Clark County
Department of Air Quality
& Environmental Management

Protecting the air we share

Air Quality

Annual Network Plan Report
June 2009

June 15, 2009

Deborah Jordan, Director
U.S. Environmental Protection Agency, Region 9
Technical Support Office (Air-7)
75 Hawthorne Street
San Francisco, CA 94104-3901

RE: ANNUAL NETWORK PLAN

Ms. Jordan:

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 May 15, 2009, on our web site at http://www.accessclarkcounty.com/depts/daqem/aq/Pages/aq_index.aspx. In addition, 312 recipients were notified electronically from a DAQEM 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, maintaining National Ambient Air Quality Standards, determining the effectiveness of air pollution control programs, and evaluating the effects of air pollution levels on public health.

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:
Sean Hogan, Manager, EPA Region 9

Meredith Kurpius, 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 40 CFR 58.

The plan focuses on changes to the Monitoring Network that occurred in 2008, planned changes and improvements in 2009, efforts to improve data quality, and how information recorded by the network is disseminated.

The 2008 network review identified potential deficiencies at three monitoring stations, along with options for correction. Shortcomings fell into the following categories:

1. Spacing to roadways.
2. Obstacle distance.
3. Probe distance to supporting structure.

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.

For completeness, this plan also describes the automated data collection system purchased in 2006, which is a significant improvement over the system used since the early 1990s. Advantages include automated quality control, a new web site, and complete meteorological information for improved air quality forecasting. DAQEM fi

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Acronyms and Abbreviations

Acronyms

AQI	Air Quality Index
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
DAS	Data Acquisition System
EMS	Environment Management System
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
LEADS	Leading Environmental Analysis and Display System
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
QMS	Quality Management System
RAAS	Reference Ambient Air Sampler
SASS	Speciation Air Sampling System
SLAMS	State and Local Air Monitoring System
TTP	Through The Probe

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 monitoring sites that exceed the 2008 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 2008.
11. Identification of projected network changes during calendar year 2009 and beyond.
12. Description of the plan to correct guidance conflicts.

During 2008, the following conditions existed:

1. DAQEM operated air quality instruments to measure ambient concentrations of the following criteria pollutants: particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), $PM_{2.5,}$ ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO, NO_2, NO_x), and sulfur dioxide (SO_2).
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 using long path technology in the Las Vegas Valley.
    d. Review analyzer placement for ozone boundaries, considering formation and transport.
    e. Improve forecasting methods for O_3, CO, PM_{10}, and $PM_{2.5}$.
    f. Update monitoring equipment as needed.
    g. Develop new web site (the new site went live on April 1, 2008).
    h. Implement new data acquisition system (DAS) (the new IPS MeteoStar system went live on April 1, 2008).
    i. Develop QA project plans and quality management plan, and submit these documents to EPA on December 31, 2008.

j. Develop site safety improvement plans.
k. Finalize NCore site architectural plans.

5. Clark County remains designated a serious nonattainment area for two criteria pollutants, PM_{10} and CO. In 2004, Clark County was designated as a basic nonattainment area for ozone under the 1997 National Ambient Air Quality Standards (NAAQS). Currently, Clark County is designated as unclassifiable for $PM_{2.5}$. The following information summarizes Clark County's compliance status with the NAAQS:
   a. PM_{10}**:** In attainment of the NAAQS from 1/1/2004 through 2008.
   b. $PM_{2.5}$: Presumed in attainment of the NAAQS from 1/1/2004 through 2008. DAQEM is currently assessing Federal Reference Method (FRM) data to confirm.
   c. CO**:** In attainment of the NAAQS since 2000 and requesting redesignation.
   d. Ozone**:** In attainment of the 1997 NAAQS based on 2006-2008 data. DAQEM will prepare a maintenance plan for the 1997 NAAQS once the new rule is finalized and EPA provides related guidance.
   e. Ozone: In nonattainment of the 2008 NAAQS and expecting EPA designation of nonattainment in March 2010.

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


EXIT

Public Inspection Process

This annual monitoring network plan report will be published at least 30 days prior to submittal to EPA, in compliance with 40 CFR 58.10. It will be published and distributed on the DAQEM web site, and otherwise made available by request. Public comments on this report may be sent to:

Yousaf Hameed, 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 "State & Local Air Monitoring Station (SLAMS), National Air Monitoring Station (NAMS), and Photochemical Assessment Monitoring Station (PAMS) Network Review Guidance," published in 1998 by the EPA Office of Air Quality Planning and Standards. The report team included supervisors, field technicians, data management specialists, planning staff, and quality assurance technicians.

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

During the last two decades, the Las Vegas Valley has emerged as one of the fastest growing metropolitan areas in the nation. The population has expanded from about 400,000 in 1980 to an estimated 1.8 million in 2005. In addition, Las Vegas attracts more visitors annually than any other American city except Orlando, Florida. As a result, local forecasters continually answer questions from the public regarding the area's climate. This report is used as a reference for National Weather Service personnel in responding to climate inquiries, and is also intended to be a resource for the local media and general public.

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° 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.

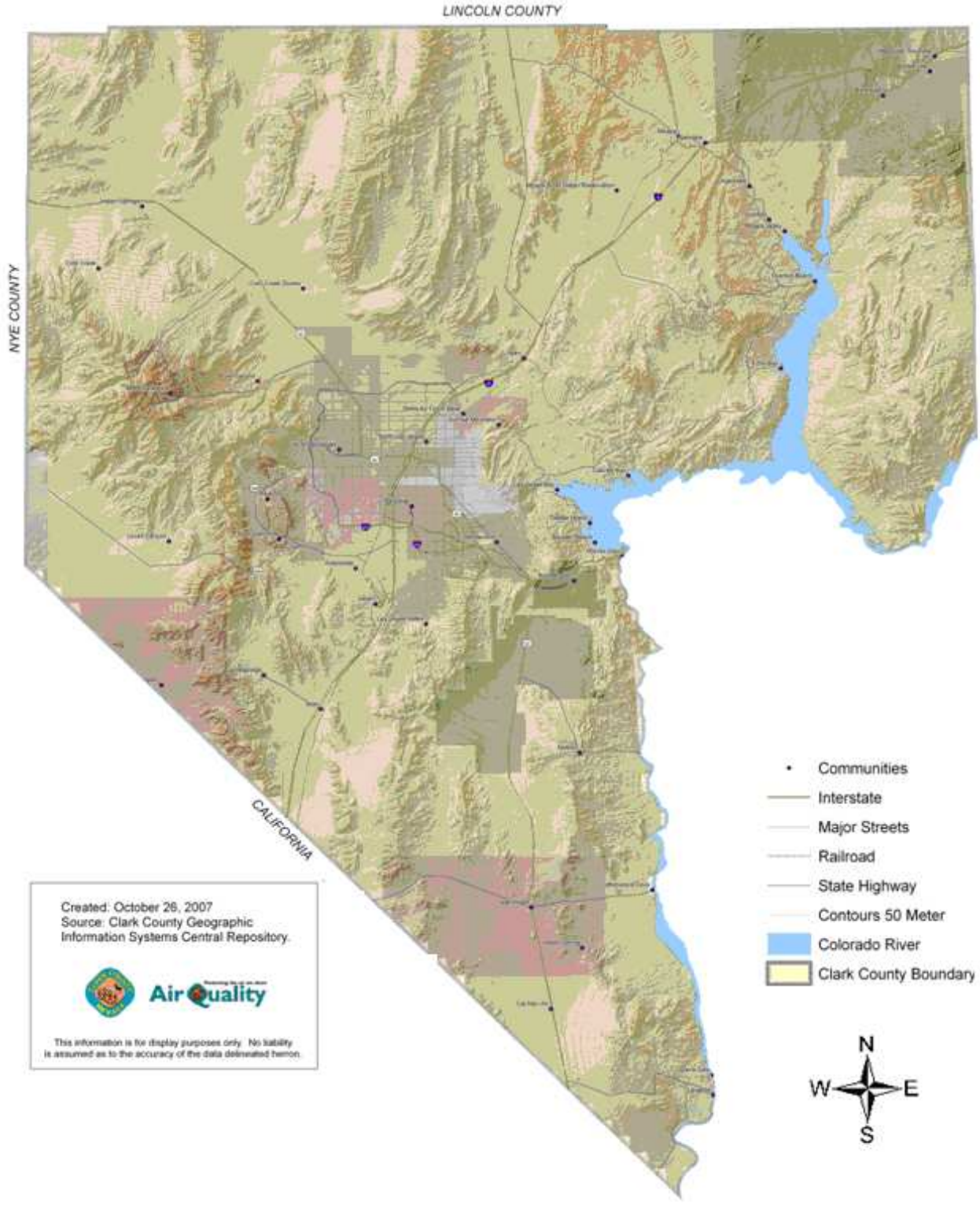
Strong winds are the most persistent weather hazard in the area. Winds over 50 mph are infrequent, but can occur with vigorous storms. Winter and spring wind events often generate widespread areas of blowing dust and sand. Strong wind episodes in the summertime are usually connected with thunderstorms, 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 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 17 monitoring stations in Clark County during 2008. The types of monitors vary from station to station. The monitoring network is primarily SLAMS, with a neighborhood-scale focus intended to assess exposure levels of the general population. It contains subnetworks for the EPA criteria pollutants PM_{10}, $PM_{2.5}$, CO, O_3, NO_2, and SO_2.

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.

Continuous Particulate Matter Monitors

The sampling methodology employs the continuous Thermo Electron FH 62 C-14 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 2008, 16 continuous PM_{10} monitors operated in Clark County. Twelve operated within the Las Vegas Valley; the Jean, Boulder City, Apex, and Mesquite monitors operated outside the valley. The maps in the section entitled "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 2008, DAQEM operated six continuous $PM_{2.5}$ monitors in Clark County. The maps in the section entitled "Continuous $PM_{2.5}$ Monitoring Locations" show the locations of the monitors in the continuous $PM_{2.5}$ monitoring network (Figures 28 and 29).

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 FRM and Speciation $PM_{2.5}$ samplers are the only filter-based monitoring instruments DAQEM employs. The maps in the section entitled "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 Anderson Model 300 Reference Ambient Air Sampler (RAAS) FRM sampler.

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

Particulate Matter of 2.5 Microns or Less

In 2008, three filter-based $PM_{2.5}$ FRMs 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 using an e-mail distribution list. DAQEM will respond to any public comments and take all comments into consideration before making changes to the $PM_{2.5}$ monitoring network. The exception to this is in the event of a lost lease or a 30-day notice to vacate the site from the property owner.

For completeness, we note that 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 $PM_{2.5}$ monitor, so all its FRM $PM_{2.5}$ monitors are suitable for NAAQS comparisons.

Speciation

DAQEM operates one speciation 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 entitled “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 2008, DAQEM operated 14 ozone monitors in Clark County. Ten operated within the Las Vegas Valley; the Jean, Apex, Boulder City, and Mesquite monitors operated outside the valley. The maps in the section entitled “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 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 NAAQS ozone standard.

DAQEM's ozone projects include:

- Ozone Characterization Study.
- Clark County Regional Ozone & Precursor Study (CCROPS).
- 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 2008 wildfire impacts on air quality in Clark County.

DAQEM conducts a three-point QC check on the O_3 monitors every week and calibrates them quarterly. Twenty-five percent of the O_3 monitors undergo a QA audit every quarter, and all O_3 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

DAQEM is planning another wildfire study in the summer of 2009 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 O_3, $PM_{2.5}$, 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. DAQEM is planning to deploy a chemiluminescence ozone analyzer as a special-purpose monitor in the 2009 study, since it uses a measurement principle that is not affected by particulate interference.

Nitrogen Oxides

In 2008, DAQEM operated two nitrogen oxide monitors in Clark County. All nitrogen oxide monitors operated within the Las Vegas Valley. The map in the section entitled "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
JD Smith	Neighborhood	Highest concentration
Joe Neal	Neighborhood	Population exposure

Sulfur Dioxide

On March 31, 2008, DAQEM discontinued monitoring for sulfur dioxide. EPA no longer requires this pollutant to be monitored, and the historical data were well below the SO_2 NAAQS.

Site	Spatial Scale	Objective
East Sahara	Urban	Population exposure

Siting Criteria Deficiencies

The following deficiencies were identified in the 2008 review of the network:

Site	Roadway	Obstacle Distance	Probe Distance from Support Structure
East Sahara	CO		
Walter Johnson		Water cooling tower 15' from inlet	
Orr			Ozone <1 m spacing from support structure

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

Deficiency	Site/Monitor	Corrective Action	Schedule
Spacing from roads	E. Sahara		2010
	CO	Move to Jerome Mack Middle School	
Obstacle distance	Walter Johnson		2009
	Ozone	Will monitor data for impacts from newly constructed cooling tower	
Probe distance from support structure	Orr		2009
	Ozone	Will change probe height	

Spacing from roads:
DAQEM will evaluate spacing and attempt to comply with 40 CFR 58, Appendix E. If the situation continues to impact the site, DAQEM will consider 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.

Probe distance from support structure:
DAQEM will evaluate the situation and attempt to comply with 40 CFR 58, Appendix E. If the situation continues to impact the site, DAQEM will consider the following options:

1. Increase the probe height.
2. Relocate the site.
3. Shut down the site.

Design Values for 2008

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

Station	Ozone Design Value (ppm)	NAAQS Standard (ppm)
E. Craig Road	.075	.075
Winterwood	.075	.075
Apex	.078	.075
Lone Mountain	.081	.075
Palo Verde	.079	.075
Jean	.078	.075
Paul Meyer	.081	.075
Boulder City	.073	.075
J.D. Smith	.076	.075
Walter Johnson	.082	.075
Joe Neal	.080	.075
Mesquite	.067	.075
Orr	.078	.075

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	9.29	15
Jean	4.44	15
J.D. Smith	8.99	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	24.6	35
Jean	13.8	35
J.D. Smith	19.8	35

For completeness, we note that 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 $PM_{2.5}$ monitor, 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 flow out of the Las Vegas Valley. This monitoring site is generally downwind from Las Vegas and is representative of the Apex Valley. NO_x monitoring was terminated in January 2008 to conserve resources, and because 40 CFR 58 no longer requires it.

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 and PM; 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.

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.

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, and monitors gaseous and particulate pollutants.

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 and PM.

Joe Neal (32-003-0075). 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. A NO_x monitor has been operating at this location since January 2008. The primary reason for this installation is to monitor O_3 precursors in a high O_3 concentration area, and to support DAQEM modeling efforts. Recent growth in this part of the valley makes it a good site for monitoring PM_{10} as well.

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). This site is centrally located in the Las Vegas Valley, and one of the oldest sites. Its primary objective is to monitor CO. The PM_{10} Beta Attenuation Monitor (BAM) was shut down in January 2008 due to safety concerns. NO_x monitoring was terminated in Janu-

ary 2008, and SO_2 monitoring was terminated at the end of March 2008, to conserve resources; 40 CFR 58 no longer requires nitrogen oxides and sulfur dioxide monitoring.

