highest concentration	Highest concentration
Population exposure	Highest concentration	—	—	—	—
Vertical probe placement	4.7 m	3.6 m	2.9 m	2.9 m	4.8 m
Unrestricted airflow	360°	360°	360°	—	360°
Spacing from trees	—	—	—	—	—

	PM_{10}	CO	$PM_{2.5}$ (FRM)	$PM_{2.5}$ FRM Collocated	$PM_{2.5}$ Continuous
Spacing from station to road	134 m	134 m	134 m	134 m	134 m
Distance between collocated monitors	3.0 m	—	2.1 m	2.1 m	3.0 m
Paving	Ground cover	—	Paved	Paved	Paved
Spacing from supporting structure	—	—	—	—	—
Obstructions on roof	None	—	—	—	None
Obstacle distance	—	—	8 m to wall	7 m to wall	—
3.99 building height	6.5 m to building	—	—	—	—
Probe material	—	Teflon	—	—	—
Residence time	—	0.54 s	—	—	—

Figure 17 – Walter Johnson

Type: SLAMS
Walter Johnson (WJ) (32-002-0071)
Location: 7701 Ducharme Ave., Las Vegas, NV 89145
Three Closest Roads: S. Buffalo Dr., Alta Dr., S. Cimarron Rd.
UTM X-Coordinate: 656223.000; UTM Y-Coordinate: 4004175.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400
Predominant Wind Direction: Southwest
Photograph Direction: West

	O_3
Spatial scale	Neighborhood
Monitoring objective	Population exposure
Vertical probe placement	3.7 m
Unrestricted airflow	360°
Spacing from trees	16.5 m
Spacing from station to road	13.0 m
Distance between collocated monitors	—
Ground cover	—
Spacing from supporting structure	0.5 m
Obstructions on roof	—
Obstacle distance	18.4 m
Probe material	Teflon
Residence time	3.1 s

Figure 18 – Winterwood

Type: NAMS/SLAMS
Winterwood (WW) (32-0030-538), Elevation 1788
Location: 5483 Club House Dr., Las Vegas, NV 89142
Three Closest Roads: E. Sahara Ave., Winterwood Blvd., S. Nellis Blvd.
UTM X-Coordinate: 674872.900; UTM Y-Coordinate: 4001556.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400A
Carbon Monoxide: Gas Filter Correlation Analyzer, API 300E
Predominant Wind Direction: Southeast
Photograph Direction: North

	CO	O_3
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	3.9 m	3.9 m
Unrestricted airflow	360°	360°
Spacing from trees	26.4 m	26.4 m
Spacing from station to road	42 m	42 m
Distance between collocated monitors	—	—
Ground cover	Paving, grass, rock	—
Spacing from supporting structure	0.5 m	0.5 m
Obstructions on roof	—	—
Obstacle distance	—	—
Probe material	—	Teflon
Residence time	—	3.1 s

Figure 19 – Visibility Sites

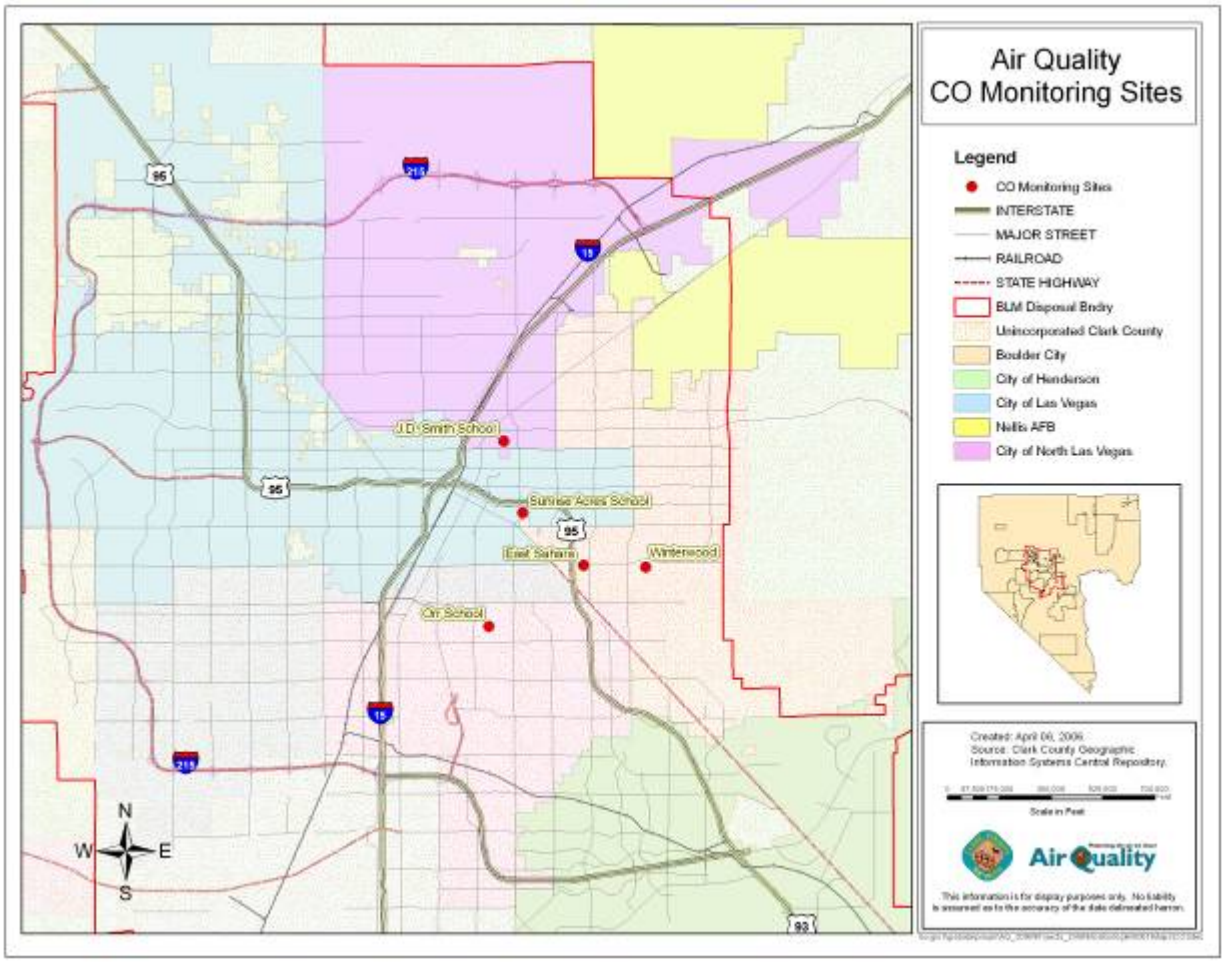
Visibility Monitoring Network (Transmitter/Receiver)

VISIBILITY SITE (Las Vegas)
Bank of America – T1 receiver
Location: 300 S. Fourth St., Las Vegas, NV 89101
Three closest roads: Fremont St., S. Las Vegas Blvd., Main St.
Operative Schedule: 24 hours
Equipment: Optec LPV-2

VISIBILITY SITE (Las Vegas)
Sunrise Hospital – T1 transmitter
Location: 3186 S. Maryland Pkwy., Las Vegas, NV 89109
Three Closest Roads: E. Desert Inn Rd., Vegas Valley Dr., Maryland Pkwy.
Operative Schedule: 24 hours
Equipment: Optec LPV-2

