Clark County
Department of Air Quality

Annual Network Plan Report
June 2012

Executive Summary

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

The plan focuses on network changes in 2011, changes and improvements planned for 2012, efforts to improve data quality, and the ways in which network data is disseminated.

The 2011 network review identified potential deficiencies at two monitoring stations, along with options for correction. The shortcomings were associated with "obstacle distance," and the "Siting Criteria Deficiencies" section contains an implementation schedule for corrective actions.

In addition to network plan requirements, the U.S. Environmental Protection Agency finalized revisions to the ambient air monitoring requirements for lead on January 26, 2011; revised the National Ambient Air Quality Standard (NAAQS) for sulfur dioxide on June 2, 2010; revised the NAAQS for nitrogen dioxide on January 22, 2010; and retained the carbon monoxide NAAQS on August 12, 2011. In addition, this plan discusses the requirement to operate a National Core Monitoring Network station and regulation changes that affect Clark County and its compliance status.

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Acronyms and Abbreviations

Acronyms	
AQS	Air Quality System
BAM	Beta Attenuation Monitor
CFR	Code of Federal Regulations
Air Quality	Clark County Department of Air Quality
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
HA	Hydrographic Area
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Monitoring Station
NCore	National Core Monitoring Network
NPAP	National Performance Audit Program
PEP	Performance Evaluation Program
TAD	Technical Assistance Document
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAAS	Reference Ambient Air Sampler
SASS	Speciation Air Sampling System
SODAR	sonic detection and ranging
SLAMS	State and Local Air Monitoring System
TTP	Through-the-Probe
URG	University Research Glassware
UTM	Universal Transverse Mercator
VSCC	Very Sharp Cut Cyclone

Abbreviations	
CO	carbon monoxide
m	meter
mb	millibar
mph	miles per hour
$\mu g/m^3$	micrograms per cubic meter
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NO_Y	total reactive nitrogen
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

1 Introduction

This document serves as a review of the current Clark County Department of Air Quality (Air Quality) air monitoring network and a plan for future network 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 aero-dynamic diameter ($PM_{2.5}$) meets the design value standard.
7. Identification of ozone (O_3) monitoring sites as they compare to the 2011 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 2011.
11. Identification of projected network changes during calendar year 2012 and beyond.
12. Description of plans to correct guidance conflicts.

During 2011, the following conditions existed:

1. Air Quality operated monitoring instruments to measure ambient concentrations of the following criteria pollutants: continuous and filter-based $PM_{2.5}$, continuous PM_{10}, O_3, carbon monoxide (CO), nitrogen oxides (NO, NO_2, NO_x, NO_Y), and sulfur dioxide (SO_2).

2. Air Quality operated under a quality-assured system. EPA approved a $PM_{2.5}$ QA Project Plan (QAPP) on February 2, 1999. EPA approved a gaseous QAPP for CO, NO_2, O_3, and SO_2 on December 7, 2007. A revised quality system that included a Quality Management Plan and QAPPs for gaseous compounds (CO, NO_2, O_3, and SO_2), continuous PM (PM_{10} and $PM_{2.5}$), filter-based PM ($PM_{2.5}$), and meteorology were submitted on December 30, 2008. An NCore QAPP was submitted on April 28, 2009, and a revised lead (Pb) QAPP was submitted on June 30, 2011. The quality system is being revised to address findings in the 2009 Technical Systems Audit performed by Region 9 of the U.S. Environmental Protection Agency (EPA). In addition, the quality system is continually being improved and revised.

3. Air Quality operated visibility instrumentation at North Las Vegas Airport as a special project.

4. Air Quality operated with the following program objectives:
   a. Ensure that the network is monitoring representative data, and that geographical and population factors are considered in managing the network.
   b. Make monitoring data readily accessible to EPA, regional and national air quality agencies, the general public, and stakeholders.

c. Monitor visibility using visibility cameras.
d. Review analyzer placement for O_3 boundaries, considering formation and transport.
e. Improve forecasting methods for O_3, PM_{10}, and $PM_{2.5}$.
f. Make efforts to update and maintain monitoring equipment.