Mesquite (32-003-0023). This station is located in Mesquite, approximately 70 miles north of Las Vegas; it monitors O_3 and PM_{10}. DAQEM decided to terminate NO_x monitoring in January 2008 to conserve resources since 40 CFR 58 no longer requires it.

Orr (32-003-1021). This station 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.

Southeast Valley/Henderson (32-003-0007). This is one of the oldest sites in the network. The original objective was to monitor chlorine gas releases from nearby Basic Management Industries, but the site has monitored several pollutants of interest; recently, the primary monitored pollutants were O_3 and PM_{10}. This site was terminated in January 2008 due to safety concerns.

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. CO monitoring was discontinued because of consistently low readings, but the site continues to monitor PM_{10}.

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}. DAQEM decided to terminate NO_x monitoring in January 2008 to conserve resources since 40 CFR 58 no longer requires it.

Sunrise Acres (32-003-0561). The site is near the center of the Las Vegas Valley. It began monitoring 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 is the primary site for monitoring $PM_{2.5}$ and CO in the valley.

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 higher O_3 and precursor levels towards this site from the east end of the Las Vegas Valley. The site also monitors PM_{10}. Due to safety concerns, the PM_{10} BAM was shut down in January 2008.

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. SO_2
4. NO_x
5. PM_{10} continuous
6. $PM_{2.5}$ continuous
7. $PM_{2.5}$ FRM, manual method
8. $PM_{2.5}$ species, manual method
9. Visibility
10. Meteorological.

Analyzer type:

1. CO: gas filter correlation (non-dispersive infrared).
2. O_3: ultraviolet absorption.
3. SO_2: ultraviolet chemiluminescence.
4. NO_x: chemiluminescent gas phase reaction of NO_x and O_3.
5. PM_{10} and $PM_{2.5}$ C-14 continuous monitor: BAM.
6. $PM_{2.5}$ RAAS manual method: filter-based.
7. $PM_{2.5}$ SASS manual method: filter-based.
8. 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 C-14		X		Yes
$PM_{2.5}$	Thermo Electron C-14			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	Parameter	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	Parameter	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	17,000		40,000/20,000
E. Craig Road	34 meters to Mitchell	4,600		20,000/15,000
E. Sahara	48 meters to Sahara	29,000		20,000/20,000
Green Valley	12.2 meters to Santiago	5,100		10,000/10,000
J.D. Smith	180 meters to Bruce	7,800		70,000/60,000
Jean	1287 meters to State Hwy. 161	2,100		110,000/60,000
Joe Neal	12.2 meters to Rebecca	4,200		10,000/10,000
Lone Mountain	50 meters to Valadez	6,000		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	10,000		10,000/10,000
Paul Meyer	102 meters to New Forrest Dr.	4,900		70,000/30,000
Sunrise Acres	128 meters to Sunrise	17,000		70,000/40,000
Walter Johnson	13 meters to Villa Monterrey	13,000		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 NDOT.
[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 2008

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. Southeast Valley – Henderson (shut down)
15. Sunrise Acres
16. Walter Johnson
17. Winterwood.

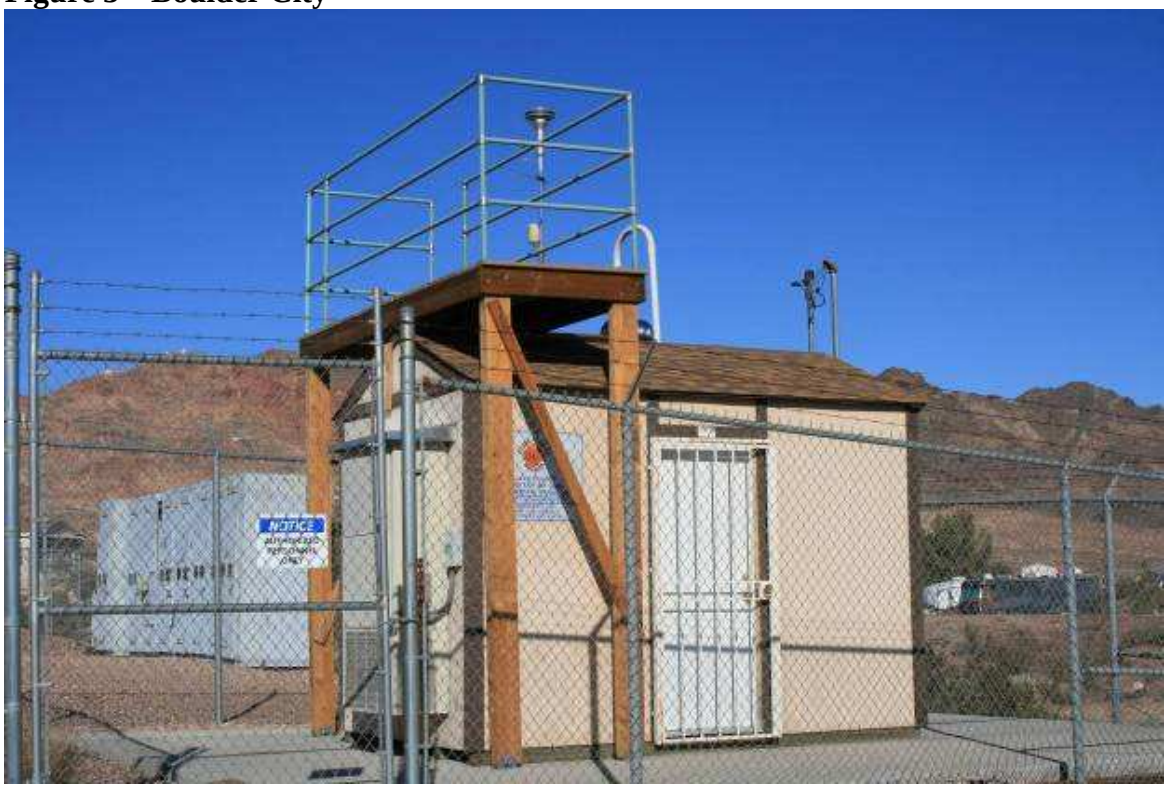
Figure 2 – Apex

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 C-14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C-14
Predominant Wind Direction: Southwest
Photograph Direction: South

	PM_{10}	**$PM_{2.5}$Continuous**	**Ozone**
Spatial scale	Neighborhood	Neighborhood	Regional
Monitoring objective	Source-oriented	Source-oriented	Regional transport
Vertical probe placement	4.8 m	4.9m	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**	**Ozone**
Obstructions on roof	None	None	—
Obstacle distance	None	None	None
Manifold linear velocity			5.0 m/s
Probe material	—		Teflon
Residence time	—		1.48

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 C-14
Predominant Wind Direction: Southwest
Photograph Direction: Northwest

	PM_{10}	**Ozone**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	5.0 m	4.10 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	—	1.60 m
Obstructions on roof	None	—
Obstacle distance	None	None
Probe material	—	Teflon
Residence time	—	2.89 s

Figure 4 – Craig Road

Type: SLAMS
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 C-14
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C-14
$PM_{2.5}$: Speciation, MetOne SASS
Predominant Wind Direction: Northwest
Photograph Direction: West

	PM_{10}	**Ozone**	**Speciation**	**$PM_{2.5}$ Continuous**
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring objective	Highest concentration	Population exposure	Population exposure	Population exposure
Vertical probe placement	5.60 m	4.40 m	5.7 m	5.80 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	1.8 m	—	2 m	1.8 m

	PM_{10}	**Ozone**	**Speciation**	**$PM_{2.5}$ Continuous**
Ground cover	Paved & unpaved	—	Paved & unpaved	Paved & unpaved
Spacing from supporting structure	—	1.1 m	—	—
Obstructions on roof	None	—	None	None
Obstacle distance	15	60	15	15
Probe material	—	Teflon	—	—
Manifold linear velocity		3.75 m/s		
Residence time	—	1.63 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	4.4 m
Unrestricted airflow	360°
Spacing from trees	39.5 m
Spacing from station to road	37.6 m
Distance between collocated monitors	—
Ground cover	—
Spacing from supporting structure	—
Obstructions on roof	—

	CO
Obstacle distance	—
Probe material	—
Manifold linear velocity	
Residence time	—

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 C-14
PM_{10}: Beta Attenuation, Thermo Electron FH 62 C-14
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	5.00 m
Unrestricted airflow	360°	360°
Spacing from trees	1.1 m	4.5 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	—	—
Probe material	—	—
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 C-14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C-14
$PM_{2.5}$: Andersen RAAS 300 FRM
Nitrogen Dioxide: Gas Phase Chemiluminescence, API 200E
Predominant Wind Direction: Northwest
Photograph Direction: North

	PM_{10}	**CO**	**$PM_{2.5}$ (FRM)**	**NO_2**	**Ozone**	**$PM_{2.5}$ 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	4.6 m	3.7 m	3.6 m	3.7 m	3.7 m	4.8 m

	PM_{10}	**CO**	**$PM_{2.5}$ (FRM)**	**NO_2**	**Ozone**	**$PM_{2.5}$ Continuous**
Unrestricted airflow	360°	360°	360°	360°	360°	360°
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 collocated monitors	2.5 m	—	NA	—	—	2.5
Ground cover	Paved & grass	—	Paved & grass	—	—	Paved & grass
Spacing from supporting structure	—	—	—	1.2 m	1.2 m	—
Obstructions on roof	None	—	None	—	—	None
Obstacle distance	3.3 m to wall	—	5.1 m to wall	4.20 m to wall	4.2 m to wall	5.8 m to wall
Probe material	—	—	—	Teflon	Teflon	—
Manifold linear velocity	—	—	—	5.6 m/s	5.6 m/s	—
Residence time	—	—	—	2.73 s	1.52 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 C-14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C-14
$PM_{2.5}$: Andersen RAAS 300 FRM
Predominant Wind Direction: Southwest
Photograph Direction: Southwest

	PM_{10}	**$PM_{2.5}$ Continuous**	**Ozone**	**$PM_{2.5}$ (FRM)**
Spatial scale	Regional	Regional	Regional	Regional
Monitoring objective	Background	Background	Transport	Background
Vertical probe placement	5 m	5 m	3.90 m	5.00 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

	PM_{10}	**$PM_{2.5}$ Continuous**	**Ozone**	**$PM_{2.5}$ (FRM)**
Distance between collocated monitors	2.7	10M	—	10M
Ground cover	Native desert & gravel	Native desert & gravel		Native desert & gravel
Spacing from support-ing structure	—	—	1.40 m	—
Obstructions on roof	—	—	—	—
Obstacle distance	—	—	—	—
Probe material	—	—	Teflon	—
Manifold linear velocity	—	—	2.5 m/s	—
Residence time			3.12 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 C-14
Nitrogen Dioxide: Gas Phase Chemiluminescence, API 200E
Predominant Wind Direction: Southwest
Photograph Direction: North

	PM_{10}	**Ozone**	**NO_2**
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Highest concentration	Population exposure
Vertical probe placement	4.70 m	3.8 m	3.8
Unrestricted airflow	360°	360°	360°
Spacing from trees	6.8 m	4.9 m	4.9 m
Spacing from station to road	12.6 m	12.6 m	12.6
Distance between collocated monitors	—	—	—
Ground cover	Gravel, grass, natural desert	—	—
Spacing from supporting structure	—	1.4 m	1.4 m
Obstructions on roof	None	—	—
Obstacle distance	None	None	None
Probe material	—	Teflon	Teflon
Manifold linear velocity	—	5 m/s	
Residence time		2.72 s	4.87 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 C-14
Predominant Wind Direction: Southwest
Photograph Direction: West

	PM_{10}	**Ozone**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	5.0 m	4.40 m
Unrestricted airflow	360°	360°
Spacing from trees	12.6 m	15.4 m
Spacing from station to road	50.0 m	50.0 m
Distance between collocated monitors	None	—
Ground cover	Gravel	—
Spacing from supporting structure	—	1.4 m
Obstructions on roof	None	—
Obstacle distance	20 m	20 m
Probe material	—	Teflon
Manifold linear velocity	—	2.4 m/s
Residence time	—	2.58 s

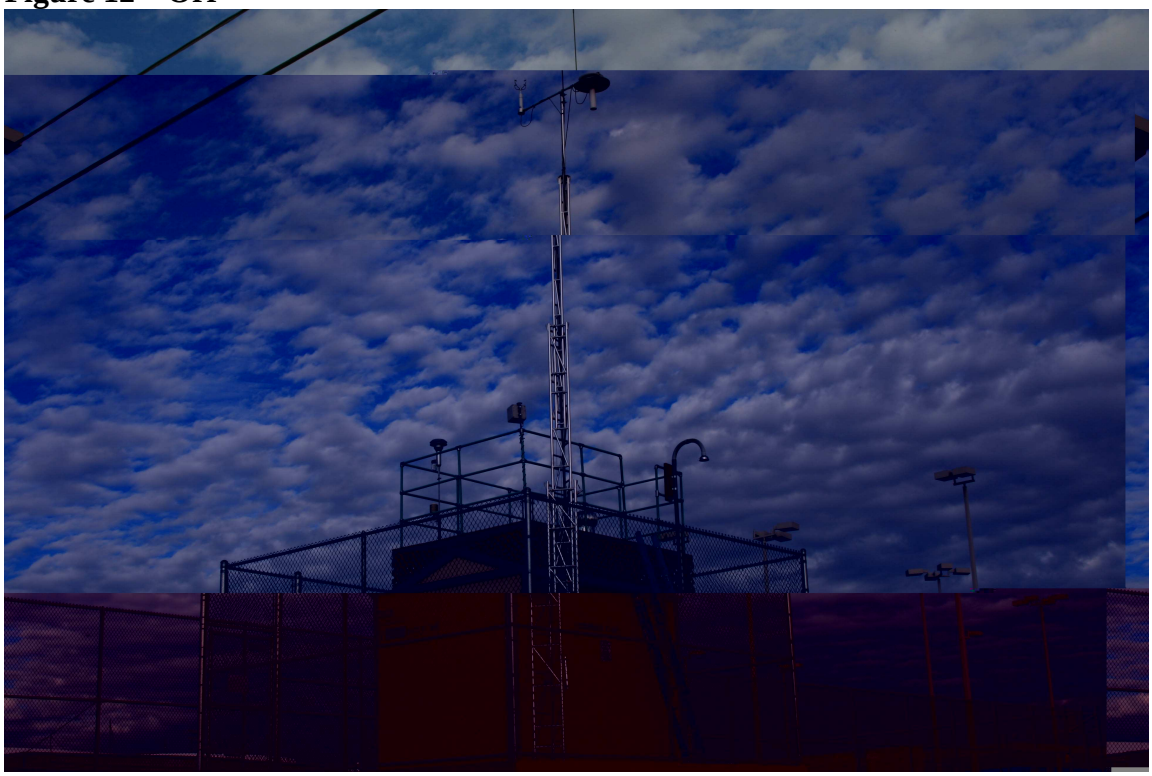
Figure 11 – Mesquite

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 C-14
Predominant Wind Direction: Southwest
Photograph Direction: West