Carbon Monoxide Monitoring Locations

Figure 20 – Carbon Monoxide Monitoring Locations



Ozone Monitoring Locations

Figure 21 – Ozone Monitoring Locations in Las Vegas, Boulder City, and Apex

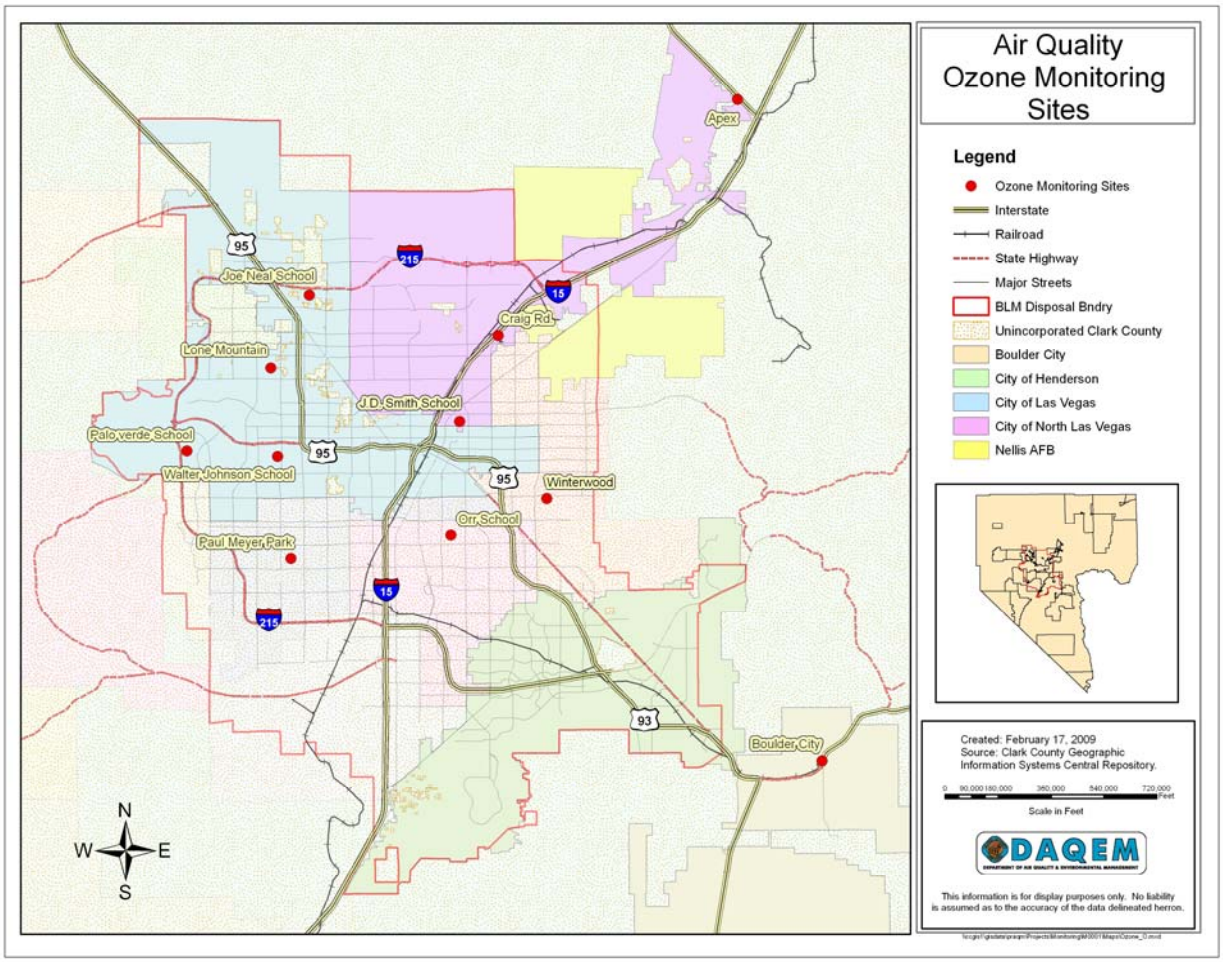
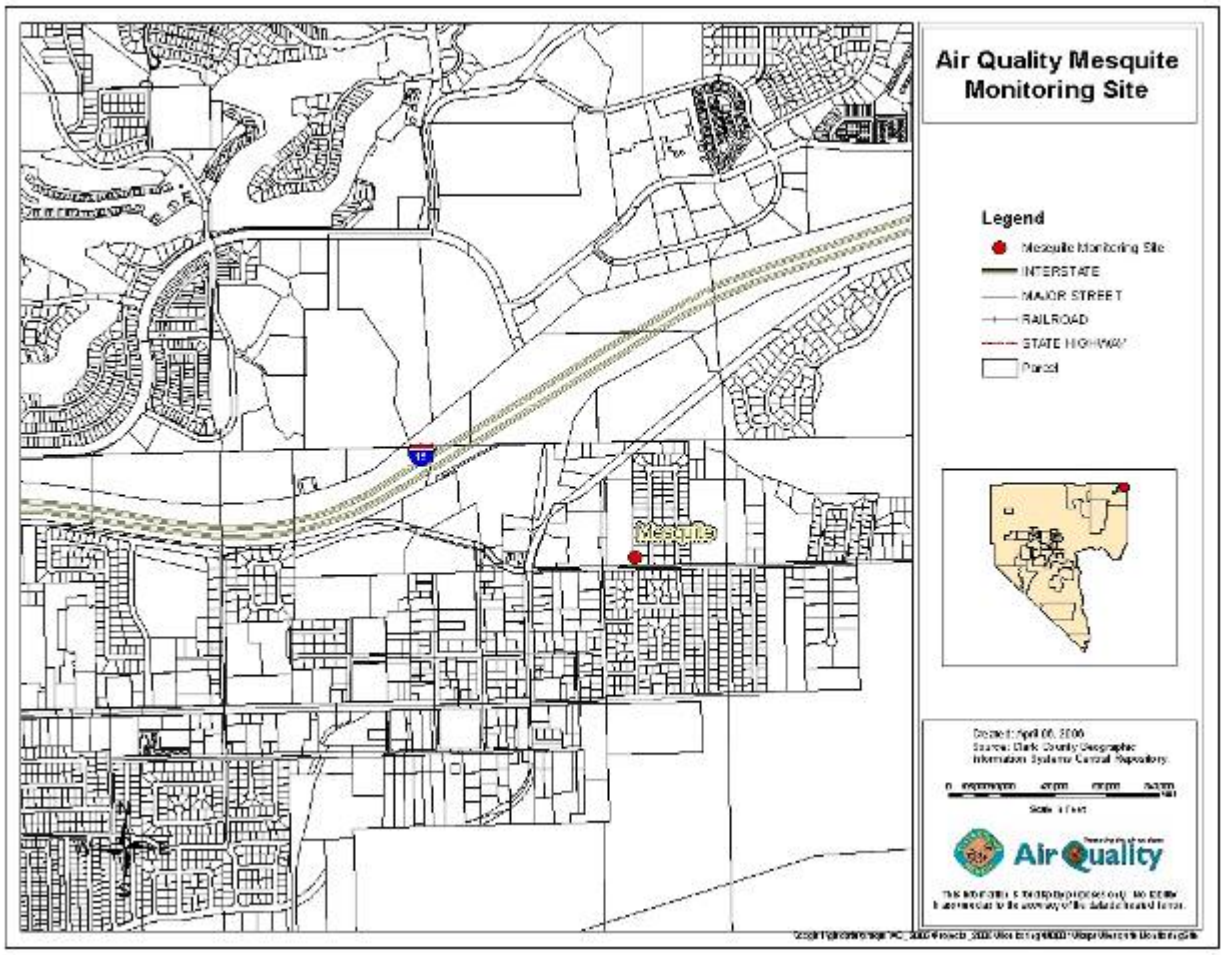


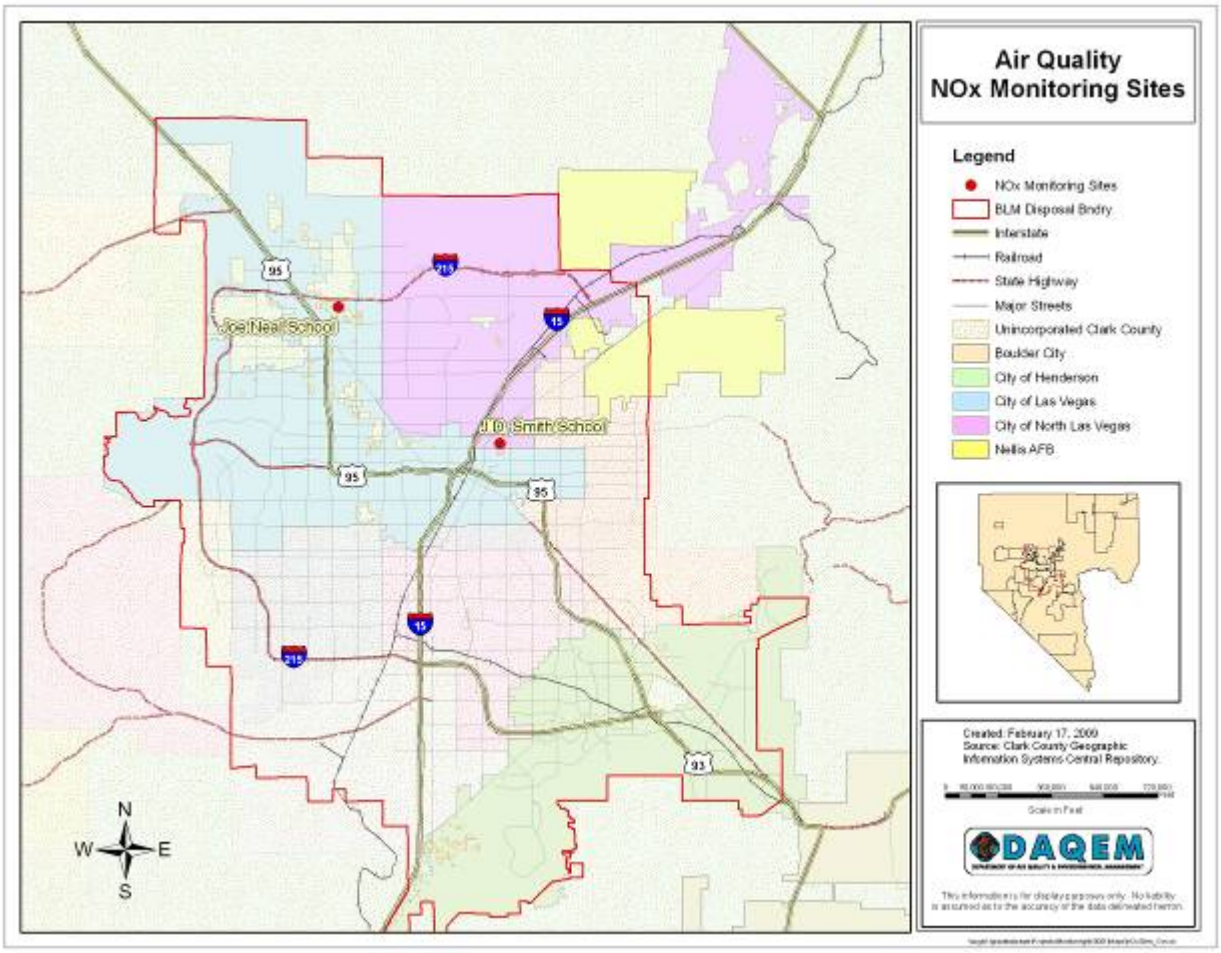
Figure 22 – Ozone Monitoring Location in Jean

Figure 23 – Ozone Monitoring Location in Mesquite



Nitrogen Oxide Monitoring Locations

Figure 24 – Nitrogen Oxide Monitoring Locations in Las Vegas



Continuous PM_{10} Monitoring Locations

Figure 25 – Continuous PM_{10} Monitoring Locations in Las Vegas, Boulder City, and Apex