5. Parts of Clark County are designated nonattainment for two criteria pollutants: PM_{10} in Hydrographic Area (HA) 212, and O_3 in HAs 164A, 164B, 165, 166, 167, 212, 213, 214, 216, 217, and 218.
   a. The Las Vegas Valley (HA 212) was designated nonattainment for PM_{10} in the late 1980s, and in 1993 was reclassified as "serious" nonattainment under the 1990 National Ambient Air Quality Standards (NAAQS) for PM_{10}. Since the end of 2006, however, Clark County has maintained compliance with the 1990 PM_{10} NAAQS. Air Quality is developing a *PM_{10} Request for Redesignation and Maintenance Plan* for submittal to EPA in 2012. In addition, exceptional event demonstration packages have been submitted to EPA for two events in February and May of 2008.
   b. In April 2004, parts of Clark County were designated nonattainment for the 1997 O_3 NAAQS. Based on 2009–2011 monitoring data, Clark County is in compliance with the 1997 O_3 NAAQS and "unclassifiable/attainment" under the 2008 O_3 NAAQS.
   c. The Las Vegas Valley was designated "moderate" nonattainment for the 1990 CO NAAQS in 1997, and in 2000 redesignated "serious" nonattainment. In June 2005, EPA determined that the Las Vegas Valley had attained the CO NAAQS by the applicable date of December 31, 2000, making the area eligible to submit a request for redesignation to attainment status. In 2008, Air Quality prepared and submitted the *CO Request for Redesignation and Maintenance Plan*, which EPA approved in September 2010. Clark County is thus now designated a maintenance area for CO.
   d. Clark County is in attainment for $PM_{2.5}$, NO_2, and SO_2.
   e. According to the 2008 Pb NAAQS, the whole state of Nevada (including Clark County) is categorized as unclassifiable/attainment.

Below is a picture of the Engineering Division, which includes the Air Quality Monitoring and Quality Assurance Team. From left to right: Christian Francis, Management Analyst II; Mickey Palmer, Senior Air Quality Monitoring Technician; Pravin Pema, Air Quality Monitoring Technician II; Matt Nelson, Air Quality Monitoring Technician II; Mike Sword, Air Quality Engineering Manager; Mickey Turner, Senior Air Quality Monitoring Technician; Yousaf Hameed, Air Quality Monitoring Supervisor; David Dickens, Air Quality Monitoring Technician II; Brandon Cunningham, Air Quality Supervisor; Phil Wiker, Senior Air Quality Monitoring Technician; Kris Simonian, Air Quality Monitoring Technician II; Joe Biebrich, Air Quality Monitoring Technician II; and Gregory Weber, Senior Office Specialist (not pictured).

2 Network Review Methodology

This annual monitoring network plan report was written, and the monitoring network was planned, in accordance with EPA's guidance on the National Air Monitoring System (NAMS) and the State and Local Air Monitoring System (SLAMS), "SLAMS/NAMS/PAMS Network Review Guidance," published in 1998 (EPA-454/R-98-003). The report team included the monitoring supervisor, field technicians, data management specialist, planning staff, QA technician, and managers.

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

1. Evaluated each station for pathway and probe siting criteria compliance.
2. Reviewed Air Quality System (AQS) reports.
3. Reviewed topographical maps.
4. Reviewed historical trends in the monitoring network.
5. Reviewed National Weather Service climate resources.
6. Studied traffic count reports prepared by the Nevada Department of Transportation.
7. Reviewed lease agreements.
8. Calculated design values for O_3 and $PM_{2.5}$.
9. Reviewed recommendations from the 2010 Network Assessment.

3 Metropolitan Statistical Area

Each monitor operated by Air Quality is contained within Clark County and the Las Vegas-Paradise Metropolitan Statistical Area (40 CFR 81).

4 Climatological Information

Information in this section was taken from the National Weather Service’s Las Vegas climate book (“Climate of Las Vegas, Nevada,” updated October 2011).

4.1 Topography and History

Las Vegas is located in a broad desert valley in extreme southern Nevada. Mountains surrounding the valley extend 2,000–10,000 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 the outflow of the Las Vegas Wash into Lake Mead is generally considered its eastern 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 southern rim of the valley, including the Muddy Mountains, the Black Mountains, and the Eldorado Range.