	PM_{10}	**Ozone**
Spatial scale	Middle	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.7 m	3.60 m
Unrestricted airflow	360°	360°
Spacing from trees	24 m	24.0 m
Spacing from station to road	6.9 m	8.7 m
Distance between collocated monitors	—	—
Ground cover	Adjacent raised dirt field	—
Spacing from supporting structure	—	1.20 m
Obstructions on roof	None	—
Obstacle distance	None	None

	PM_{10}	Ozone
Probe material	—	Teflon
Sample manifold linear velocity		6.3 m/s
Residence time		1.57 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 C-14
Predominant Wind Direction: Southwest
Photograph Direction: Northwest

	PM_{10}	**CO**	**Ozone**
Spatial scale	Middle	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure	Population exposure
Vertical probe placement	4.7 m	4.0 m	4.0 m
Unrestricted airflow	360°	360°	360°
Spacing from trees	30.0 m	28.0 m	28.0 m
Spacing from station to road	12.4 m	15.4 m	15.4 m
Distance between collocated monitors	—	—	
Ground cover	Paved, grass, gravel	—	
Spacing from supporting structure	—	—	0.8 m
Obstructions on roof	None	—	
Obstacle distance	No obstacles	—	
Probe material	—	—	Teflon
Residence time	—	—	3.18 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 C-14
Predominant Wind Direction: Southwest
Photograph Direction: East

	PM_{10}	**Ozone**
Spatial scale	Middle	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.90 m	3.7 m
Unrestricted airflow	360°	360°
Spacing from trees	16.5 m	18.5 m
Spacing from station to road	14.7 m	14.7 m
Distance between collocated monitors	Not applicable	—
Ground cover	Paved	Paved
Spacing from supporting structure	—	1.9 m
Obstructions on roof	—	—
Obstacle distance	—	—

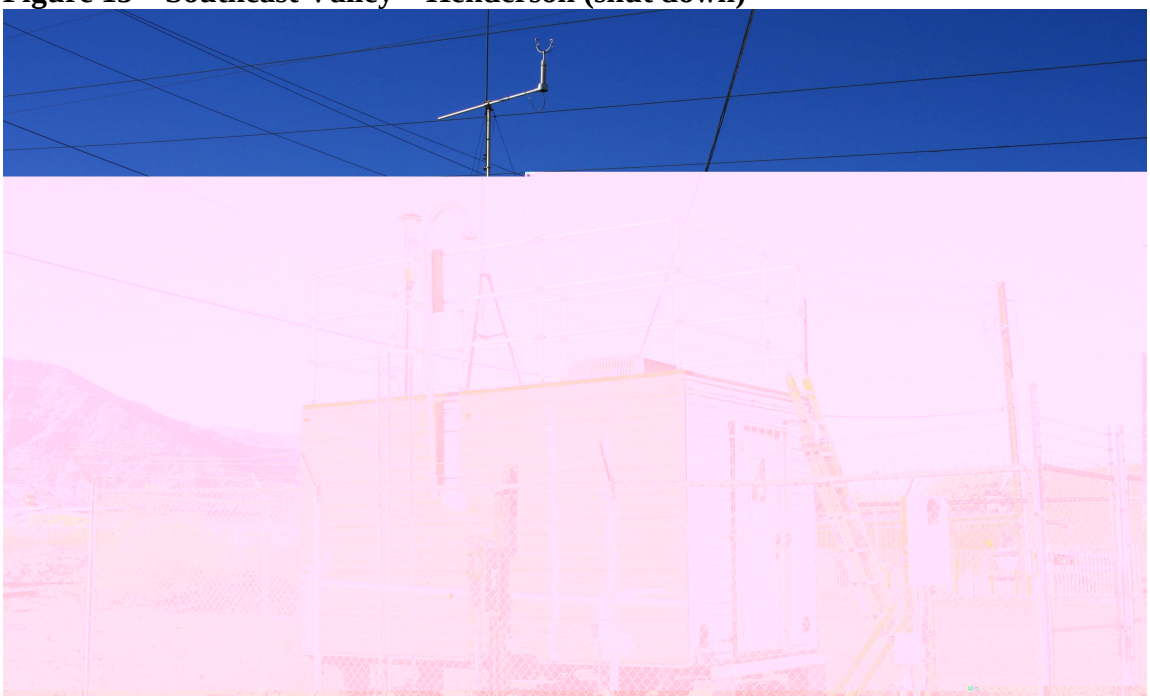
	PM_{10}	Ozone
Probe material	—	Teflon
Linear manifold velocity	—	16.2 m/s
Residence time	—	3.19 s

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 C-14
Predominant Wind Direction: Southwest
Photograph Direction: Southwest

	PM_{10}	**Ozone**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.9 m	3.9 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	—	1.4 m
Obstructions on roof	None	—
Obstacle distance	None	—
Probe material	—	Teflon
Linear manifold velocity	—	5 m/s
Residence time	—	2.65 s

Figure 15 – Southeast Valley – Henderson (shut down)



Type: SLAMS
Southeast Valley (Henderson) (PL) (32-003-0007)
Location: 545 W. Lake Mead Dr., Henderson, NV 89015
Three Closest Roads: W. Lake Mead Dr., W. Van Wagenen St., I-515
UTM X-Coordinate: 680361.100; UTM Y-Coordinate: 3989681.000
Operative Schedule: 24 hours
Sampling Method: Ozone: Ultraviolet Absorption, API 400A
PM_{10}: Beta Attenuation, Thermo Andersen FH 62 C-14
Predominant Wind Direction: Southwest
Photograph Direction: West
Station shut down in February 2008.

	PM_{10}	**Ozone**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	5.1 m	4.1 m
Unrestricted airflow	360°	360°
Spacing from trees	—	—
Spacing from station to road	46.9 m	46.9 m
Distance between collocated monitors	—	—
Ground cover	Unpaved	Unpaved
Spacing from supporting structure	—	1.30 m
Obstructions on roof	None	None
Obstacle distance	None	None
Probe material	—	Teflon
Linear manifold velocity	—	4.7 m/s
Residence time	—	2.6 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 C-14
$PM_{2.5}$: Beta Attenuation, Thermo Electron FH 62 C-14
$PM_{2.5}$: Andersen RAAS 2.5 300 FRM
$PM_{2.5}$ Collocated: Andersen RAAS 2.5 300 FRM
Predominant Wind Direction: Southwest
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 concen-tration	Highest concen-tration	Highest concen-tration
Population exposure	Highest concentration	—	—	—	—
Vertical probe placement	4.7 m	3.6 m	2.9 m	2.9 m	5.0 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	—	—	—
Manifold linear velocity	—	5.6 m/s	—	—	—
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

	Ozone
Spatial scale	Neighborhood
Monitoring objective	Population exposure
Vertical probe placement	3.8 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	1.4 m
Obstructions on roof	—
Obstacle distance	14m
Probe material	Teflon
Linear manifold velocity	5.5 m/s
Residence time	2.89 s

Figure 16 – 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	Ozone
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	1.3 m	1.1 m
Obstructions on roof	—	—
Obstacle distance	—	—
Probe material	—	Teflon
Linear manifold velocity	—	5.2 m/s
Residence time	—	3.02 s

Figure 19 – Visibility Sites

Visibility Monitoring Network (Transmitters/Receivers)

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

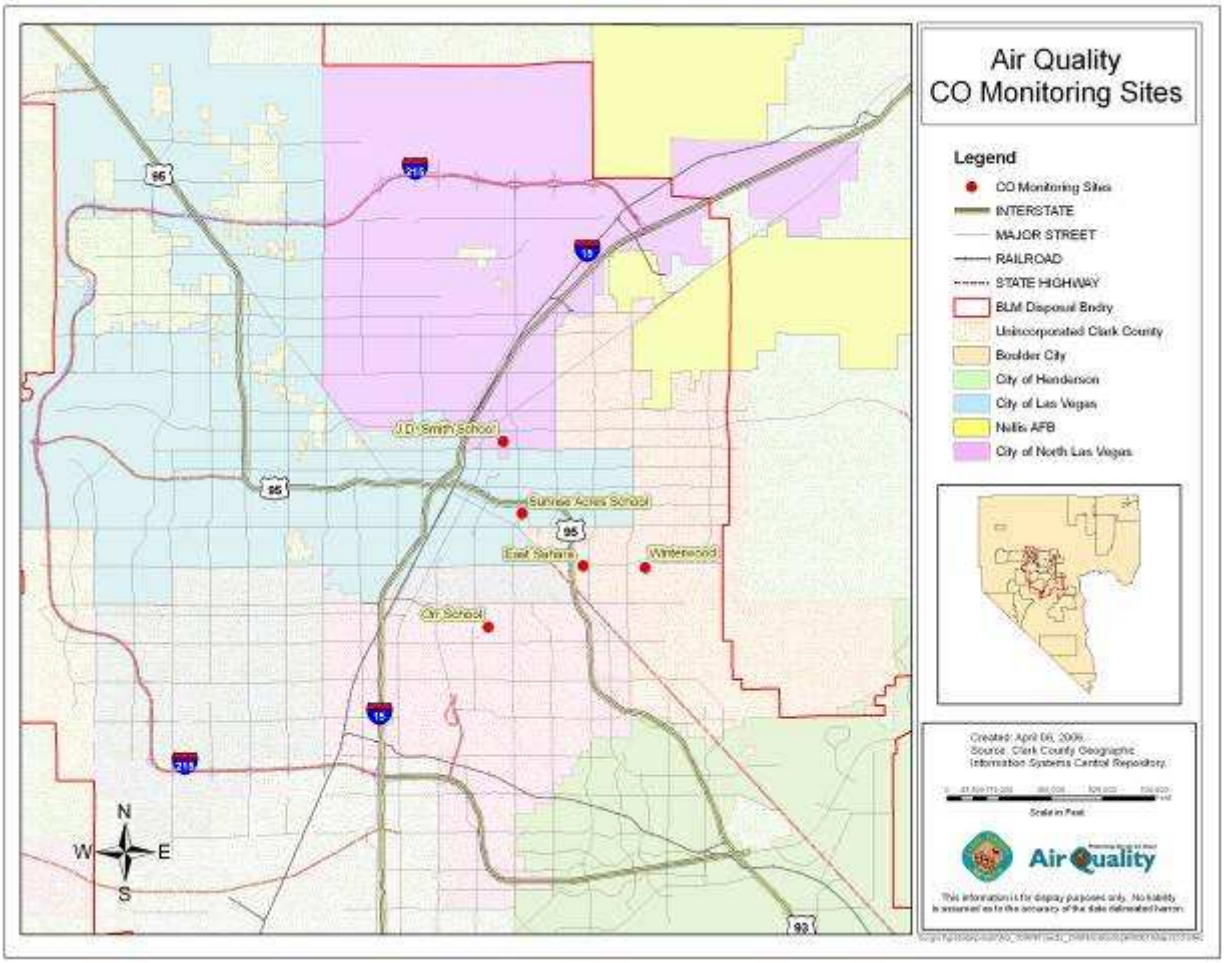
VISIBILITY SITE (Las Vegas)
Sunrise Hospital – T1 transmitter
Location: 3186 S. Maryland Pkwy., Las Vegas, NV 89109
Three Closest Roads: E. Desert Inn Rd., Vegas Valley Dr., Maryland Pkwy.
Operative Schedule: 24 hours
Equipment: Optec LPV-2

VISIBILITY SITE (Henderson)
Sunset Station – T2 transmitter
Location: 1301 E. Sunset Rd., Henderson, NV 89014
Three Closest Roads: I-515, N. Stephanie St., W. Warm Springs Rd.
Operative Schedule: 24 hours
Equipment: Optec LPV-2

VISIBILITY SITE (Henderson)
Eldorado Casino – T2 receiver
Location: 340 S. Water St., Henderson, NV 89015
Three Closest Roads: S. Boulder Hwy., E. Van Wagenen St., W. Lake Mead Dr.
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