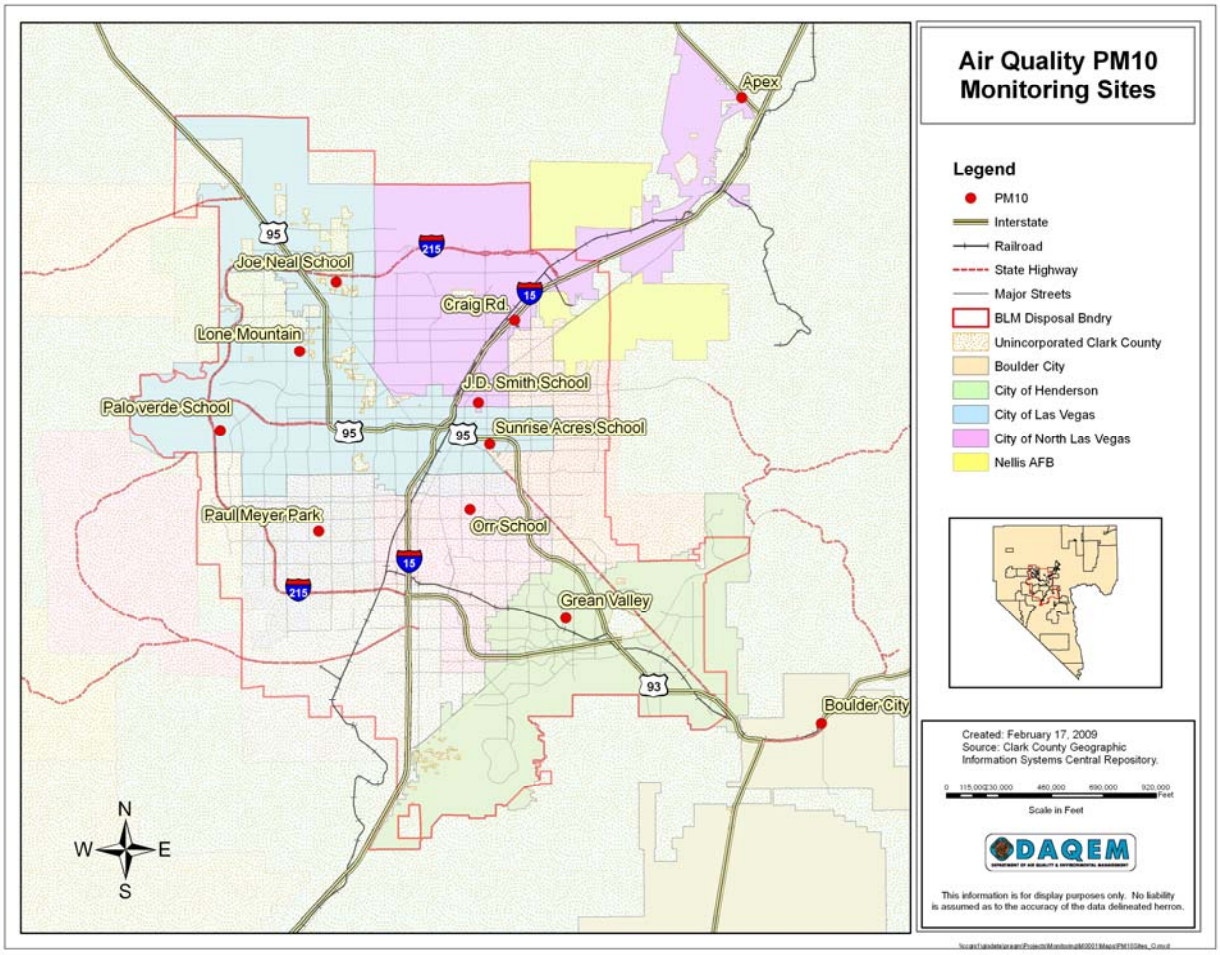
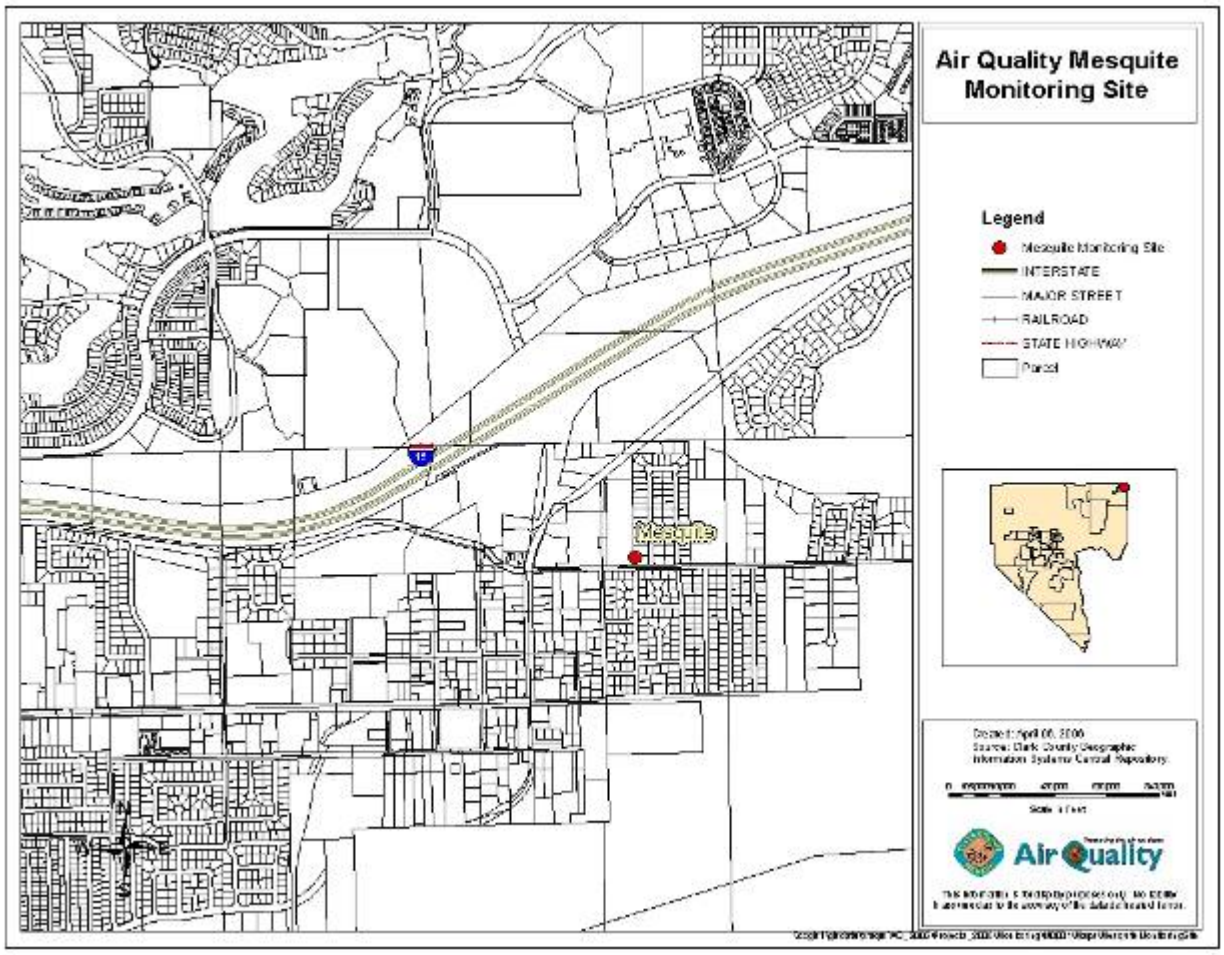