Official weather observations began in 1937 at what is now Nellis Air Force Base. In late 1948, the U.S. Weather Bureau moved to McCarran Field, now McCarran International Airport, which is located 7 miles south of downtown Las Vegas. For most of the Las Vegas metropolitan area, the valley floor slopes downward from west to east. This affects the local climatology significantly by driving variations in wind, precipitation, and storm runoff.

4.2 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 100ºF, with lows in the 70s. The summer heat is tempered somewhat by extremely low relative humidity. However, it is not uncommon for humidity to increase 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 desert thunderstorms, which are frequently associated with significant flash flooding and/or strong downburst winds. On average, sunny days are recorded 85 percent of the time, and there are over 300 days per year with no measurable rainfall.

Winters, on the whole, are mild and pleasant. Afternoon temperatures average near 60ºF 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. Freezing temperatures do occur with some regularity each year, with a 30-year average of 24 days having low temperatures at or below 32ºF. Snowfall is common in the mountains surrounding Las Vegas, with the Spring Mountains receiving between 5–10 feet annually.

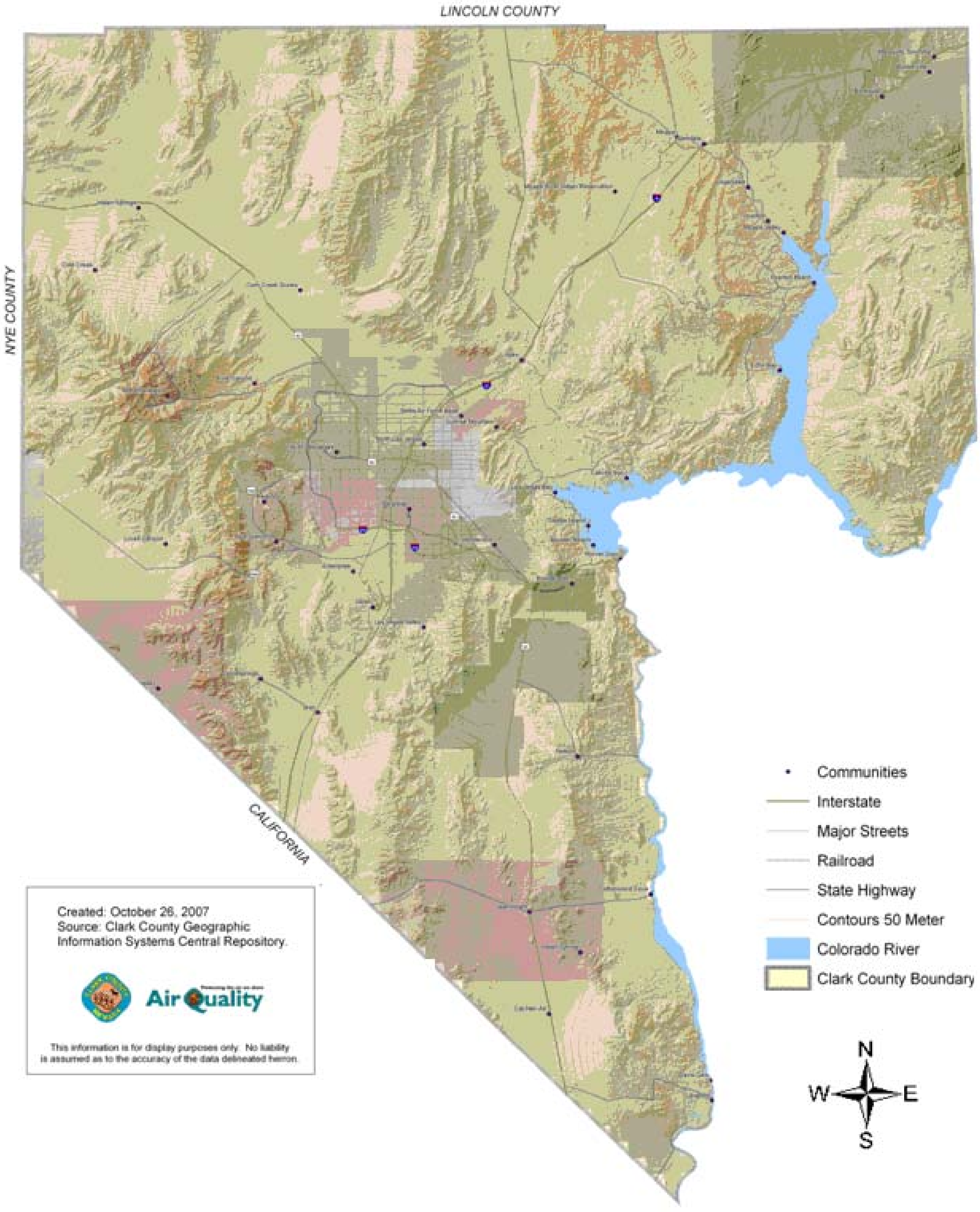
Spring and fall are generally considered ideal for outdoor activities. Temperatures can change sharply during these seasons, but seldom enough to hamper these activities.