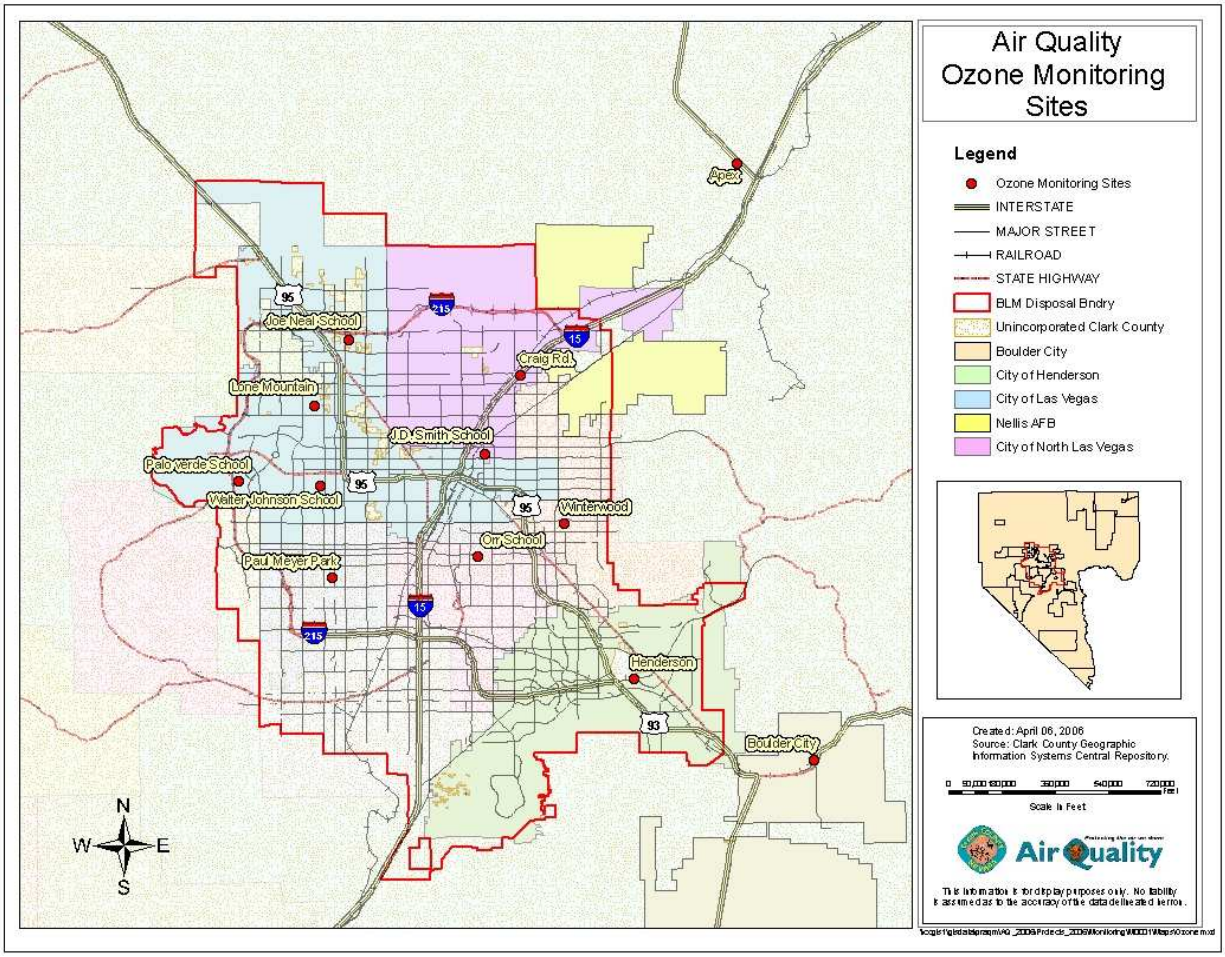
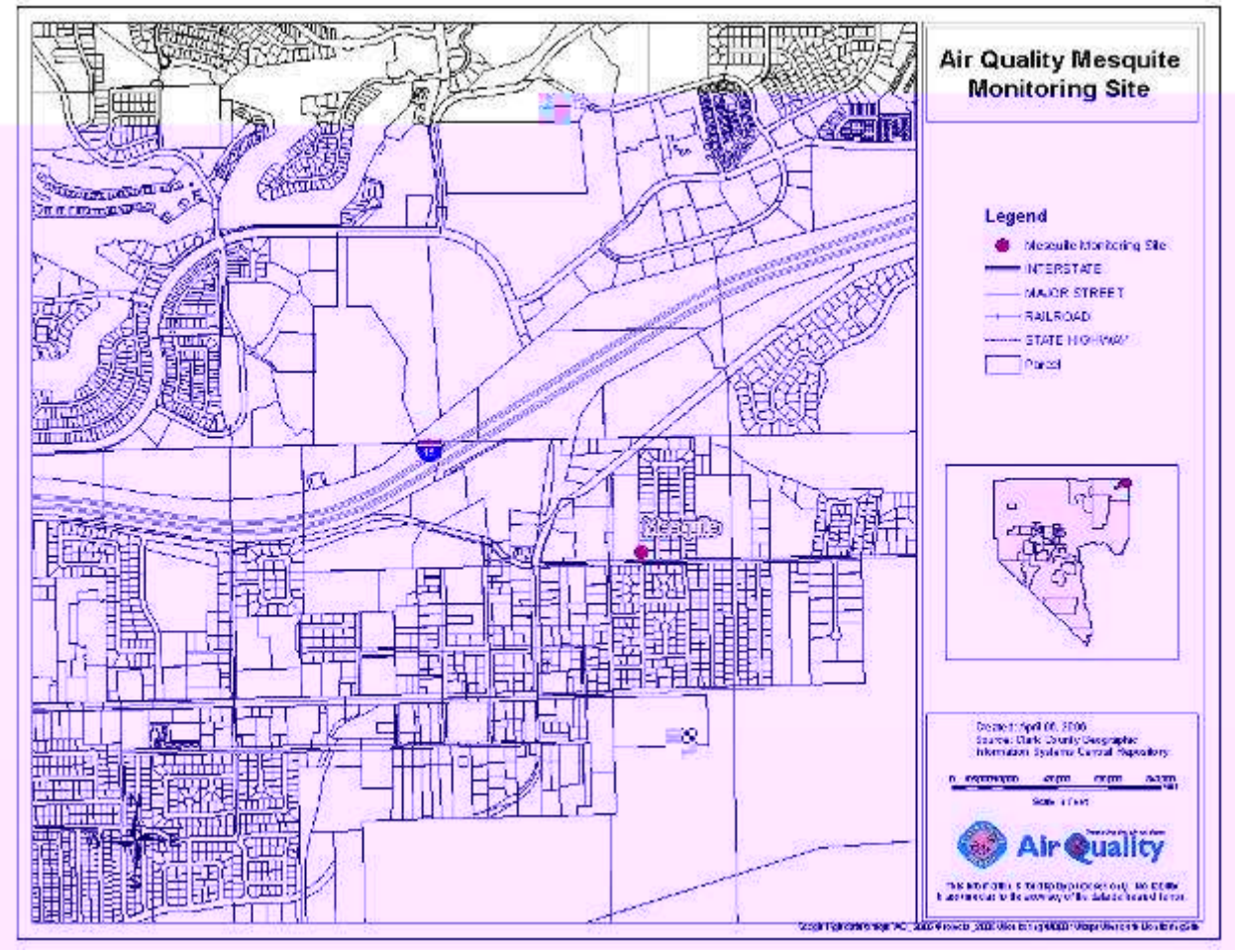


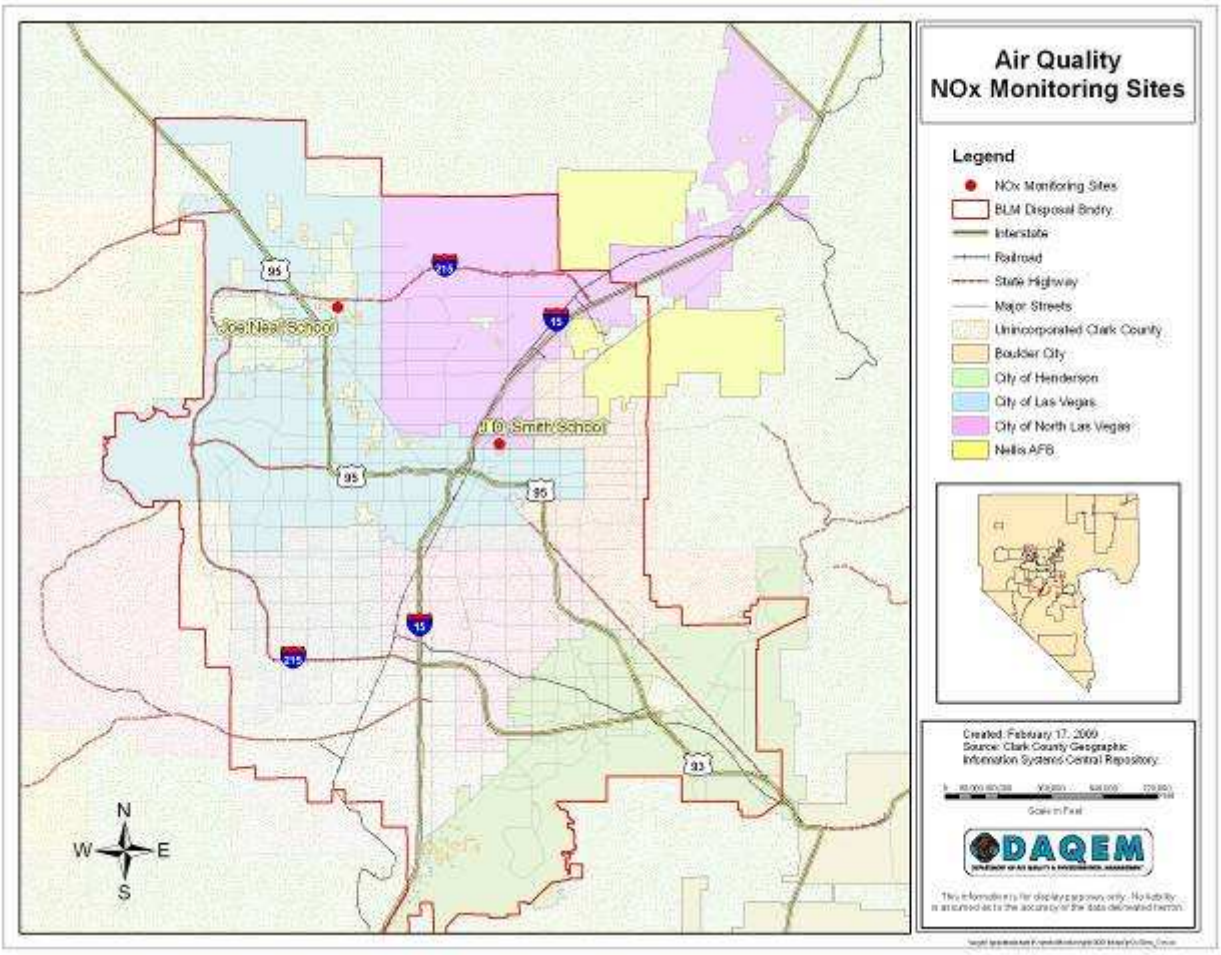
Figure 22 – Ozone Monitoring Locations in Jean

Figure 23 – Ozone Monitoring Location in Mesquite



Nitrogen Oxide Monitoring Locations

Figure 24 – Nitrogen Oxide Monitoring Locations in Las Vegas and Apex



Continuous PM_{10} Monitoring Locations

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

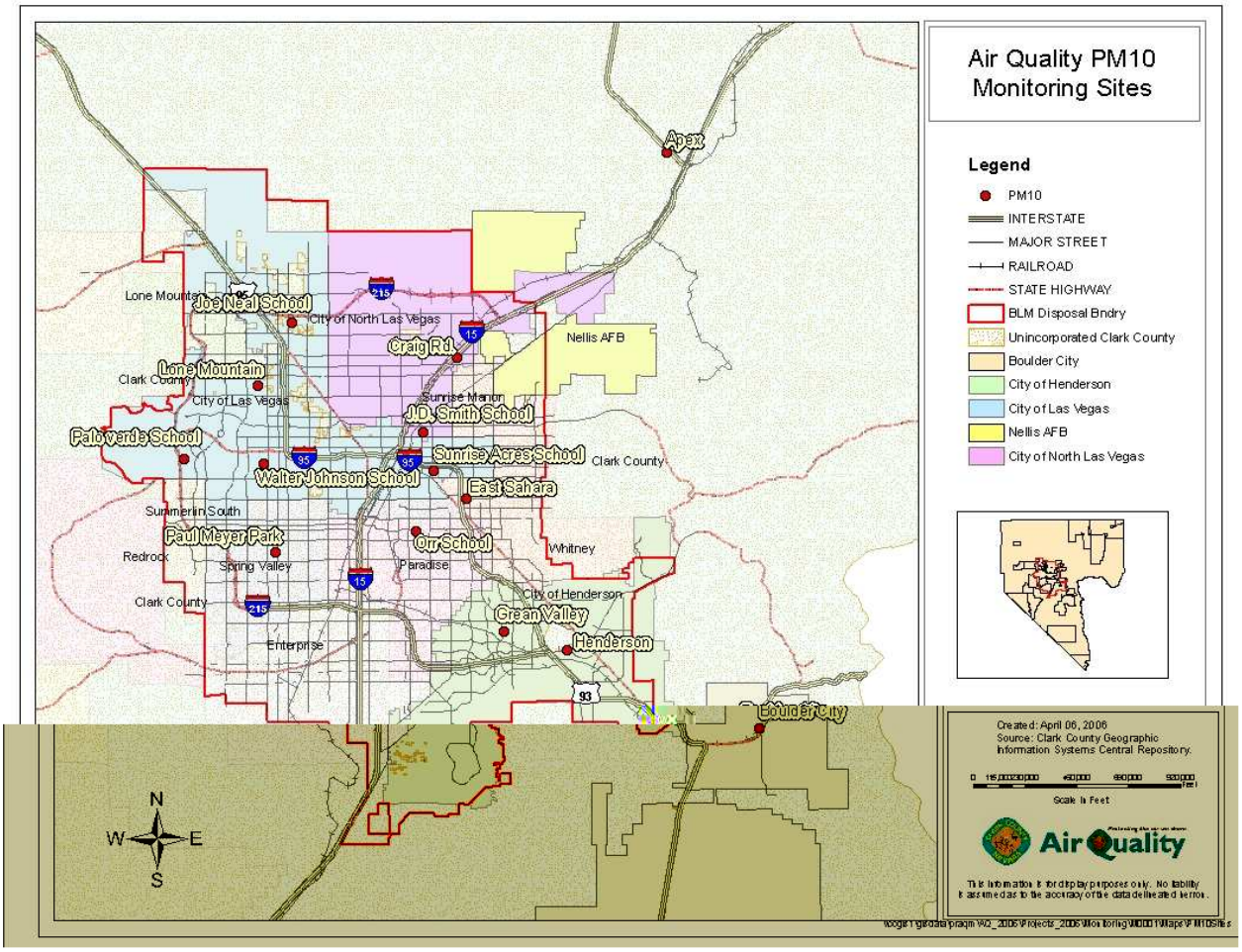
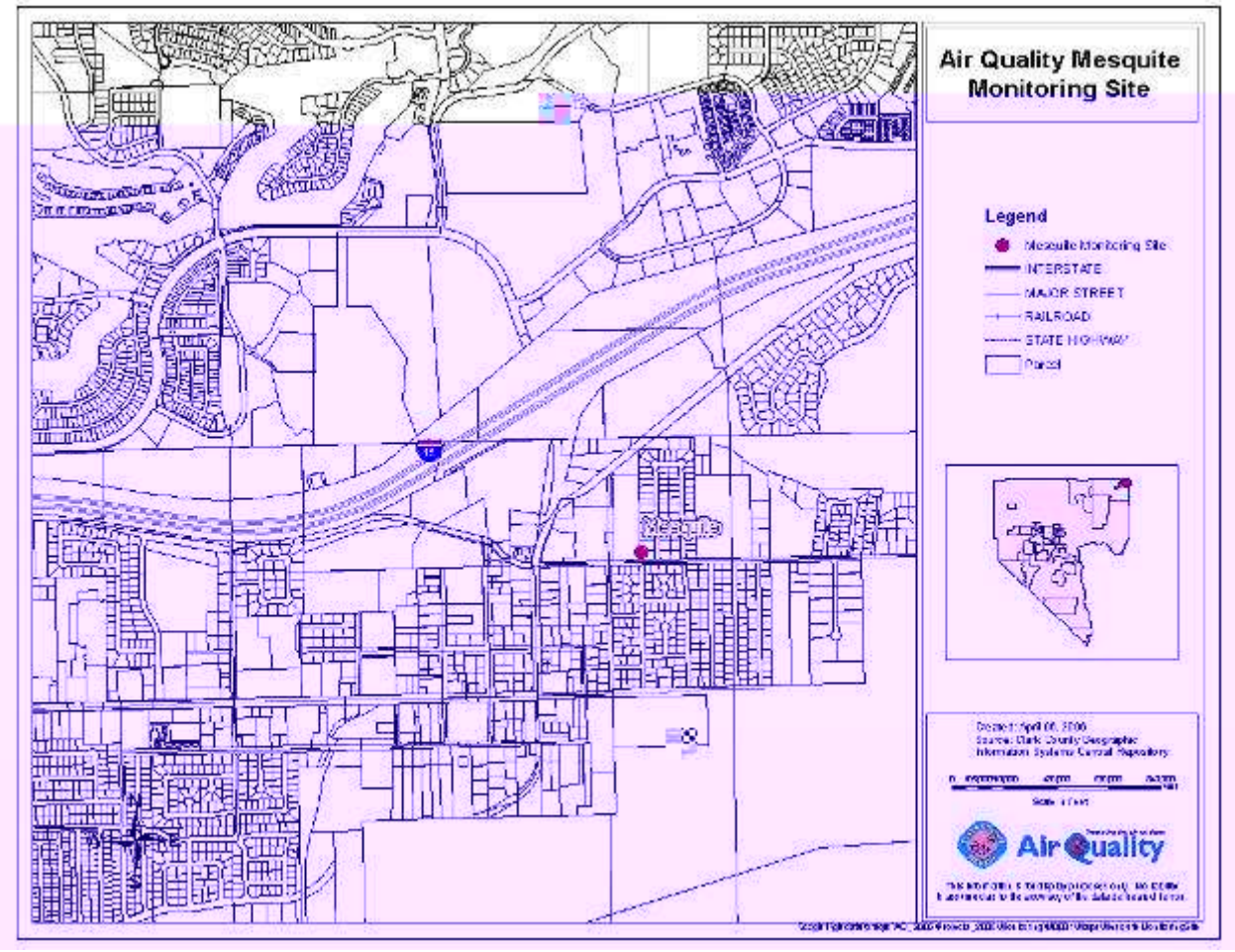