Figure 26 – Continuous PM_{10} Monitoring Location in Jean

Figure 27 – Continuous PM_{10} Monitoring Location in Mesquite



Continuous $PM_{2.5}$ Monitoring Locations

Figure 28 – Continuous $PM_{2.5}$ Monitoring Locations in Las Vegas and Apex

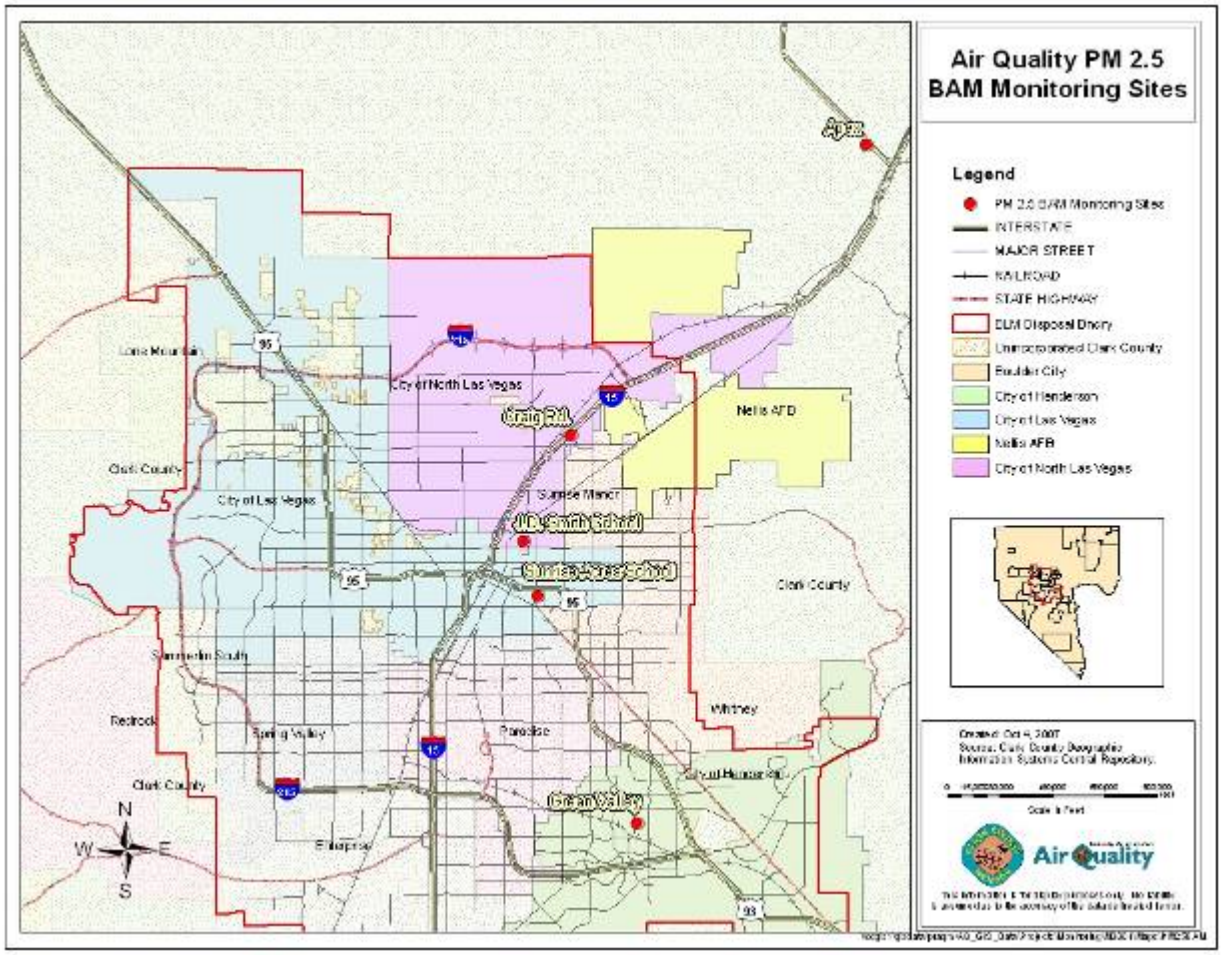


Figure 29 – Continuous $PM_{2.5}$ Monitoring Location in Jean

Filter-Based $PM_{2.5}$ Monitoring Locations

Figure 30 – Filter-Based $PM_{2.5}$ Monitoring Locations in Las Vegas

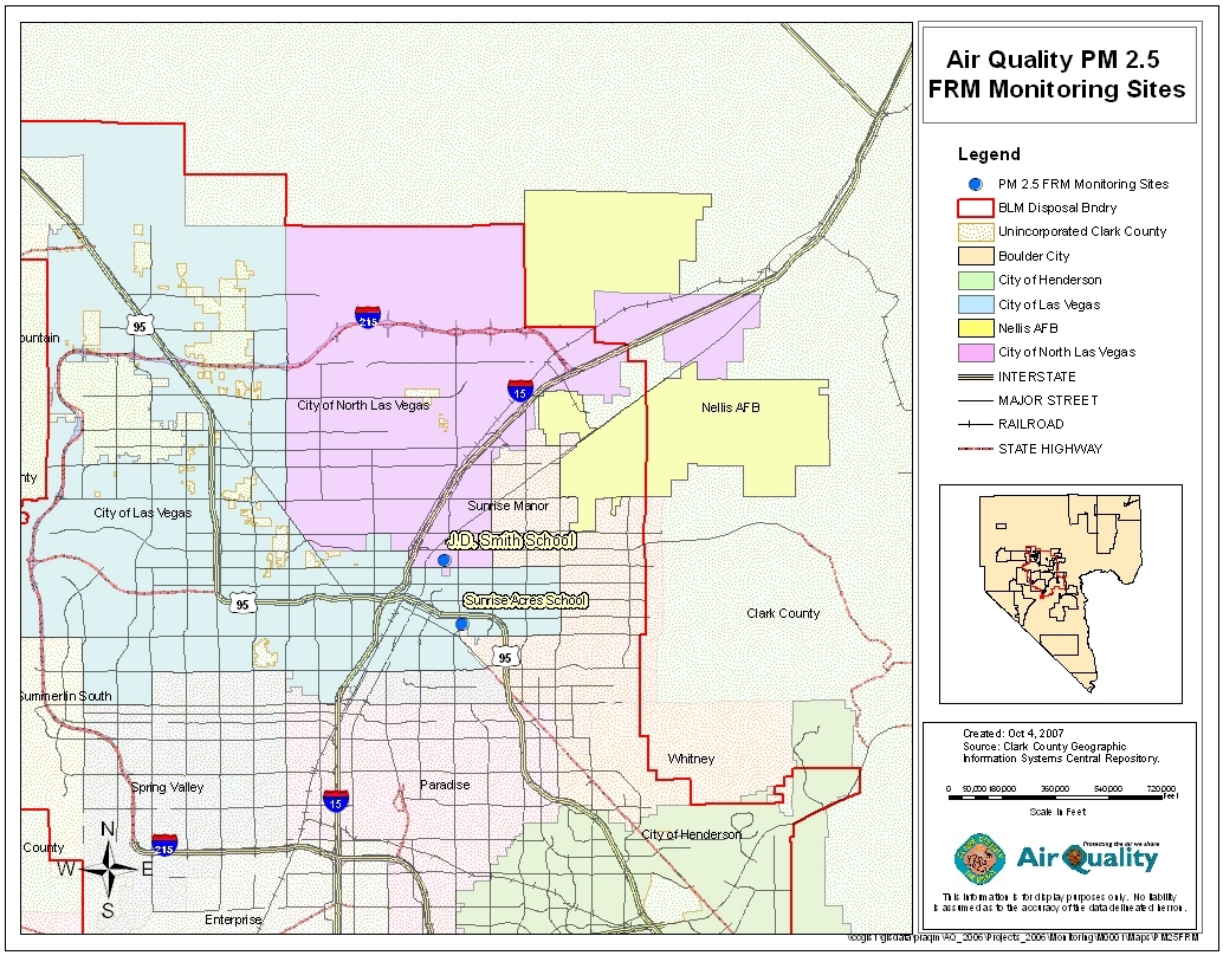


Figure 31 – Filter Based $PM_{2.5}$ Monitoring Location in Jean

Effect of New Regulations on Air Monitoring

On February 9, 2010, EPA released 40 CFR Parts 50 and 58, "Primary National Ambient Air Quality Standards for Nitrogen Dioxide; Final Rule." In this revision, EPA established requirements for an NO_2 monitoring network with monitors at locations where maximum NO_2 concentrations are expected to occur, including within 50 meters of major roadways, and monitors sited to measure the area-wide NO_2 concentrations that occur more broadly across communities. Clark County is currently investigating siting locations and believes that the City Center site (EPA site number 32-003-0016) may meet this requirement. City Center is one of the top ten high traffic count areas. It has a diverse traffic mix that includes older vehicles, since it is located in an underserved community, and experiences significant congestion at least twice per day. City Center is situated in a unique topographic area that, based on predominant wind flow, receives transport from both the I-15 and South Las Vegas Boulevard (i.e., Las Vegas Strip) corridors, as well as roadside emissions from U.S. Highway 95; since the site is within 50 m of U.S. 95, it may also be suitable for microscale monitoring. In addition, the City Center location has the flexibility to qualify for neighborhood scale monitoring. A previous study determined that ozone was undergoing titration by NO_x from vehicles on U.S. 95.

On November 12, 2008, EPA released the revised NAAQS for lead (Pb). There are two lead monitoring requirements that Clark County must address: ambient nonsource monitoring and ambient source-oriented monitoring. DAQEM plans to initiate ambient nonsource lead monitoring at the NCore site by January 2011. DAQEM is currently in the process of identifying potential sources that may trigger required ambient source-oriented lead monitoring.

DAQEM is planning for an NCore site in accordance with 40 CFR 58, Appendix D. The location is a new monitoring station at Jerome Mack Middle School that should be operating by January 2011.

With the exception of $PM_{2.5}$ FRM samplers, pollen samplers, speciation samplers, and nonroutine special studies, all monitoring instruments are operated continuously all year round.

Summary of Monitoring Requirements

40 CFR 58 dictates requirements for maintaining ambient air monitoring networks. DAQEM continuously considers those requirements in its network design, resulting in the conclusions listed beneath each requirement.

1. Determine the highest NAAQS concentration area in the network.
   - The area of highest CO concentration is the Sunrise Acres station at 2501 Sunrise Ave., Las Vegas, NV.
   - The areas of highest O_3 concentration are the Joe Neal station at 6651 W. Azure Way, Las Vegas, NV and the Walter Johnson station at 7701 Ducharme Ave., Las Vegas, NV.
   - The area of highest PM_{10} concentration is the Apex station at 12101 U.S. Highway 93, Las Vegas, NV.
   - The area of highest annual average $PM_{2.5}$ concentration is the Sunrise Acres station at 2501 Sunrise Ave.
   - The area of highest annual average NO_2 concentration is the J.D. Smith station at 1301b E. Tonopah Dr.

2. Determine representative concentrations in areas of high population density.
   - City of Las Vegas:
     - Annual average CO concentration is 0.6 ppm.
     - Annual average O_3 concentration is 0.031 ppm.
     - Annual average PM_{10} concentration is 21.9 $\mu g/m^3$.
     - Average $PM_{2.5}$ concentration is 8.64 $\mu g/m^3$.
     - Annual average NO_2 concentration is 0.011 ppm.
   - City of Henderson:
     - Annual average PM_{10} concentration is 19.86 $\mu g/m^3$.
     - Average $PM_{2.5}$ concentration is 6.65 $\mu g/m^3$.
   - City of Boulder City:
     - Annual average O_3 concentration is 0.045 ppm.
     - Annual average PM_{10} concentration is 14.55 $\mu g/m^3$.
   - City of Mesquite:
     - Annual average O_3 concentration is 0.028 ppm.
     - Annual average PM_{10} concentration is 20.45 $\mu g/m^3$.

3. Determine impacts of significant sources on air quality.
   - CO sources: vehicle and non-vehicle combustion sources
     - Impact: zero exceedance days.
   - NO_2 sources: vehicle and non-vehicle combustion sources
     - Impact: zero exceedance days.
   - $PM_{2.5}$ sources: vehicle and non-vehicle combustion sources, fugitive dust
     - Impact: zero exceedance days.
   - PM_{10} sources: fugitive dust, industrial processes
     - Impact: One exceedance day in 2009.

4. Determine general background concentration levels.
   - Jean:
     - PM_{10}: 2009 average = 12.37 μg/m^3.
     - $PM_{2.5}$: 2009 average = 4.85 μg/m^3.
     - O_3: 2009 average = 0.041 ppm.

5. Determine extent of regional pollutant transport among population areas.
   - Studies show that ozone transport and regional contributors have an influence on Clark County, which results in ozone exceedances. Smoke from seasonal wildfires contributes significantly to ozone and particulate matter levels in Clark County.

6. Determine welfare-related impacts in rural and remote areas.
   - Monitoring at Jean serves a rural area, provides background levels, and can be used to indicate transport from California
   - Monitoring at Boulder City serves a rural population
   - Monitoring at Mesquite serves a remote population and is located at an outflow transport corridor adjacent a jurisdictional boundary

Clark County Air Monitoring Network

The table below shows that the network meets or exceeds the minimum monitoring requirements in 40 CFR 58.

Pollutant	Monitors Required	Monitors in service in 2009
CO	0	5
O_3	2	13
SO_2	0	0
NO_2	0	2
PM_{10} BAM	4-8	13
$PM_{2.5}$ BAM	0	6
$PM_{2.5}$ FRM	2 + collocation	3 + collocation

DAQEM uses the following criteria to evaluate the placement and function of the network to meet the requirements of 40 CFR 58:

1. Monitoring objectives
2. AQS scale of representation
3. Emission densities
4. Dispersion modeling
5. Special studies
6. Revised monitoring strategies
7. Sampling schedules
8. Las Vegas area population.

State implementation and maintenance plans require no additional instrumentation.

Quality Assurance Program

The QA Officer conducted performance field evaluations throughout 2009. These audits indicated that DAQEM is providing instrument data of sufficient quality to satisfy EPA guidance parameters and meet Measurement Quality Objectives.

All gaseous criteria pollutant monitoring instruments were field-audited. There were no SO_2 instruments to be audited. Two sites had NO_2 instruments, and both were evaluated. Five CO instruments were evaluated. Twelve O_3 instruments were also audited, and there were no failures.

Seven $PM_{2.5}$ FRM RAAS samplers at three monitoring sites were evaluated. A single SASS was audited. Twelve continuous PM_{10} C-14 BAMs and six continuous $PM_{2.5}$ C-14 BAMs underwent performance evaluations for flow, temperature, pressure, and time. Each continuous $PM_{2.5}$ BAM is equipped with a Very Sharp Cut Cyclone as a second stage separator. The $PM_{2.5}$ FRM samplers are equipped with a mix of Very Sharp Cut Cyclone separators and Well Impactor Ninety-Six impactors. The three $PM_{2.5}$ FRM sites (including Sunrise Acres, which hosts the precision pair) were evaluated twelve times during 2009. Each operational $PM_{2.5}$ FRM and the SASS were audited quarterly. All continuous particulate monitors were evaluated semiannually except the one at the Boulder City site, where sampling was terminated for site structure repair.

Evaluations of audit sites were balanced across the calendar year. Any adjustments to the auditing schedule favored pollutant seasonality, e.g., more CO instruments were audited during the winter months and more ozone instruments during the summer months. Audit evaluations of the gaseous pollutants used the transmutation values of slope/intercept created by calibration activity from the IPS MeteoStar Leading Environment Analysis and Display System, DAQEM's data acquisition system. Assessments of data flow—from collection, to storage, to transfer, to processing with verification, to validation, to review and submittal—indicated consistent, thorough, and acceptable handling regimens.

Precision and accuracy data were uploaded to the AQS database in accordance with 40 CFR 58 requirements, and annual data certifications were completed in accordance with 40 CFR 58.15 requirements.

The following table summarizes the 2009 gaseous and continuous particulate matter event schedule for internal QA performance evaluations.