Strong winds are arguably the most persistent weather hazard experienced in the area. Winds over 50 miles per hour (mph) are infrequent, but can occur with some of the more 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 more isolated and localized. Prevailing wind direction is typically either southwest or north unless associated with a thunderstorm outflow.

4.3 Synoptic Meteorology

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

Figure 1: Clark County Topographic Map.



5 Ambient Air Quality Monitoring Methodology

Air Quality operated 13 monitoring stations, including two seasonal O_3 monitoring stations, in Clark County during 2011. Monitor types vary from station to station. The network consists primarily of State and Local Air Monitoring Stations (SLAMS) that have a neighborhood-scale focus intended to assess the exposure levels of the general population. The network, which also characterizes pollution transport, ambient background, and trace levels, contains subnetworks for the criteria pollutants PM_{10}, $PM_{2.5}$, CO, O_3, SO_2, and NO_2.

5.1 Continuous Particulate Matter Monitors

The sampling method employs the continuous Thermo Electron FH62C14 series monitor, which uses carbon-14 as the beta source. All continuous $PM_{2.5}$ monitors have a Very Sharp Cut Cyclone (VSCC) as their second-stage separator.

5.1.1 Particulate Matter of Ten Microns or Less

Air Quality operated eight continuous PM_{10} monitors in Clark County in 2011, six inside the Las Vegas Valley and two outside it. The "Continuous PM_{10} Monitors" map (Figure 20) graphically illustrates this network.

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

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

Site	Spatial Scale	Objective
Green Valley	Middle	Population exposure
Palo Verde	Middle	Population exposure
Jean	Regional	Background
All others	Neighborhood	Population exposure

5.1.2 Particulate Matter of 2.5 Microns or Less

In 2011, Air Quality operated four continuous $PM_{2.5}$ monitors in Clark County. The "Continuous $PM_{2.5}$ Monitors" map (Figure 21) graphically illustrates this network.

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

Site	Spatial Scale	Objective
J.D. Smith	Neighborhood	Population exposure

Sunrise Acres	Neighborhood	Highest concentration
Green Valley	Middle	Population exposure
Jean	Regional	General/background

5.2 Filter-Based Particulate Matter Samplers

The $PM_{2.5}$ Federal Reference Method (FRM) and $PM_{2.5}$ speciation samplers, the latter of which include the Met One Speciation Air Sampling System (SASS) and the University Research Glassware (URG) carbon channel sampler, are the only filter-based monitoring instruments Air Quality employs. The "Filter-Based $PM_{2.5}$ Samplers" map (Figure 22) graphically illustrates the $PM_{2.5}$ FRM monitoring network. Sampling methodology employs the filter-based FRM Andersen Model 300 Reference Ambient Air Sampler (RAAS).

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

5.2.1 Particulate Matter of 2.5 Microns or Less

The table below lists the four filter-based $PM_{2.5}$ FRM samplers (including a collocated one) that Air Quality operated in 2011.

Site	Schedule
Sunrise Acres	One in three days
Sunrise Acres (collocated)	One in six days
Jean	One in three days
Jerome Mack	One in three days

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

In accordance with 40 CFR 58.30, Air Quality has determined that all $PM_{2.5}$ monitoring sites are representative of areawide concentrations and not directly impacted by unique sources.