Figure 26 – Continuous PM_{10} Monitoring Locations in Jean

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



Continuous $PM_{2.5}$ Monitoring Locations

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

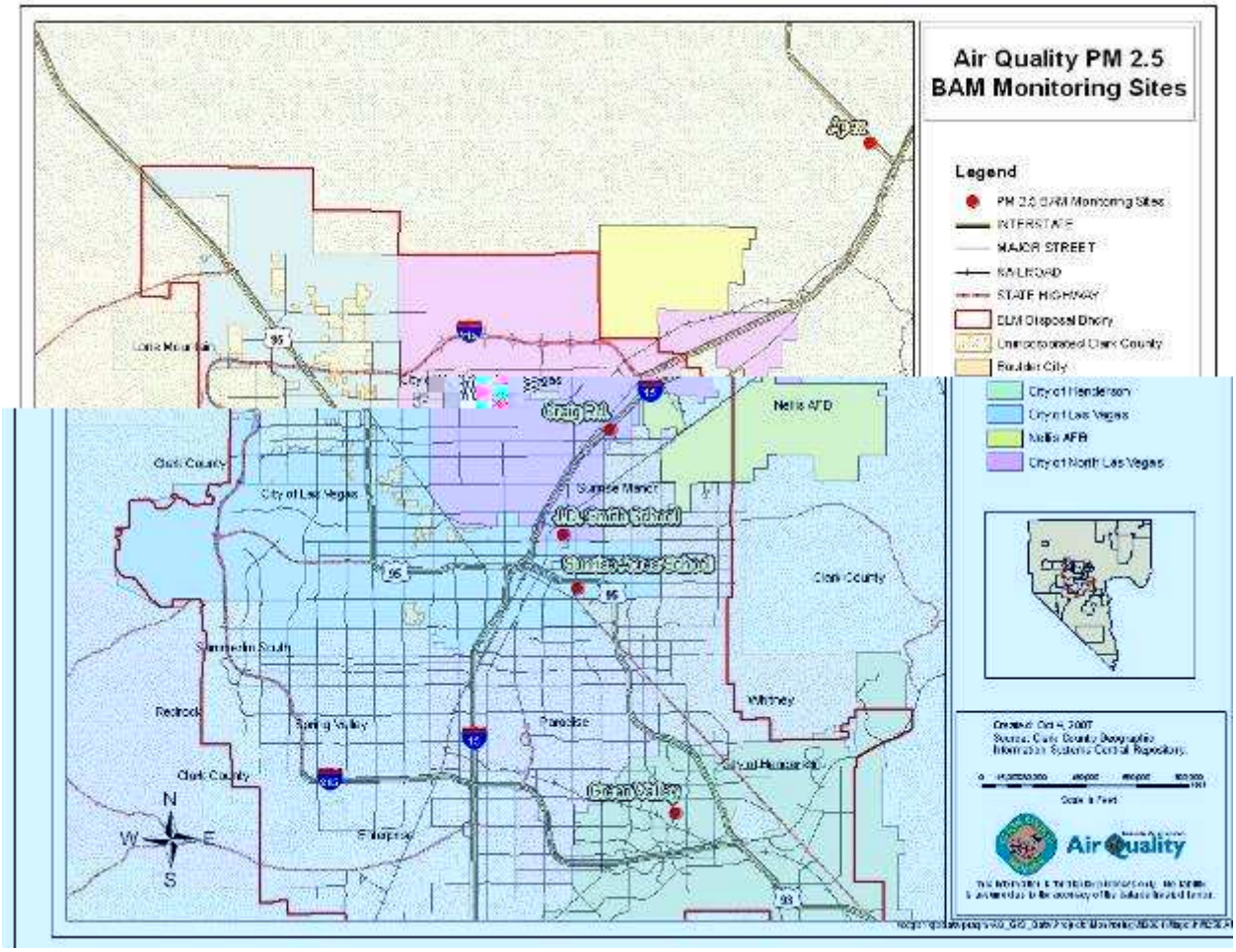


Figure 29 – Continuous $PM_{2.5}$ Monitoring Locations in Jean

Filter-Based $PM_{2.5}$ Monitoring Locations

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

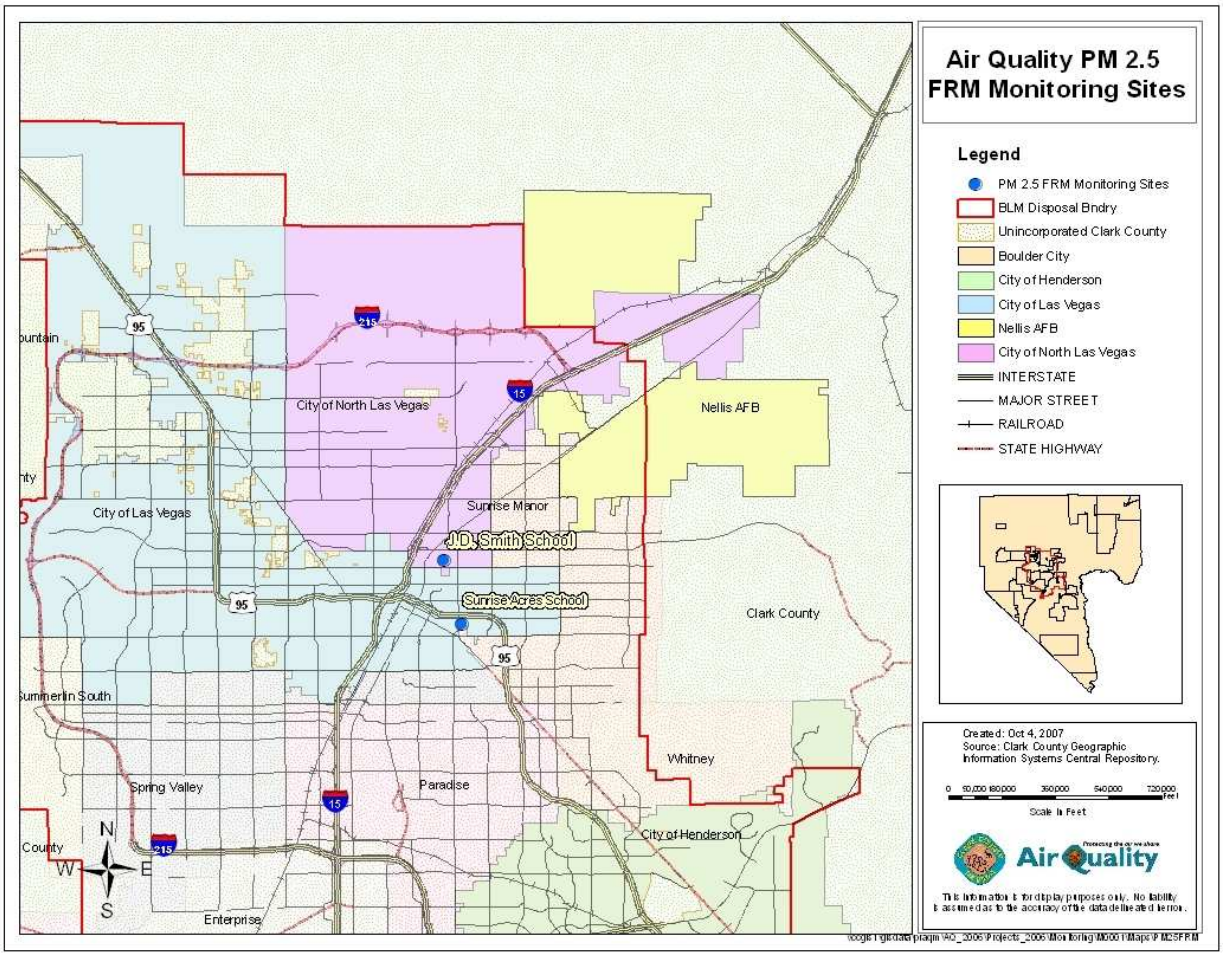


Figure 31 – Filter Based $PM_{2.5}$ Monitoring Locations in Jean

Effect of New Regulations on Air Monitoring

On November 12, 2008, EPA released the revised NAAQS for lead (Pb). Although Clark County does not have permitted Pb sources that emit one ton or more per year, it does have an urban area with a population of more than 500,000, so the county must monitor for Pb.

Clark County is currently investigating siting locations and sampling/analysis methods. The non-source-oriented site will be located to measure neighborhood scale Pb concentrations in an urban area. Clark County anticipates operating two Pb monitors at the same location, one as the primary and the second as a collocated sampler. The county plans to have non-source-oriented Pb monitoring operational by January 1, 2011.

On October 17, 2006, EPA released revisions to 40 CFR Parts 50, 53, and 58. This affected Clark County in a variety of ways. $PM_{2.5}$ monitoring changed immediately in terms of operating schedule, field blank data reporting, 24-hour NAAQS reporting, and filter recovery time. Other changes included PM QA/QC procedure revisions, new reporting requirements for the annual network plan, and implementation of an NCore site. DAQEM met several of these requirements immediately, and continues to address the others.

The minimum sampling requirement for the Sunrise Acres primary $PM_{2.5}$ sampler changed from daily to once every three days, the schedule on which the primary sampler now operates. The minimum sampling requirement for $PM_{2.5}$ collocated samplers changed from once every six days to once every twelve, but DAQEM has maintained the six-day schedule to ensure meeting the requirement for minimum data pairs. DAQEM operates all $PM_{2.5}$ FRM samplers except the collocated one once every three days.

With the exception of the $PM_{2.5}$ FRM samplers, the pollen samplers, the speciation sampler, and non-routine special studies, all monitoring instruments are operated continuously all year around.

DAQEM began reporting field blank data to the AQS in the first quarter of 2007.

DAQEM is planning for an NCore site in accordance with 40 CFR 58, Appendix D. The proposed location is the new monitoring station at Jerome Mack Middle School, which will eventually replace the East Sahara monitoring station.

Summary of Monitoring Requirements

40 CFR 58 dictates requirements for maintaining ambient air monitoring networks. The following requirements are continuously considered in the network design, resulting in the conclusions listed beneath each requirement.

1. Determine the highest concentration area in the network.
   - The area of highest annual average CO concentration is the East Sahara station at 4001 E. Sahara Ave.
   - The area of highest annual average O_3 concentration is the Joe Neal School at 6651 W. Azure Ave.
   - The area of highest annual average PM_{10} concentration is the Craig Road station at 4701 Mitchell St. in North Las Vegas.
   - 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 School at 1301b E. Tonopah.
   - The area of highest annual average SO_2 concentration is the East Sahara station at 4001 E. Sahara Ave.
2. Determine representative concentrations in areas of high population density.
   - City of Las Vegas
     - Annual average CO concentration is 0.7 ppm.
     - Annual average O_3 concentration is 0.037 ppm.
     - Annual average PM_{10} concentration is 38.55 $\mu g/m^3$.
     - Average $PM_{2.5}$ concentration is 10.37 $\mu g/m^3$.
     - Annual average NO_2 concentration is 0.017 ppm.
     - Annual average SO_2 concentration is 0.0002 ppm.
   - City of Henderson
     - Annual average CO concentration is negligible.
     - Annual average O_3 concentration is 0.033 ppm.
     - Annual average PM_{10} concentration is 20.37 $\mu g/m^3$.
     - Average $PM_{2.5}$ concentration is 6.65 $\mu g/m^3$.
     - Annual average NO_2 concentration is N/A.
     - Annual average SO_2 concentration is N/A.
   - City of Boulder
     - Annual average CO concentration is N/A.
     - Annual average O_3 concentration is 0.043 ppm.
     - Annual average PM_{10} concentration is 13.79 $\mu g/m^3$.
     - Average $PM_{2.5}$ concentration is N/A.
     - Annual average NO_2 concentration is N/A.
     - Annual average SO_2 concentration is N/A.
   - City of Mesquite
     - Annual average CO concentration is N/A.
     - Annual average Ozone concentration is 0.029 ppm.
     - Annual average PM10 concentration is 19.76 $\mu g/m^3$.

- Average PM2.5 concentration is N/A.
- Annual average NO_2 concentration is 0.006 ppm.
- Annual average SO_2 concentration is N/A.

3. Determine impacts of significant sources on air quality.
   - CO sources: vehicles, coal, industrial processes
     - Impact: zero exceedance days.
   - NO_2 sources: vehicles, coal, industrial processes
     - Impact: zero exceedance days.
   - SO_2 sources: coal
     - Impact: zero exceedance days.
   - $PM_{2.5}$ sources: coal, fugitive dust
     - Impact: zero exceedance days.
   - PM_{10} sources: coal, fugitive dust
     - Impact: 2 exceedance days in 2008.
4. Determine general background concentration levels.
   - Apex
     - O_3: 2008 average = 0.038 ppm
     - NO_2: 2008 average = 0.006 ppm
     - PM_{10}: 2008 average = 17 $\mu g/m^3$
     - $PM_{2.5}$: 2008 average = 5 $\mu g/m^3$
   - Jean
     - O_3: 2008 average = 0.041 ppm
     - PM_{10}: 2008 average = 12 $\mu g/m^3$
     - $PM_{2.5}$: 2008 average = 6 $\mu g/m^3$
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 result 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.