Date	Pollutant	Monitoring Stations
2/26/2009	PM_{10}	Jean
3/12/2009	PM_{10}	Paul Meyer
3/19/2009	PM_{10}	Lone Mountain
3/31/2009	PM_{10}	Joe Neal
5/6/2009	PM_{10}	Apex, E. Craig Road
5/13/2009	PM_{10}	Sunrise Acres
7/31/2009	PM_{10}	Boulder City
8/28/2009	PM_{10}	Joe Neal, Lone Mountain, Paul Meyer
8/31/2009	PM_{10}	J.D. Smith, Mesquite

Date	Pollutant	Monitoring Stations
9/10/2009	PM_{10}	Green Valley, Orr
9/11/2009	PM_{10}	Jean
12/03/2009	PM_{10}	Craig Road, Orr, Sunrise Acres
12/04/2009	PM_{10}	Apex, Green Valley, J.D. Smith
12/24/2009	PM_{10}	Mesquite
2/26/2009	$PM_{2.5}$	Jean
5/6/2009	$PM_{2.5}$	Apex, E. Craig Road
5/13/2009	$PM_{2.5}$	Sunrise Acres
8/31/2009	$PM_{2.5}$	J.D. Smith
9/10/2009	$PM_{2.5}$	Green Valley
9/11/2009	$PM_{2.5}$	Jean
12/03/2009	$PM_{2.5}$	E. Craig Road, Sunrise Acres
12/04/2009	$PM_{2.5}$	Apex, Green Valley, J.D. Smith
1/27/2009	RAAS	Sunrise Acres
2/19/2009	RAAS	J.D. Smith
3/27/2009	RAAS	Jean
7/21/2009	RAAS	J.D. Smith, Sunrise Acres
9/11/2009	RAAS	Jean
12/28/2009	RAAS	Jean, J.D. Smith, Sunrise Acres
3/27/2009	CO	E. Sahara, Winterwood
5/13/2009	CO	Winterwood
12/22/2009	CO	Orr
12/31/2009	CO	J.D. Smith
3/12/2009	O_3	Paul Meyer
3/13/2009	O_3	Walter Johnson
3/19/2009	O_3	Lone Mountain
3/25/2009	O_3	Jean
3/26/2009	O_3	Palo Verde
7/30/2009	O_3	Apex
7/31/2009	O_3	Boulder City
9/10/2009	O_3	Orr
12/23/2009	O_3	E. Craig Road, J.D. Smith
12/24/2009	O_3	Mesquite
3/31/2009	NO_2	Joe Neal
12/31/2009	NO_2	J.D. Smith

Speciation sampling is grant-funded, and DAQEM operates as an informational adjunct to the ambient sampling network. Because it does not have a dedicated sampling site in the Chemical Speciation Network, DAQEM can move the speciation samplers throughout the county to support special project initiatives. In 2009, all sampling events took place at the E. Craig Road site; performance evaluations were conducted on 1/27/2009, 5/6/2009, 9/11/2009, and 12/08/2009.

National Performance Audits

DAQEM is available for participation in the EPA Region 9-sponsored National Performance Evaluation Program. This Through-The-Probe (TTP) performance evaluation, which focuses on gaseous criteria pollutants, is contracted for and scheduled by Region 9. Audit results are made available immediately. DAQEM received a "Pass" audit report for all TTP performance evaluations in 2009.

The following table shows the 2009 TTP event schedule.

MONITORING STATION	POLLUTANT	TTP CONDUCTED
Walter Johnson	O_3	4/13/2009
Orr, Winterwood	CO, O_3	4/14/2009
J.D. Smith	CO, O_3, NO_2	4/15/2009
Sunrise Acres	CO	4/16/2009

DAQEM annually submits its $PM_{2.5}$ FRM sampling network for a Performance Evaluation Program (PEP) audit. Through EPA Region 9, an independent auditor is contracted to perform external field audits. An audit event occurs quarterly at the same specified site. The contractor submits evaluation results to the AQS database. Because of the manual methods used to audit FRM samplers, the audit findings (in $\mu g/m^3$) are not immediately known.

The following table summarizes 2009 PEP audit event activity.

$PM_{2.5}$ Sampler Location	Date of PEP Audit
J.D. Smith	1/07/2009
J.D. Smith	5/13/09
J.D. Smith	8/11/2009
J.D. Smith	11/03/2009

Network Modifications Completed in 2009

The following table summarizes network changes in 2009.

Action	Date	Reason
Terminated chemiluminescent O_3 operations at Joe Neal site	September 2009	Operated as part of 2009 wildfire study; instrument ran between April and September
Temporarily shut down O_3 and PM_{10} operations at Boulder City site.	November 2009	Station repairs

Network Modifications Proposed

This section describes anticipated and potential changes to the air monitoring network over the next two years. The actions proposed in this section constitute DAQEM's official approval request to EPA Region 9.

Financial, technical, and regulatory challenges may necessitate air monitoring site and equipment terminations. In addition, logistical issues, such as expired leases, leases due to expire, and administrative issues may require DAQEM to terminate sites or equipment beyond what is specified in this plan.

Proposed Terminations

Site/Equipment Termination	Date	Explanation
Apex	To be determined	Site is located on property of a major stationary source
$PM_{2.5}$ FRMs at J.D. Smith and Jean sites	To be determined	Anticipate continuous $PM_{2.5}$ FEM or ARM deployment at NCore site; Sunrise Acres has the primary and collocated $PM_{2.5}$ FRM for the network
CO monitoring at J.D. Smith, Orr, E. Sahara, and Winterwood sites	To be determined	No EPA requirement for CO monitoring
O_3 monitoring at Orr, Winterwood, Boulder City, Walter Johnson, and Lone Mountain sites	To be determined	EPA requires only two sites for O_3 monitoring
E. Craig Road, Mesquite, Apex, Jean, and Lone Mountain sites	To be determined	Unresolved lease issues
Additional Site Closures	To be determined	Site Closures due to budgetary issues

Note: ARM = Approved Regional Method.

Termination Considerations

Apex. The Apex site is located on the property of a major stationary source. Data trends indicate that the major source may be influencing this site, so DAQEM has reconsidered its viability. The site may be reconfigured for meteorological measurements, including upper air measurements.

$PM_{2.5}$ FRM samplers at J.D. Smith and Jean sites. In 2009, DAQEM maintained operations in the $PM_{2.5}$ FRM filter-based network to match the grant level of funding. If this network is reduced, DAQEM will continue to keep using, and applying for, grant funding based on activities outside the $PM_{2.5}$ FRM network, including $PM_{2.5}$ BAM operations, $PM_{2.5}$ speciation sampling, $PM_{2.5}$ FEM and ARM efforts, applicable NCore monitoring, and related training. If deemed appropriate, the criteria in 40 CFR 58.14(c)(3) will comprise DAQEM's justification for discontinuing filter-based $PM_{2.5}$ FRM samplers altogether. DAQEM is anticipating the upgrade of a $PM_{2.5}$ BAM to FEM status and a potential ARM designation in 2010. Sunrise Acres has the primary and collocated $PM_{2.5}$ FRM sampler for the network, and DAQEM anticipates installing a $PM_{2.5}$ BAM at the NCore site that may receive FEM or ARM designation.

CO monitoring at J.D. Smith, Orr, East Sahara, and Winterwood sites. Since 40 CFR 58.14(c)(2) no longer requires CO monitoring at these locations, DAQEM may discontinue use of these monitors. DAQEM will evaluate the CO data from these sites and the state implementation plan (SIP) requirements, and may choose to terminate CO monitoring at these sites to conserve resources that can be redirected within the monitoring program.

O_3 monitoring at Orr, Winterwood, Boulder City, Walter Johnson, and Lone Mountain sites. In accordance with 40 CFR 58, DAQEM is only required to operate two O_3 monitoring sites. DAQEM will evaluate the O_3 data from these sites and the SIP requirements, and may choose to terminate O_3 monitoring at these sites to conserve resources that can be redirected within the monitoring program. Comparatively, Orr and Winterwood sites measure lower O_3 readings in the Las Vegas Valley, and Boulder City has the potential to be considered non-representative. The Walter Johnson and Lone Mountain sites could be considered redundant; however, both have been the high O_3 site in the network. DAQEM will continue to monitor and evaluate O_3 in the urban core, high-concentration areas, background areas, and other areas to characterize transport.

E. Craig Road, Mesquite, Apex, Jean, and Lone Mountain sites. These sites have a variety of issues with lease or occupancy agreements. DAQEM could be required to vacate with little or no notice, which would necessitate terminating all monitoring operations.

Additional Site Closures. Due to reductions in the Air Quality Monitoring budget, DAQEM is considering site closures during the 2010 calendar year.

Proposed Relocations and Installations

Relocation/Installation	Date	Explanation
E. Sahara	2010	Remove monitoring equipment from private property; begin monitoring at nearby Jerome Mack Middle School
E. Craig Road	2010	Move SASS and URG from E. Craig Road to Jerome Mack Middle School to support NCore operations
Apex	2011	Install SODAR to provide upper air data, facilitate O_3 forecasting & transport

Note: SODAR = sonic detection and ranging.

Relocation and Installation Considerations

East Sahara. This site has several administrative and logistical issues: (1) zoning requires the site to be a wheeled mobile unit; (2) the structure is past its life expectancy; (3) climate control indoors has become increasingly difficult; (4) electrical code prohibits permanent use of extension cords, which are the only way to power this unit; (5) electricity prices at this location have increased significantly; and (6) the lease requires all tenants to share the cost of electric usage, which causes monthly fees to vary considerably. DAQEM will relocate operations to the Jerome Mack Middle School NCore Site in 2010, less than a mile away.

East Craig Road. Speciation sampling at this site will be moved to the Jerome Mack Middle School NCore monitoring station before January 2011; the move will include both the SASS and URG samplers.

Apex. DAQEM plans to install a SODAR unit at the Apex monitoring station. The unit will provide upper-air meteorological data, facilitate pollution forecasting, characterize outflow from the Las Vegas Valley, and help in evaluating pollution transport issues.

Other Considerations

Ivanpah Valley. DAQEM is conducting background monitoring at the Jean site in the Ivanpah Valley. Since there may be construction in this area over the next few years, the Jean site may continue to monitor PM_{10}, $PM_{2.5}$, other criteria pollutants, and meteorological parameters.

Spatial monitoring gaps and potential high pollutant sites. DAQEM has an interest in filling spatial monitoring gaps and monitoring in high concentration areas. Through special studies, modeling, and forecasting, DAQEM has projected spatial gaps and elevated pollutant concentrations in specific areas throughout the county: Indian Springs, Laughlin, Coyote Springs, the north-central valley, the southwest valley, and Mt. Charleston have been identified for potential monitoring in the future when resources allow.

Collaboration on monitoring. DAQEM may receive opportunities to exchange information and data with other local agencies, such as the Desert Research Institute (DRI) and the Las Vegas Paiute Tribe. DAQEM may also seek opportunities to enhance current data sets through data exchanges, and may engage in operational exchanges while ensuring the integrity of associated data.

Mobile monitoring. DAQEM would like to implement a mobile monitoring system as an evaluation tool for PM_{10} and O_3 throughout Clark County. The mobile monitoring system could be deployed at various locations to assess air quality and help determine where to site permanent monitoring stations. DAQEM's current resource limitations do not allow its to implement a mobile monitoring system at this time, but the department will continue to look for opportunities to fund this project.