The table below 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
Jerome Mack	Neighborhood	Population exposure

In accordance with 40 CFR 58, Air Quality will notify the public if a $PM_{2.5}$ monitor exceeds the NAAQS or if a community monitoring zone (as defined in 40 CFR 58.10) is created or changed. To notify the community of a proposed zone change, Air Quality will post a review of the changes being considered on its Web site and solicit feedback from the community. Air Quality will consider and respond to all public comments before making changes to the $PM_{2.5}$ network.

Exceptions to the review process will be made only for a lost lease or a notice from the property owner to vacate a site.

40 CFR 58.30(a)(1) states that samples from certain types of microscale sites are unsuitable for comparison to the annual $PM_{2.5}$ NAAQS. Air Quality does not operate a microscale $PM_{2.5}$ site, so all its $PM_{2.5}$ samples are suitable for NAAQS comparisons.

5.3 Speciation

Air Quality operated a SASS speciation sampler in conjunction with a carbon channel URG sampler at the Jerome Mack NCore site (AQS # 32-003-0540). Speciation sampling occurs on a one-in-three-days schedule, the same as the $PM_{2.5}$ FRM network. Air Quality provides speciation samples to the Research Triangle Institute (RTI), which analyzes the samples and reports the results to the AQS.

5.4 Carbon Monoxide

Air Quality uses API 300 Series CO monitors with gas filter correlation. The “CO Monitors” map (Figure 16) graphically illustrates this network.

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

The table below 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

5.5 Ozone

In 2011, Air Quality operated 15 API 400 Series ultraviolet absorption O_3 monitors in Clark County. Seven monitors operated inside the Las Vegas Valley; two operated outside the valley; two operated as seasonal outside the valley; and four operated as part of a summer study. The network was originally designed for comparison to the one-hour O_3 NAAQS, but was modified to calculate eight-hour (rolling average) values when EPA changed the standard in 1997. The “O_3 Monitors” map (Figure 17) graphically illustrates this network.

Air Quality’s O_3 projects include:

- *Ozone Characterization Study*.
- *Clark County Regional Ozone and Precursor Study*.
- *Southwest Desert Las Vegas Ozone Transport Study*.
- Biogenic emissions inventory.
- Emission inventory of volatile organic compounds from consumer products.

- Establishment of upper-air wind measurements in Clark County.
- Characterization of wildfire/smoke impacts on air quality in Clark County.
- Model validation of upper-air O_3 reservoir.

Air Quality will monitor O_3 seasonally at Apex and Mesquite. The O_3 season will run between April and September as approved by EPA Region 9 in March, 2012.

Air Quality is planning another O_3 study in the summer of 2012 to validate its models and further characterize the upper-air O_3 reservoir; in addition, wildfire/smoke impacts and transport will be assessed and ground-level impacts will be measured. These studies should contribute to a better understanding of O_3 formation and more thorough exceptional event demonstrations.

Air Quality conducts a three-point QC check on O_3 monitors every week and calibrates them quarterly. Twenty-five percent of the monitors undergo a QA audit every quarter, and all are audited at least once a year.

The table below shows the spatial scale and monitoring objective for each O_3 monitor.

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

5.6 Nitrogen Oxides

In 2011, Air Quality operated three API 200 Series NO_x monitors with gas phase chemiluminescence inside the Las Vegas Valley. The “NO_x Monitors” map (Figure 18) graphically illustrates this network.

Air Quality conducts a three-point QC check on the NO_x monitors every week and calibrates them quarterly. Twenty-five percent of the monitors undergo a QA audit every quarter, and all are audited at least once a year.

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

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

6 Siting Criteria Deficiencies

The table below lists the deficiencies Air Quality identified in its 2011 review of the monitoring network.

Site	Obstacle Distance
Walter Johnson	Water cooling tower 15’ from inlet
Green Valley	Tree drip line 2 m from inlet; tree base 4 m from inlet

The table below shows the schedule for correcting these deficiencies.

Deficiency	Site/Monitor	Corrective Action	Schedule
Obstacle distance	Walter Johnson/O_3	Continue to monitor data for impacts from cooling tower	2012
Obstacle distance	Green Valley/$PM_{2.5}$	Coordinate with city to have tree trimmed	2012

Obstacle Distance

Air Quality will evaluate the obstacle distance issue at the Walter Johnson and Green Valley sites and attempt to bring both into compliance with 40 CFR 58, Appendix E. One or more of the following options will be employed:

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

7 Design Values for 2011

The following table compares O_3 design values with the NAAQS.