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 2008
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.

The Las Vegas area population is approximately two million.

State implementation and maintenance plans require no additional instrumentation.

Quality Assurance Program

The QA Officer conducted performance field evaluations throughout 2008. 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, and the single SO_2 instrument was audited before its removal from network service. The NO_x and NO_2 instruments residing at two sites were each evaluated, as were the five CO instruments. There were no failures.

Five $PM_{2.5}$ FRM RAAS samplers, a Speciation Air Sampling System (SASS), thirteen 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. Likewise, the FRM samplers are equipped with Very Sharp Cut Cyclone-A separators. Three RAAS sites (including Sunrise Acres, which hosts the precision pair) were evaluated eighteen times during 2008. Each operational RAAS and the SASS were audited quarterly. All continuous particulate monitors were evaluated semiannually.

Evaluations of audit sites were balanced across the calendar year. Any adjustments to the auditing schedule favored pollutant seasonality, i.e., more CO instruments were audited during the winter months and more O_3 instruments during the summer months. Audit evaluations used the transmutation values of slope/intercept created by calibration activity from the IPS MeteoStar Leading Environment Analysis and Display System (LEADS), DAQEM's DAS. 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 2008 gaseous and continuous particulate matter event schedule for internal QA performance evaluations.

Date	Pollutant	Monitoring Stations
3/18/2008	PM_{10}	Jean, Joe Neal
3/20/2008	PM_{10}	Lone Mountain
3/26/2008	PM_{10}	Craig Road, Sunrise Acres
5/12/2008	PM_{10}	Palo Verde
6/19/2008	PM_{10}	Orr, Paul Meyer
6/25/2008	PM_{10}	Boulder City, Green Valley, J.D. Smith
7/8/2008	PM_{10}	Joe Neal, Lone Mountain, Palo Verde
7/15/2008	PM_{10}	Apex, E. Craig Road
9/16/2008	PM_{10}	Jean
9/24/2008	PM_{10}	Mesquite, Sunrise Acres
11/6/2008	PM_{10}	Apex, Orr, Paul Meyer

Date	Pollutant	Monitoring Stations
11/10/2008	PM_{10}	Boulder City, Green Valley, J.D. Smith
3/18/2008	$PM_{2.5}$	Jean
3/26/2008	$PM_{2.5}$	E. Craig Road, Sunrise Acres
6/25/2008	$PM_{2.5}$	Green Valley, J.D. Smith
7/15/2008	$PM_{2.5}$	Apex, E. Craig Road
9/16/2008	$PM_{2.5}$	Jean
9/24/2008	$PM_{2.5}$	Sunrise Acres
11/6/2008	$PM_{2.5}$	Apex
11/10/2008	$PM_{2.5}$	Green Valley, J.D. Smith
3/3/2008	RAAS	Sunrise Acres
3/26/2008	RAAS	J.D. Smith
3/28/2008	RAAS	Jean
6/12/2008	RAAS	Jean, J.D. Smith, Sunrise Acres
9/16/2008	RAAS	Jean
9/24/2008	RAAS	J.D. Smith, Sunrise Acres
11/10/2008	RAAS	J.D. Smith
12/31/2008	RAAS	Jean, Sunrise Acres
3/27/2008	CO	E. Sahara
5/13/2008	CO	Winterwood
12/22/2008	CO	Orr, Sunrise Acres
12/24/2008	CO	J.D. Smith
3/18/2008	O_3	Jean, Joe Neal
3/20/2008	O_3	Lone Mountain
5/13/2008	O_3	Winterwood
6/24/2008	O_3	Orr
6/25/2008	O_3	Boulder City
7/8/2008	O_3	Joe Neal
11/24/2008	O_3	Palo Verde, Walter Johnson
11/25/2008	O_3	Apex, E. Craig Road, Mesquite
12/8/2008	O_3	J.D. Smith, Paul Meyer
3/20/2008	NO_2	Joe Neal
12/23/2008	NO_2	Joe Neal
12/24/2008	NO_2	J.D. Smith
3/28/2008	SO_2	E. Sahara

The speciation SASS is grant-funded, and DAQEM operates it as an informational adjunct to the ambient sampling network. Because it is not a dedicated sampling site in the Chemical Speciation Network, DAQEM can move the SASS (with permission) to support special project initiatives throughout the county. In 2008, all sampling events took place at the E. Craig Road site; performance evaluation dates were 3/26/2008, 6/10/2008, 7/15/2008, and 12/31/2008.

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 the 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 2008.

The following table shows the 2008 TTP event schedule.

Monitoring Station	Pollutant	TTP Conducted
Boulder City	O_3	4/24/2008
Apex	O_3	4/25/2008
East Sahara	CO, O_3, NO_2	4/30/2008
Mesquite	O_3	5/1/2008

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 2008 PEP audit event activity.

$PM_{2.5}$ Sampler Location	Date of PEP Audit
Jean	1/31/2008
Jean	5/1/2008
Jean	8/7/2008
Jean	11/16/2008

Network Modifications Completed in 2008

The following table summarizes network changes in 2008.

Action	Date	Reason
Terminated O_3 and PM_{10} operations at southeast valley site	January 2008	Site closed, deemed unsafe.
Commenced NO_2 operations at Joe Neal site	January 2008	Support modeling efforts of Planning Section.
Terminated NO_2 operations at Apex site	January 2008	NO_2 monitoring no longer required.
Terminated NO_2 operations at Mesquite site	January 2008	NO_2 monitoring no longer required.
Terminated NO_2 operations at East Sahara site	January 2008	NO_2 monitoring no longer required.
Terminated NO_2 operations at Palo Verde site	January 2008	NO_2 monitoring no longer required.
Terminated SO_2 operations at East Sahara site	March 2008	SO_2 monitoring no longer required.
Terminated PM_{10} BAM operation at Walter Johnson site	January 2008	Servicing of monitor deemed unsafe.
Terminated PM_{10} BAM operations at East Sahara site	January 2008	Servicing of monitor deemed unsafe.

DAQEM resolved the following 2008 siting compliance issues in 2009:

1. Increased length of ozone sampling probe at Orr monitoring station to meet “distance from support structure” requirements.

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.

In addition to regulatory, technical, and financial reasons for air monitoring site and equipment terminations, logistical issues, such as expired leases, leases due to expire, and related items, DAQEM may be required to terminate sites or equipment beyond what is specifically listed below.

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 Sunrise Acres, J.D. Smith, and Jean sites	To be determined	Anticipation of ARM or continuous $PM_{2.5}$ FEM
CO monitoring at J.D. Smith, Orr, and Winterwood sites	To be determined	No EPA requirement for CO monitoring
O_3 monitoring at Orr and Winterwood sites	To be determined	EPA requires only two sites for O_3 monitoring; shutting down these sites will still leave 11 in operation

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 at Sunrise Acres, J.D. Smith, and Jean sites. In 2008, DAQEM maintained operations in the $PM_{2.5}$ FRM filter-based network to match the grant level of funding. If the $PM_{2.5}$ FRM filter-based network is reduced or discontinued, DAQEM will continue to keep using, and applying for, grant funding based on activities outside the FRM network, including $PM_{2.5}$ BAM operations, $PM_{2.5}$ speciation sampler operation, and $PM_{2.5}$ ARM efforts. The criteria in 40 CFR 58.14(c)(3) comprise DAQEM's justification for discontinuing filter-based $PM_{2.5}$ FRM samplers altogether. DAQEM will still operate the continuous $PM_{2.5}$ BAMs at these locations. Furthermore, DAQEM is anticipating an Approved Regional Method (ARM) designation or continuous $PM_{2.5}$ Federal Equivalent Method (FEM) designation on the BAMs in 2009.

CO monitoring at J.D. Smith, Orr, 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 and Winterwood 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. DAQEM will continue to monitor O_3 in the urban core, high-concentration areas, background areas, and other areas to characterize transport. Shutdown of these two sites would leave eleven in operation.

Proposed Relocations and Installations

Relocation/Installation	Date	Explanation
East Sahara	2010	Moved from private property to Jerome Mack Middle School
E. Craig Road	2010	Moved SASS from E. Craig Road to Jerome Mack Middle School to support NCore operations; received carbon channel upgrade
Apex	2010	Installed SODAR to provide upper air data, facilitate O_3 forecasting & transport
Center of northern part of valley–O_3	2011	Add to fill spatial monitoring gap
Southwest part of valley–PM_{10}	2011	Add to fill spatial monitoring gap
Coyote Springs–PM_{10} and O_3	2011	Add to fill spatial monitoring gap, assess downwind & area source PM_{10} levels, and analyze O_3 transport issues
Indian Springs	2011	Add to fill spatial monitoring gap and support O_3 study recommendations
Laughlin–O_3 and PM_{10}	2011	Add to fill spatial monitoring gap and assess upwind pollution levels

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 exttension 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 this site to Jerome Mack Middle School, less than a mile from the current site, by 2010. DAQEM proposes that the new site also be used for NCore operations.

E. Craig Road. The speciation sampler will be moved from the Craig Road monitoring station to Jerome Mack Middle School in 2010 to support NCore operations. In addition, as part of the nation wide speciation network enhancement, Clark County is expecting a carbon channel upgrade from EPA in 2009.

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 out-flow from the Las Vegas Valley, and help in evaluating pollution transport issues.

North-central Valley. DAQEM anticipates installing an O_3 monitoring station in this location to fill a spatial monitoring gap where transport may cause elevated readings.

Southwest Valley. DAQEM anticipates installing a PM_{10} monitoring station in this location to fill a spatial monitoring gap where there is evidence of elevated pollutant levels.

Coyote Springs. DAQEM anticipates installing an O_3 and PM_{10} monitoring station in this area to fill a spatial monitoring gap, to assess downwind and area-source PM_{10} levels, and to analyze issues related to ozone transport.

Indian Springs. DAQEM anticipates installing an O_3 monitoring station in this area because of recommendations from CCROPS, which showed high O_3 levels in this area. This proposed monitoring station56417(o)-0.956417(.47944-0.956417()-2.53536(l)-2.70292(i)-0.478208()-2.53536(l(-)2.3678

Migration to New Data Acquisition System

DAQEM purchased a new DAS in 2006, conducted side-by-side comparisons on both systems for over a year, and switched to the new DAS on April 1, 2008. The chosen vendor was IPS MeteoStar, whose LEADS Environmental Management System (EMS) collects, integrates, and processes meteorological and air pollution data. The system displays data in near real-time using the Windows operating system; some of its most useful features are described in the following paragraphs.

Data Display. LEADS EMS can display up to a year's worth of data at a time. The system makes both the five-minute and hourly average data sets available for viewing and editing. Tools are available for creating roses that combine wind and pollution data; forward and backward trajectory maps can be created to locate emissions sources. Four types of roses are available: wind, average concentration, maximum concentration, and percentile. All can be displayed in either graphic or table format.

Automated QA/QC. Instrument challenges and calibrations are automatic to ensure optimum performance. Calibration sequences run periodically, or when a change is made to the equipment, to establish a new slope and intercept. Span check sequences run weekly to account for instrument drift. QC checks include the following:

1. Completeness test.
2. Voltage outlier.
3. Concentration outlier.
4. Concentration spacing.
5. Slope/intercept checks.
6. Precision/linearity checks.
7. Zero/span checks.
8. NO_2 converter efficiency check.
9. SO_2 scrubber efficiency check.
10. Limit checks.

Hourly Air Quality Index (AQI). LEADS EMS generates regional AQI reports showing current conditions each hour through a graphical user interface. Updated AQI maps indicate current conditions in each box, and are colored according to parameter concentration. Small boxes indicate other parameters monitored in the area. Each AQI box represents all monitoring stations in the area.

Meteorological Data. LEADS provides users with full access to satellite, radar, and other weather features, integrating full meteorological data into its display. This enables the user to make a complete evaluation of the current or future state of the environment, including air quality.

Data Validation. To relay and display the most accurate data for public access, EMS automatically screens data at time of arrival and only adds it to averaged data if it passes the first automatic check. Data is then manually validated using system tools. Validators must have certain

permissions to edit or flag data; after data is inspected, the data validator must sign off that the data has been manually validated. Data validation is a key step in collecting data that complies with regulatory standards.

Ozone Products. LEADS EMS generates various types of ozone measurements, including the four highest 8-hour ozone concentrations, daily maximum 8-hour average, and 8-hour ozone high-value days. LEADS also offers an ozone potential forecast that takes likely ozone development conditions into account.

Site File Info. Each monitoring site has web-based files that contain current conditions and site information, including aerial photos and maps, site pictures, monitoring status, parameters monitored at that station, and monthly and current reports for parameter concentrations.

Reports. Various reports can be generated automatically or manually. These reports can be useful for tracking system performance, referencing data, or troubleshooting.

Data Archives. EMS has a web-based database query page that keeps all current and historical data online and available for viewing all the time. Users can generate a specialized data report by selecting a parameter, date, and site.

DAQEM is considering some DAS upgrades that would allow it to better serve customers' needs. Some of the proposed upgrades and support functions are:

- Web page development and modification.
- Hardware and software requirements for NCore monitoring.
- Vendor technical support.

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.

Status of Lease Issues for Monitoring Sites (March 2009)

Site	Documentation	Owner	Terms	Status of Negotiations
Apex	Agreement	BLM	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		Complete
Craig Road	Agreement	L&M Holding	Letter allowing trailer on site signed by property owner	Complete
East Sahara	Lease	Maycliff Storage	6/30/07	Site being relocated to Jerome Mack Middle School
Green Valley	Agreement	City of Henderson	Ended 3/15/96	Agreement with City of Henderson Attorney
J.D. Smith	MOU	Clark County School District	5/10/10	Complete
Jean	ROW grant/ Temp. Use Permit	BLM	6/22/09	Complete
Joe Neal	MOU	Clark County School District	5/10/10	Complete
Lone Mountain	No agreement	Water District	New interlocal agreement is pending and will terminate 12/31/15	Water District seeking board approval for new agreement
Mesquite	Agreement	City of Mesquite	4/30/06	County sent revised agreement to Mesquite Director of Public Works; Mesquite has not signed agreement
NLV Airport	Agreement	Clark County Department of Aviation	10/19/10	Complete
Orr	MOU	Clark County School District	5/10/10	Complete
Palo Verde	MOU	Clark County School District	5/10/10	Complete
Paul Meyer	Agreement	Clark County	4/14/14	Complete
Sunrise Acres	MOU	Clark County School District	5/10/10	Complete

Site	Documentation	Owner	Terms	Status of Negotiations
Walter Johnson	MOU	Clark County School District	5/10/10	Complete
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
East Craig Road	O_3	Neighborhood	Population exposure
East Craig Road	PM_{10} C-14	Neighborhood	Highest concentration
East Craig Road	$PM_{2.5}$ C-14	Neighborhood	Population exposure
East 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	FRM $PM_{2.5}$	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	FRM $PM_{2.5}$	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	FRM $PM_{2.5}$	Neighborhood	Highest concentration
Sunrise Acres	FRM $PM_{2.5}$	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 and O_3 have remained steady over the past few years, CO and PM have declined, and SO_2 has remained insignificant.