In addition to the modifications proposed above, DAQEM will evaluate other network changes based on results from the following studies:

1. "PM_{10} Saturation Study" (completed December 2005).
2. "Clark County Regional Ozone & Precursor Study" (completed March 2006).
3. "Field Measurements and Documentation of Wildfire Event Air Quality Impacts during the 2009 Summer Wildfire Season."
4. Analysis to determine the ozone nonattainment boundary area (completed July 2004).
5. "Carbon Monoxide Saturation Study" (completed April 2002), which confirmed at the time that the network did not miss any CO hot spots. (DAQEM is currently reevaluating the CO network and considering site closures.)

6. The recent designation by EPA of the Thermo Electron FH 62 C14 $PM_{2.5}$ BAM as an FEM, or the potential EPA approval of the Thermo Electron FH 62 C14 $PM_{2.5}$ BAM as an ARM.

Status of Monitoring Site Leases

The following table documents the status of leases for each monitoring site as of March 2009. Expired leases or related events may result in the closure of a monitoring station at a particular site. This plan constitutes DAQEM's official request to EPA Region 9 to discontinue monitoring under these or similar circumstances.

Site	Documentation	Owner	Terms	Status of Negotiations
Apex	Agreement with BLM. However, property is not owned by BLM. Site is part of property owned and operated by Chemical Lime.	Chemical Lime	9/17/20	Complete
Boulder City: 1 pollen site, 1 air quality monitoring station (at different locations)	2 agreements	City of Boulder City	11/30/15	Complete
City Center	Space use permit	NDOT		Expired
E. Craig Road	None	L&M Holding	County letter to property owner identifying presence of trailer on site	Complete (owner unwilling to provide authorization)
E. Sahara	Lease	Maycliff Storage	6/30/12	Site being relocated to Jerome Mack Middle School
Green Valley	Agreement	City of Henderson	Ended 3/15/96	Agreement held by Henderson City Attorney
J.D. Smith	MOU	Clark County School District	5/10/10	Currently in renewal process
Jean	ROW grant/ temp. use permit	BLM	6/22/09	Complete (owner unwilling to provide authorization renewal)
Joe Neal	MOU	Clark County School District	5/10/10	Currently in renewal process
Lone Mountain	No agreement	LV Water District	New interlocal agreement pending, will terminate 12/31/15	Water District seeking board approval for new agreement
Mesquite	Agreement with city. However, site is located on an easement on private land.	City of Mesquite	4/30/06	Complete with City (Private land owner has failed to respond and provide authorization)
NLV Airport	Agreement	Clark County Department of Aviation	10/19/10	Complete
Orr	MOU	Clark County School District	5/10/10	Currently in renewal process

Site	Documentation	Owner	Terms	Status of Negotiations
Palo Verde	MOU	Clark County School District	5/10/10	Currently in renewal process
Paul Meyer	Agreement	Clark County	4/14/14	Complete
Sunrise Acres	MOU	Clark County School District	5/10/10	Currently in renewal process
Walter Johnson	MOU	Clark County School District	5/10/10	Currently in renewal process
Winterwood	MOU	Clark County	6/30/25	Complete

NOTE: BLM = U.S. Bureau of Land Management; MOU = Memorandum of Understanding; NDOT = Nevada Department of Transportation; ROW = right-of-way.

Air Quality System Database Information

The following table is a compilation of scale and objective information in the AQS database.

Site	Monitor	Measurement Scale	Monitor Objective Type
Apex	O_3	Regional scale	Regional transport
Apex	PM_{10} C-14	Regional scale	Source oriented
Apex	$PM_{2.5}$ C-14	Regional scale	Source oriented
Boulder City	O_3	Neighborhood	Population exposure
Boulder City	PM_{10} C-14	Neighborhood	Population exposure
E. Craig Road	O_3	Neighborhood	Population exposure
E. Craig Road	PM_{10} C-14	Neighborhood	Highest concentration
E. Craig Road	$PM_{2.5}$ C-14	Neighborhood	Population exposure
E. Sahara	CO	Neighborhood	Population exposure
Green Valley	PM_{10} C-14	Middle scale	Population exposure
Green Valley	$PM_{2.5}$ C-14	Middle scale	Population exposure
J.D. Smith	CO	Neighborhood	Population exposure
J.D. Smith	NO_x	Neighborhood	Highest concentration
J.D. Smith	NO_2	Neighborhood	Highest concentration
J.D. Smith	O_3	Neighborhood	Population exposure
J.D. Smith	PM_{10} C-14	Neighborhood	Population exposure
J.D. Smith	$PM_{2.5}$ FRM	Neighborhood	Population exposure
J.D. Smith	$PM_{2.5}$ C-14	Neighborhood	Population exposure
Jean	O_3	Regional scale	Regional transport
Jean	PM_{10} C-14	Regional scale	General/background
Jean	$PM_{2.5}$ FRM	Regional scale	General/background
Jean	$PM_{2.5}$ C-14	Regional scale	General/background
Joe Neal	NO_x	Neighborhood	Population exposure
Joe Neal	NO_2	Neighborhood	Population exposure
Joe Neal	O_3	Neighborhood	Highest concentration
Joe Neal	PM_{10} C-14	Neighborhood	Population exposure
Lone Mountain	O_3	Neighborhood	Population exposure
Lone Mountain	PM_{10} C-14	Neighborhood	Population exposure
Mesquite	O_3	Neighborhood	Population exposure
Mesquite	PM_{10} C-14	Middle scale	Population exposure
Orr	CO	Neighborhood	Population exposure
Orr	O_3	Neighborhood	Population exposure
Orr	PM_{10} C-14	Neighborhood	Population exposure
Palo Verde	O_3	Neighborhood	Population exposure
Palo Verde	PM_{10} C-14	Neighborhood	Population exposure
Paul Meyer	O_3	Neighborhood	Population exposure

Site	Monitor	Measurement Scale	Monitor Objective Type
Paul Meyer	PM_{10} C-14	Neighborhood	Population exposure
Sunrise Acres	CO	Neighborhood	Highest concentration
Sunrise Acres	PM_{10} C-14	Neighborhood	Population exposure
Sunrise Acres	$PM_{2.5}$ FRM	Neighborhood	Highest concentration
Sunrise Acres	$PM_{2.5}$ FRM	Neighborhood	Highest concentration
Sunrise Acres	$PM_{2.5}$ C-14	Neighborhood	Highest concentration
Walter Johnson	O_3	Neighborhood	Population exposure
Winterwood	CO	Neighborhood	Population exposure
Winterwood	O_3	Neighborhood	Population exposure

Receptor-Measured Criteria Pollutant Trends

The following pages contain plots of criteria pollutant measurements. In general, NO_2 has remained steady over the past few years; CO, O_3, and PM have declined; and SO_2 has remained insignificant.