Station	O_3 Design Value (ppm)	NAAQS (ppm)
Winterwood	.070	0.075
Apex	0.069	0.075
Palo Verde	.073	0.075
Jean	0.073	0.075
Paul Meyer	.073	0.075
Boulder City	0.070	0.075
J.D. Smith	.070	0.075
Walter Johnson	0.074	0.075
Joe Neal	.075	0.075
Mesquite	.061	0.075
Orr	.073	0.075

Note: ppm = parts per million.

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

Station	$PM_{2.5}$ Design Value ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Sunrise Acres	7.7	15
Jean	3.7	15

Note: $\mu g/m^3$ = micrograms per cubic meter.

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

Station	$PM_{2.5}$ Design Value ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Sunrise Acres	20	35
Jean	10	35

40 CFR 58.30(a)(1) states that samples from certain types of microscale sites are unsuitable for comparison to the annual $PM_{2.5}$ NAAQS. Air Quality does not operate a microscale $PM_{2.5}$ site, so all its FRM $PM_{2.5}$ samples are suitable for NAAQS comparisons.

8 2011 Site and Instrument Information

8.1 Site Information

Apex (AQS# 32-003-0022). The primary objective of this site approximately 25 miles northeast of Las Vegas is to monitor the ambient impacts of emissions from nearby gravel processing and power plants. Since the site is generally downwind from Las Vegas, it also serves as an indicator of pollutant transport flow out of the Las Vegas Valley. It is the only Air Quality monitoring station in the Apex Valley. Apex is an EPA approved seasonal O_3 monitoring site; this site operates between April and September.

Boulder City (AQS# 32-003-0601). This site approximately 25 miles southeast of Las Vegas was established at the request of Boulder City government officials and residents to serve as an indicator of population exposure to pollutants, particularly O_3 and PM_{10}. It operates as an indicator of population exposure to pollutants.

Green Valley (AQS# 32-003-0298). This site in Henderson was established in response to citizen complaints about dust emissions from a gravel processing plant, and continues to monitor PM_{10} and $PM_{2.5}$.

J.D. Smith (AQS# 32-003-2000). This site in North Las Vegas replaced the old McDaniel and Post Office PM sites. It monitors gaseous (NO_2, CO, and O_3) and particulate (PM_{10} and $PM_{2.5}$) pollutants using continuous methods. It also serves as an indicator of population exposure to pollutants.

Jean (AQS# 32-003-1019). This site was originally set up as an upwind background site. However, with the amount of transport from California evident in the data, this site was never able to serve as a background site. Therefore, the primary objective of this site approximately 30 miles south of Las Vegas is to monitor transport pollutants from southern California. O_3, PM_{10}, and continuous and filter-based $PM_{2.5}$ are monitored here.

Jerome Mack (AQS# 32-003-0540). This site in east Las Vegas is the Clark County NCore site. Its primary objective is to monitor trace-level gaseous pollutants, PM parameters (including $PM_{2.5}$, PM coarse, and speciated PM parameters), and meteorological parameters as part of a nationwide network. Because of NCore requirements, speciation sampling was moved here from the East Craig Road site in May 2010.

Joe Neal (AQS# 32-003-0075). The primary objectives of this site in northwest Las Vegas are to monitor O_3 and its precursors in an area of high O_3 concentrations and to support Air Quality modeling efforts. The topography is such that the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. PM_{10} was initially deployed at this site due to population growth in the northwest, and the site continues to serve as a high O_3 indicator. A NO_x monitor was added in January 2008 to monitor for O_3 precursors.

Mesquite (AQS# 32-003-0023). This site approximately 70 miles north of Las Vegas monitors O_3 and PM_{10}. It sits along a transport and exit corridor for jurisdictional boundaries, and serves as an indicator of population exposure to pollutants. Mesquite is an EPA approved seasonal O_3 monitoring site; this site operates between April and September.

Paul Meyer (AQS# 32-003-0043). The primary objective of this site in southwest Las Vegas is to monitor O_3, but it also monitors PM_{10}. 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.