Figure 32 – Carbon Monoxide Trends

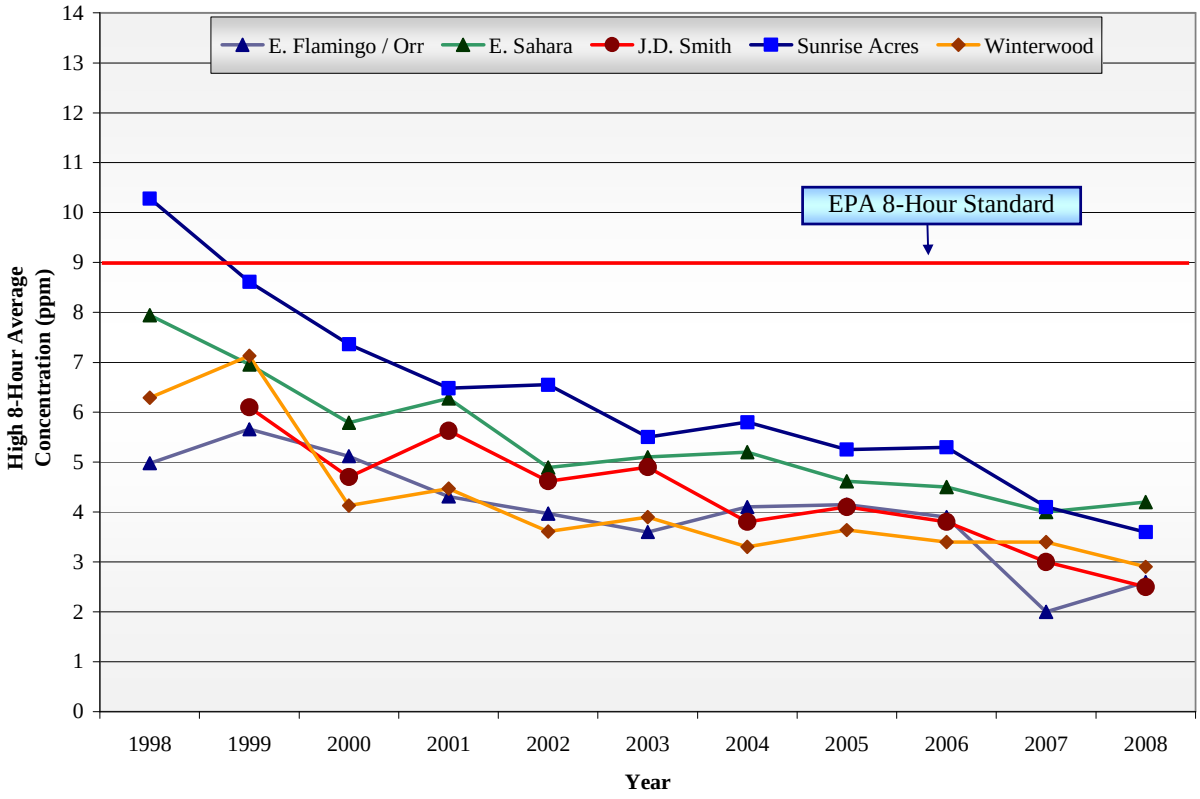


Figure 33 – Ozone Trends

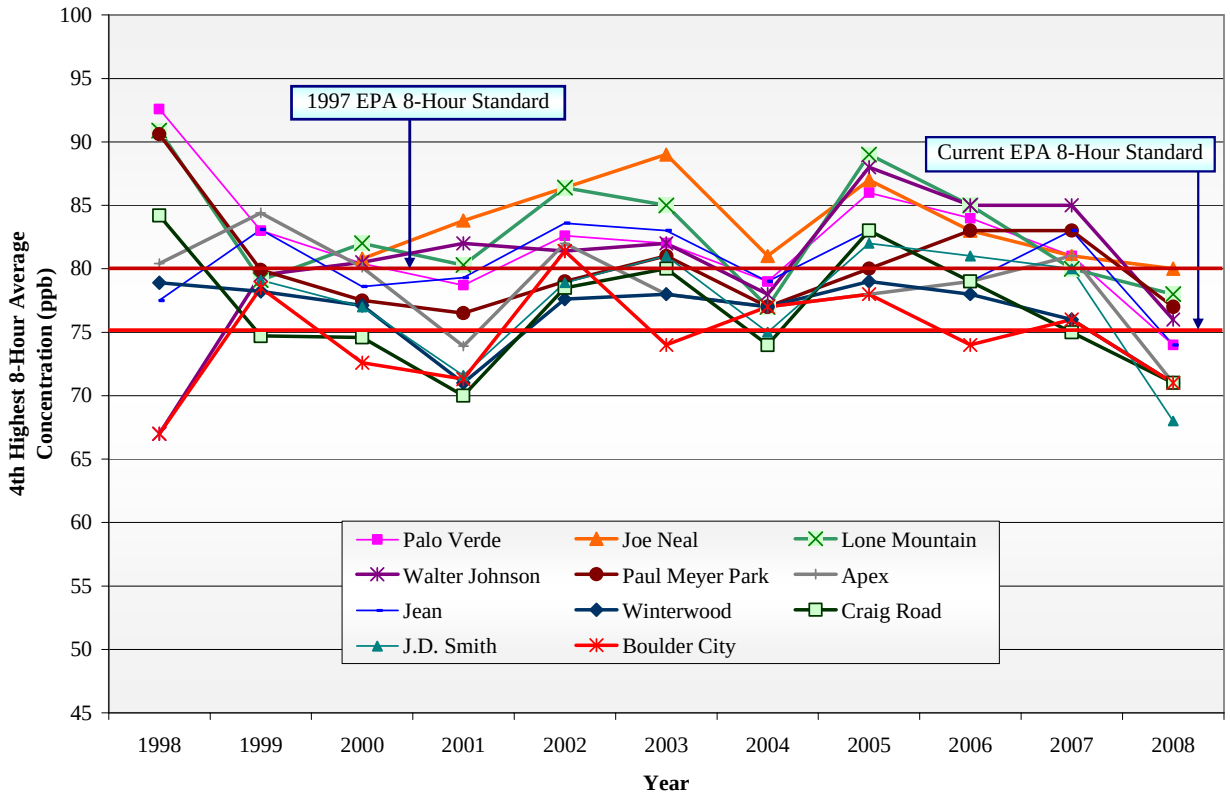


Figure 34 – SO_2 Trends

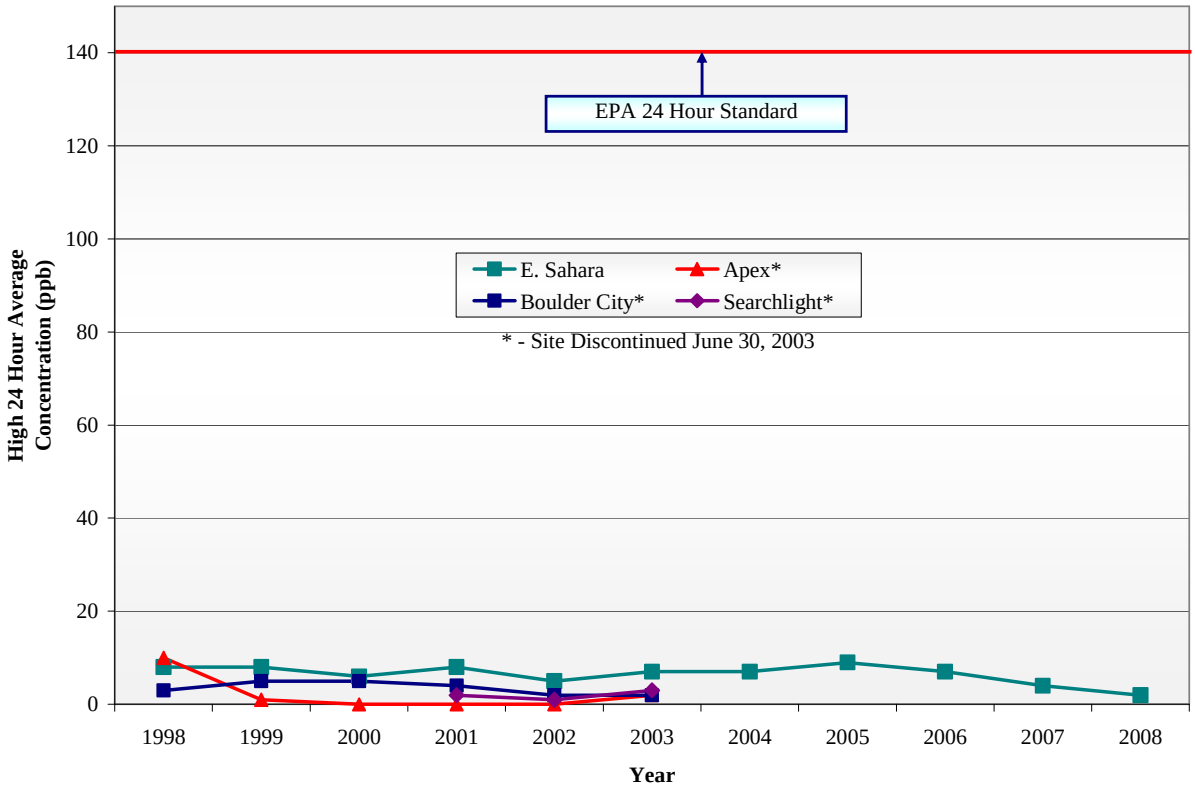


Figure 35 – NO_2 Trends

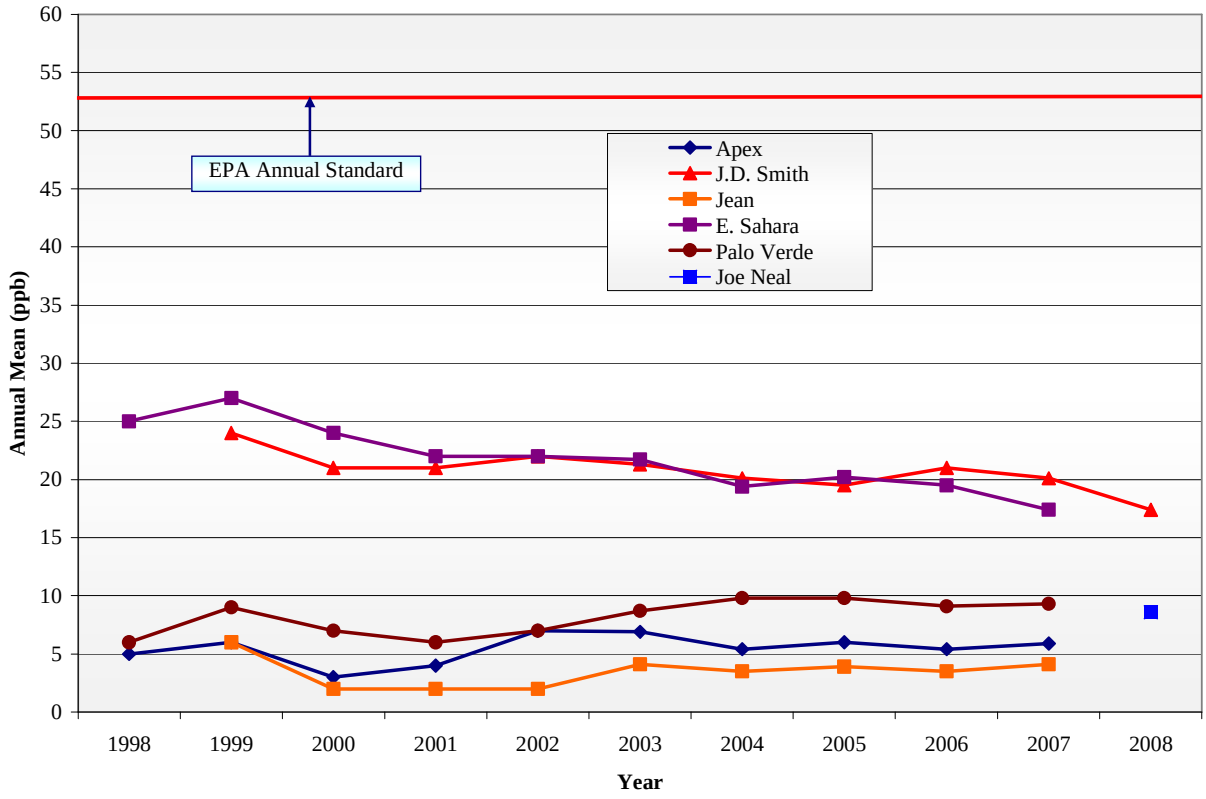


Figure 36 – Continuous PM_{10} Trends

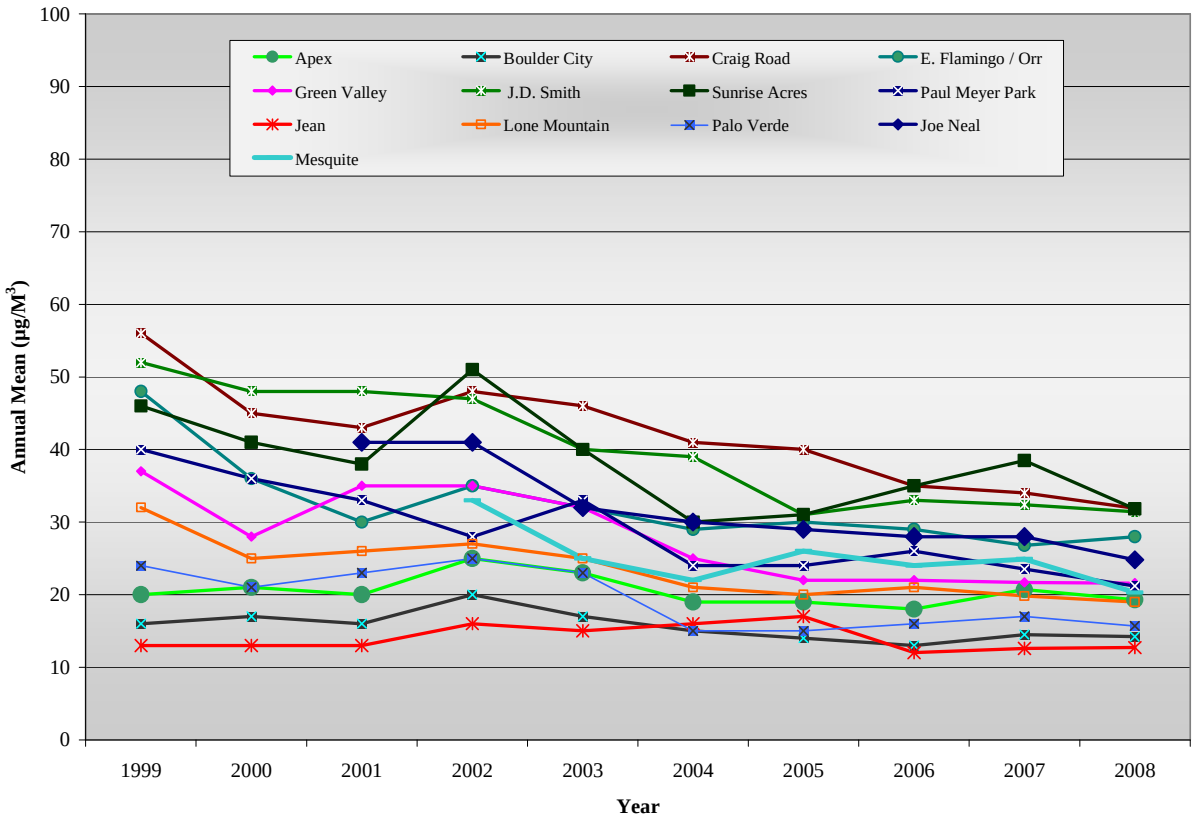


Figure 37 – Filter-Based $PM_{2.5}$ FRM Trends

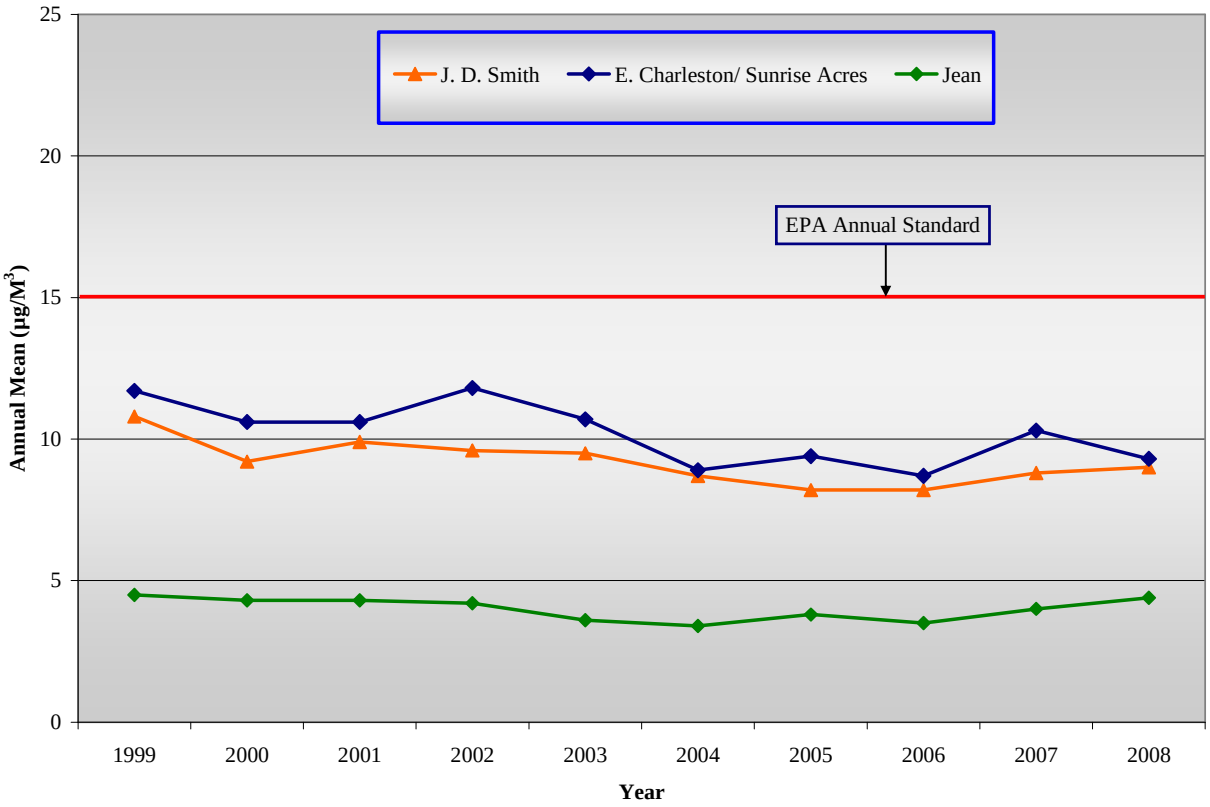


Figure 38 – Continuous $PM_{2.5}$ Annual Mean Trends

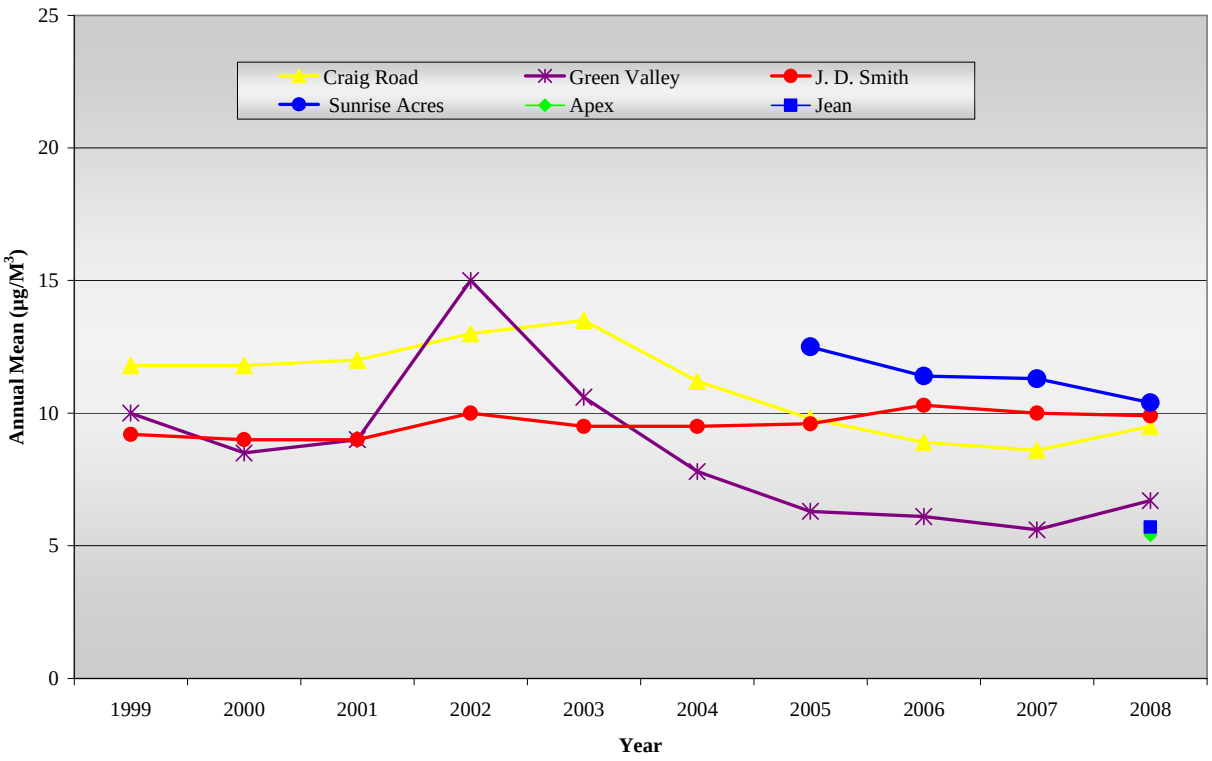
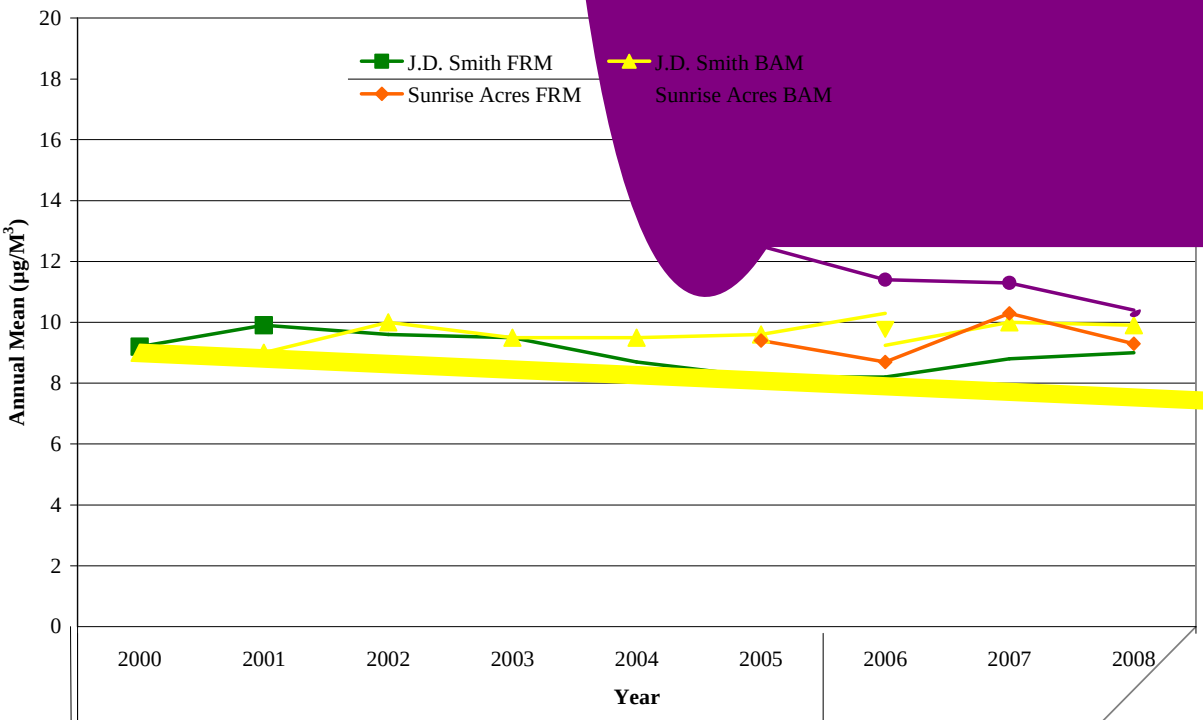


Figure 39 – Continuous vs. Filter-Based PM



Pollen Network

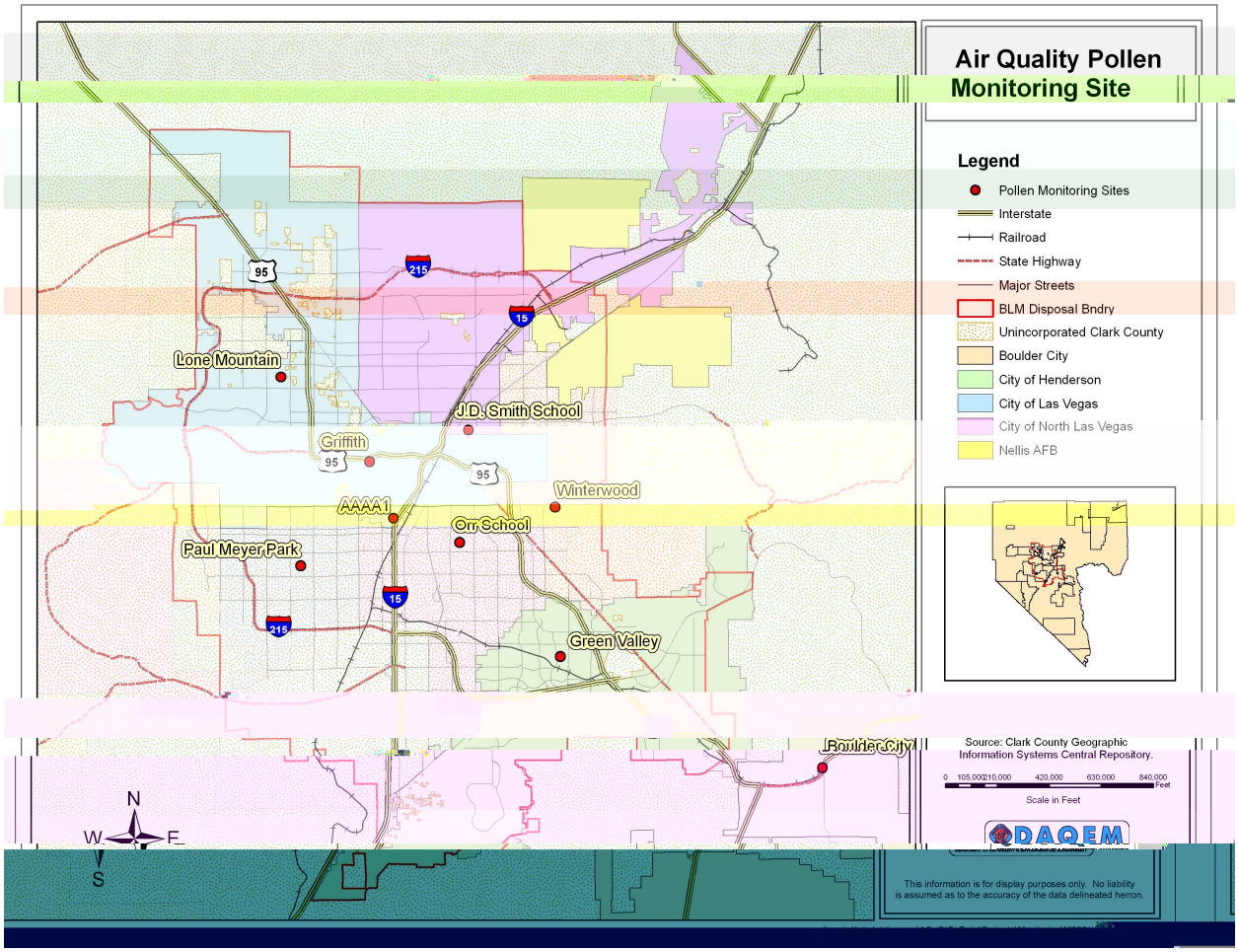
The pollen network, which is separate from the NAAQS network, is a unique local service DAQEM provides to Clark County residents. It is included in this report for DAQEM use and future reference.

DAQEM operated nine pollen monitoring stations in Clark County during 2008, 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 during the winter reporting period, typically from September through January. The remaining 10 stations report data to the public once a week from February through August.

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



NCore Quality Assurance Project Plan

The NCore Quality Control and Assurance System (QCAS) is part of the DAQEM quality system. Quality system documents include the Quality Management System, Criteria Gaseous Pollutant QCAS, Continuous PM QCAS, Filter-Based PM QCAS, and Meteorological Sensors QCAS.

The NCore QCAS is submitted bound separately as an attachment to this document.