Figure 32 – Carbon Monoxide Trends

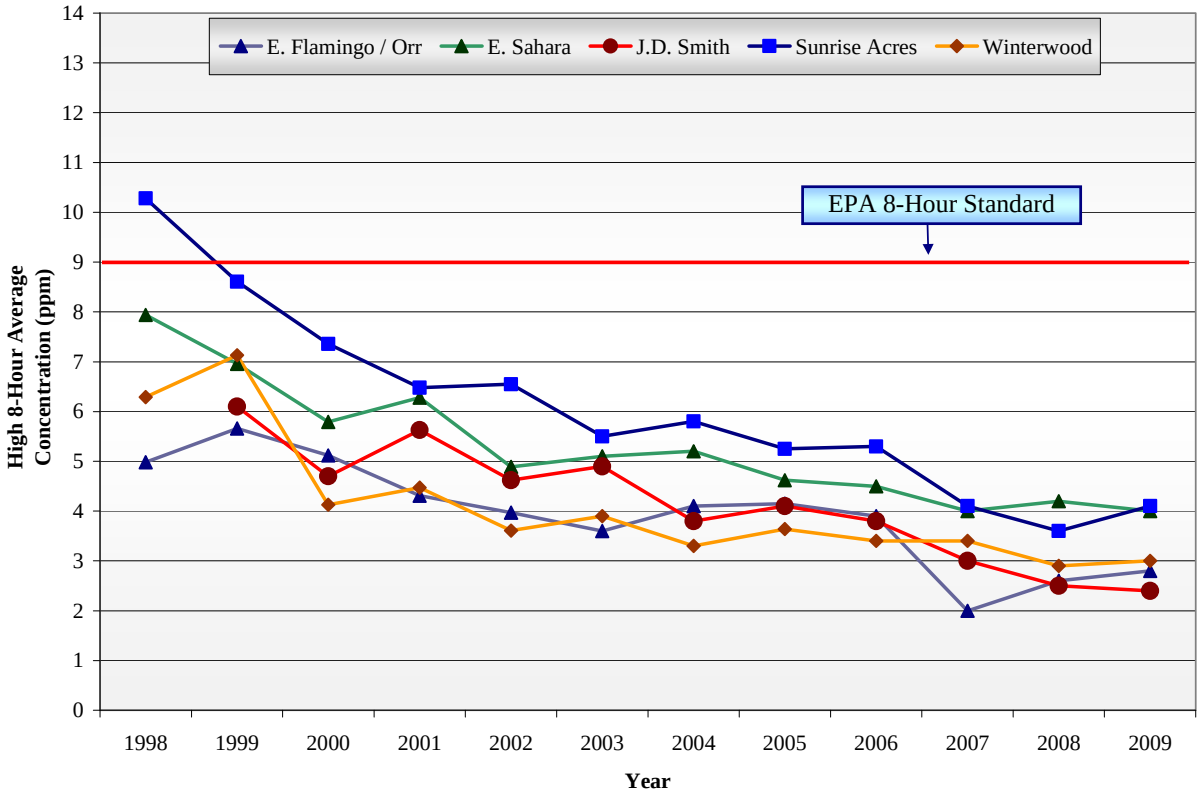


Figure 33 – Ozone Trends

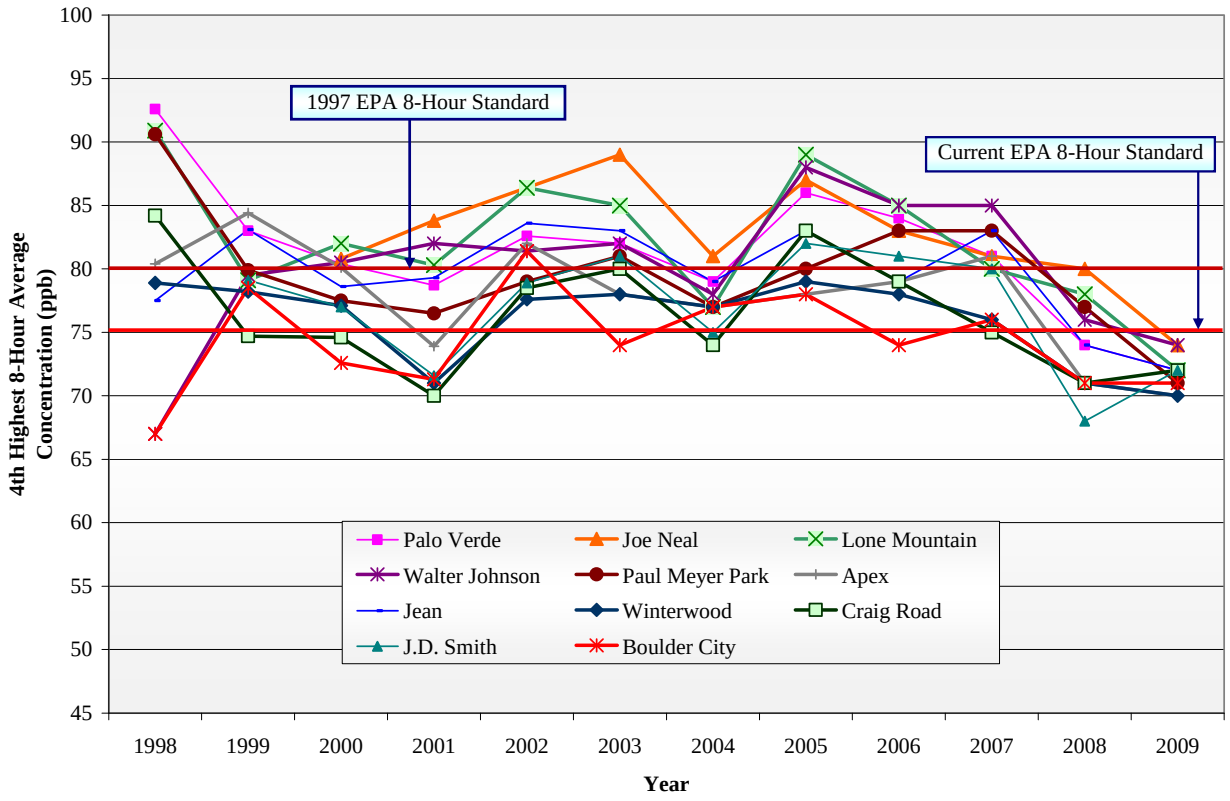


Figure 34 – SO_2 Trends

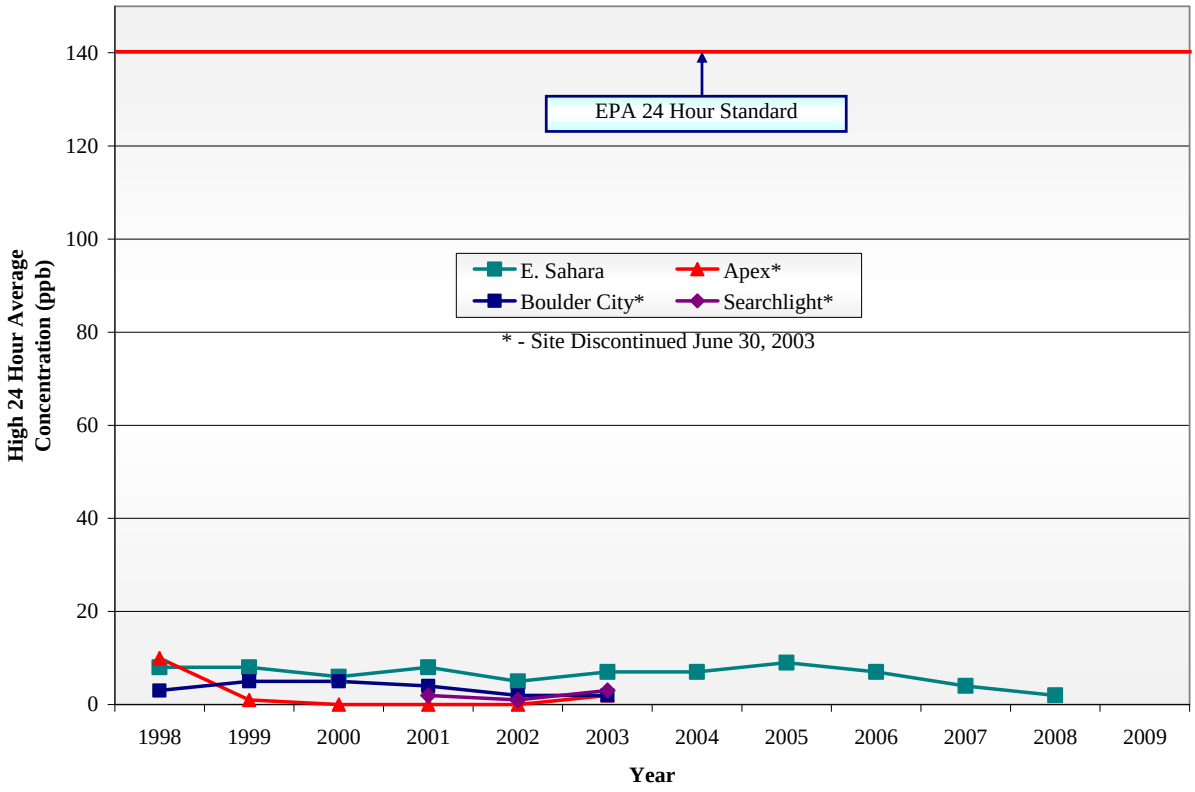


Figure 35 – NO_2 Trends

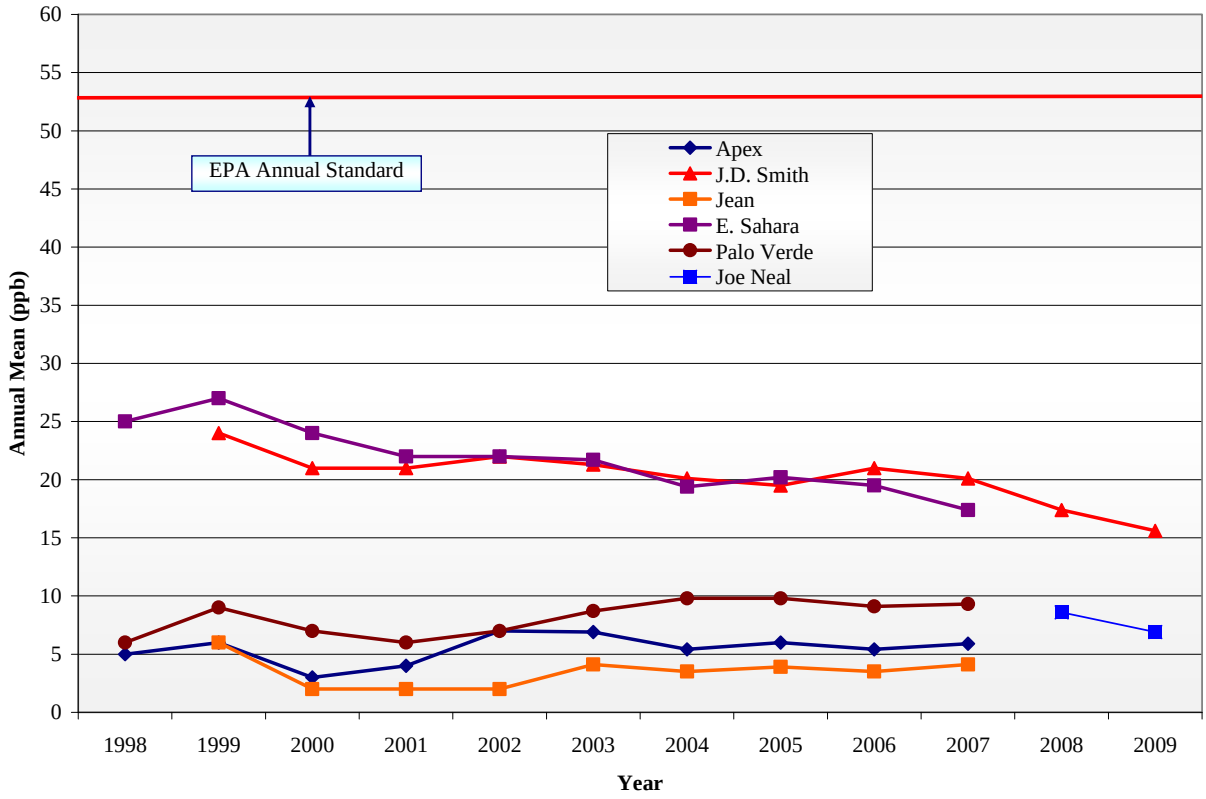


Figure 36 – Continuous PM_{10} Trends

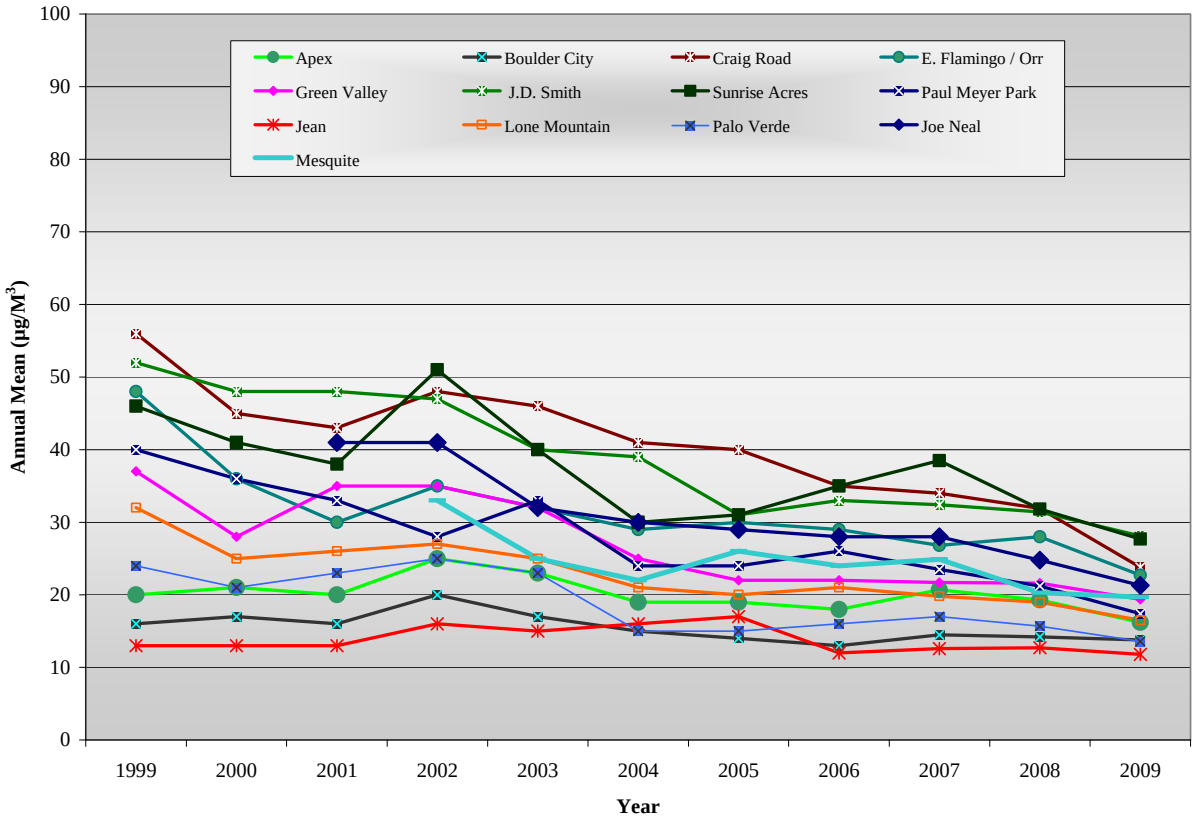


Figure 37 – Filter-Based $PM_{2.5}$ FRM Trends

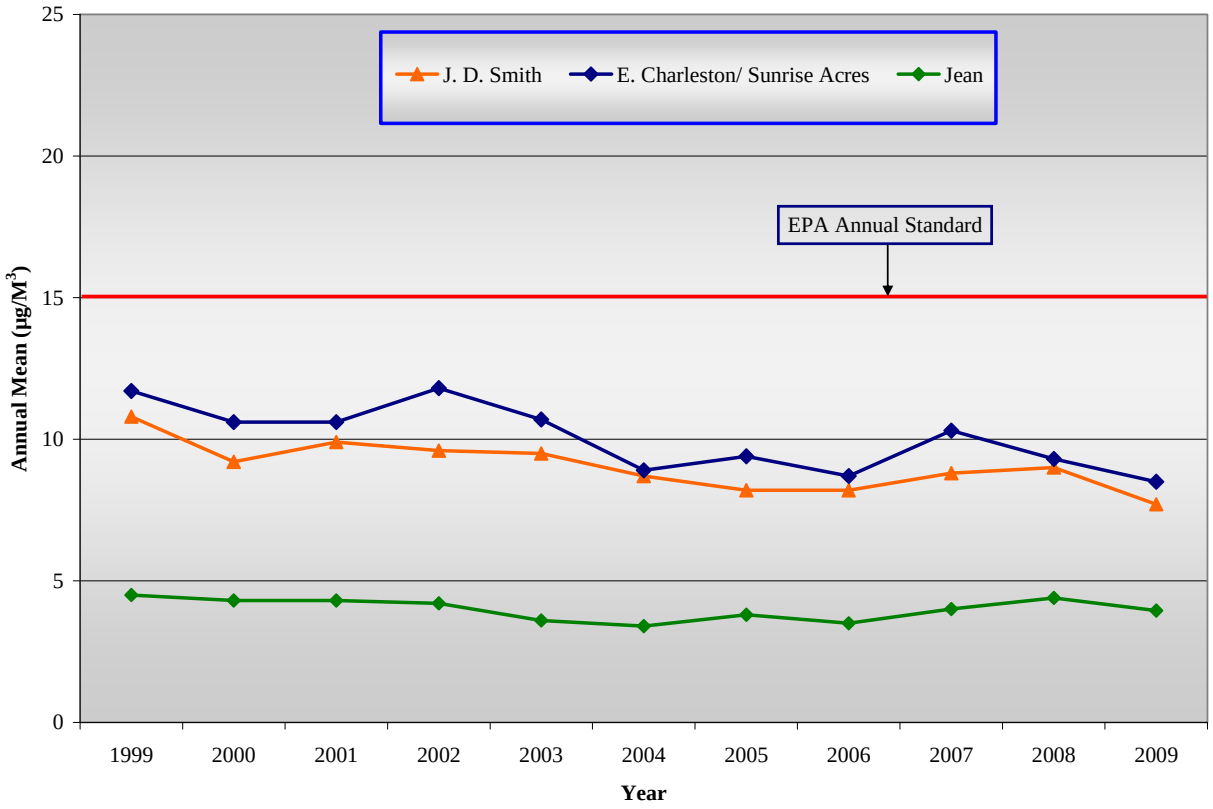


Figure 38 – Continuous $PM_{2.5}$ Annual Mean Trends

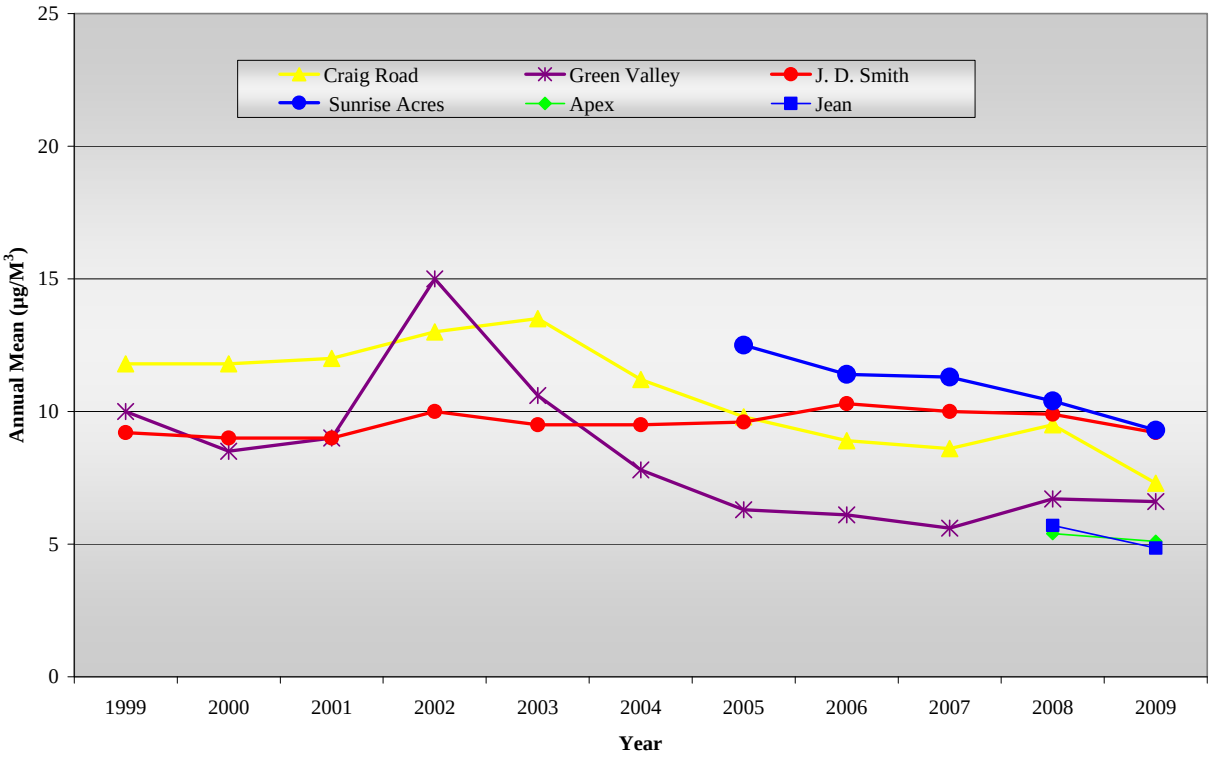
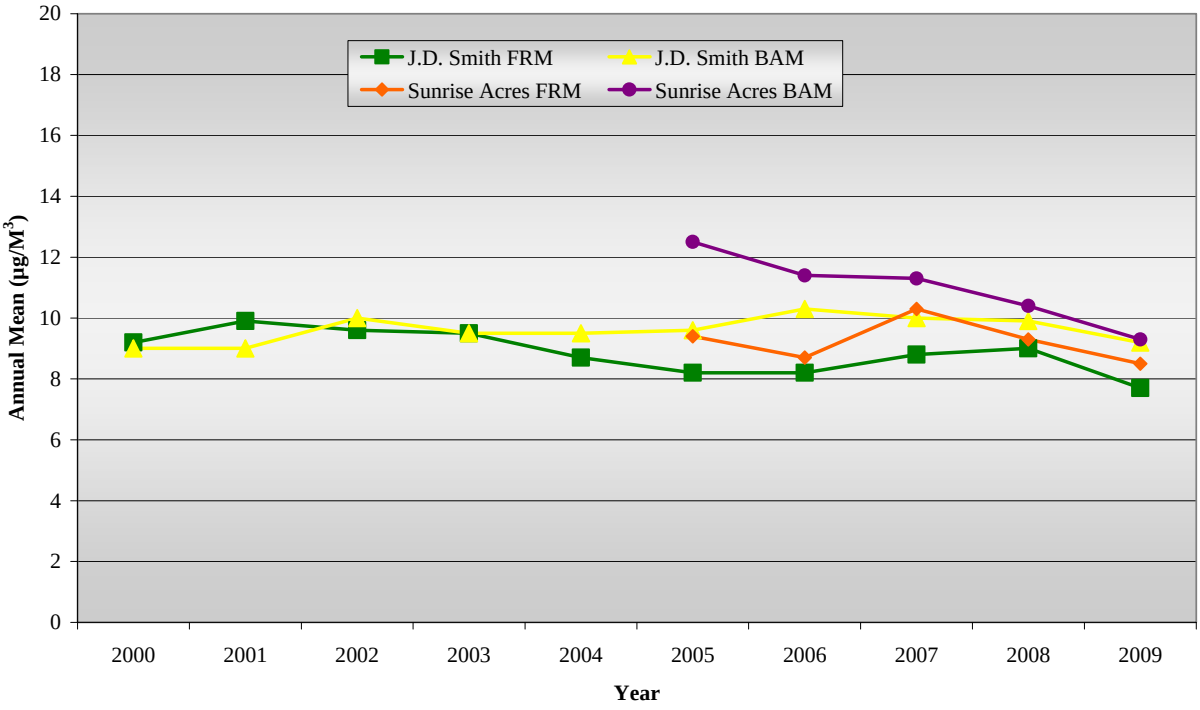


Figure 39 – Continuous vs. Filter-Based $PM_{2.5}$ Trends



Pollen Network

The pollen network, which is separate from the NAAQS network, is a unique local service DAQEM provides to Clark County residents. It is included in this report for DAQEM use and future reference.

DAQEM operated nine pollen monitoring stations in Clark County during 2009, using the Multidata Model 40 rotorod sampler at each site. The pollen network is located primarily in residential areas, and is intended to assess the general population's pollen exposure levels. Data are reported to the public through the DAQEM Web site, the media, and faxed reports; one monitoring station also reports pollen levels to the American Academy of Asthma, Allergy, & Immunology three days a week. This same station reports pollen levels to the public from July through January. The remaining ten stations report data to the public once a week from February through June.

The two primary producers of allergens in Clark County are the fruitless mulberry and the European olive. The fruitless mulberry pollinates in March, the European olive in April; during these months, eight stations operate twice a week. Clark County banned further planting of these trees, with the exception of low-pollinating varieties, because of their high levels of pollen (see Section 44 of the Clark County Air Quality Regulations).

The pollen monitoring network is dynamic, and monitoring locations change depending on valley growth, pollen levels, and public requests. The following map depicts the current pollen network.

Figure 40 – Pollen Sampling Locations in Las Vegas, Boulder City, and Apex