Palo Verde (AQS# 32-003-0073). The primary objective of this site in west Las Vegas is to monitor $O_{3,}$ but it also monitors PM_{10}. 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.

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

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

Winterwood (AQS# 32-003-0538). This site on the east side of Las Vegas is one of Air Quality's oldest sites. Its primary objective is to monitor CO and O_3, but it also serves as an indicator of population exposure to pollutants.

No Air Quality monitoring sites are located near furnaces or incinerators.

8.2 Instrument Information

Items monitored:

1. CO
2. O_3
3. NO_x
4. SO_2
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 parameters.

Monitor type:

1. CO: gas filter correlation (non-dispersive infrared)
2. O_3: ultraviolet absorption
3. NO_x: chemiluminescent gas phase reaction of NO_x and O_3
4. SO_2: ultraviolet fluorescence

5. PM_{10} and $PM_{2.5}$ C-14 continuous monitor: Beta Attenuation Monitor (BAM)
6. $PM_{2.5}$ RAAS manual method: filter-based
7. $PM_{2.5}$ speciation SASS and URG manual methods: filter-based
8. Visibility: cameras.

The table below demonstrates fulfillment of FRM or Federal Equivalent Method (FEM) and NAAQS instrumentation requirements.

Pollutant	Instrument	Analysis Method	Designation Method Number	FRM	FEM	SPM	Comparable to NAAQS
CO	API 300 Series	Gas filter correlation	RFCA-1093-093	X			Yes
O_3	API 400 Series	Photometric	EQOA-0992-087		X		Yes
NO_2	API 200 Series	Chemiluminescent	RFNA-0691-082	X			Yes
SO_2	API 100 Series	Ultraviolet fluorescence	EQSA-0495-100		X		Yes
PM_{10}	Thermo Electron FH62 C14	Beta attenuation	EQPM-0609-183		X		Yes
$PM_{2.5}$	Thermo Electron FH62 C14	Beta attenuation	N/A			X	No
$PM_{2.5}$	Thermo Andersen RAAS 300	Gravimetric	RFPS-0598-120	X			Yes
$PM_{2.5}$ speciation	Met One SASS	Speciation	N/A			X	No
$PM_{2.5}$ carbon speciation	URG 3000	Speciation	N/A			X	No

Most Air Quality monitoring stations house a meteorological tower equipped with an ultrasonic wind speed/wind direction sensor and an ambient temperature sensor at a height of 10 m. Some of the meteorological monitoring stations also have relative humidity (at a height of 10 m), precipitation, and solar radiation sensors. The North Las Vegas monitoring station has a radiometer for characterizing upper-air temperature and liquid profiles, as well as a radar wind profiler to characterize winds aloft.

9 Monitoring Start Dates in Air Quality System Database

The following table shows monitoring start dates in AQS.

Site Name	Site ID	Parameter Description	AQS Parameter Code	Parameter Occurrence Code	Date Sampling Began
Boulder City	0601	O_3	44201	1	01-Jul-1998
Boulder City	0601	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
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	NO_2	42602	1	01-Oct-1998
J.D. Smith	2002	CO	42101	1	01-Oct-1998
J.D. Smith	2002	O_3	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 C-14	88502	3	01-Jan-2003
Jean	1019	O_3	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
Jerome Mack	0540	$PM_{2.5}$ - speciation	88101	5	01-May-2010
Jerome Mack	0540	$PM_{2.5}$ - local conditions	88101	1	01-Oct-2010
Jerome Mack	0540	O_3	44201	1	01-Jan-2011
Jerome Mack	0540	CO	42101	1	01-Jan-2011
Jerome Mack	0540	SO_2	42401	1	01-Jan-2011
Jerome Mack	0540	NOy	42600	1	01-Jan-2011
Jerome Mack	0540	NO	42601	1	01-Jan-2011
Joe Neal	0075	O_3	44201	1	01-Jul-2000
Joe Neal	0075	PM_{10} total 0-10 µm STP	81102	1	01-Jan-2001
Joe Neal	0075	NO_2	42602	1	01-Jan-2008
Palo Verde	0073	O_3	44201	1	01-Jul-1998
Palo Verde	0073	PM_{10} total 0-10 µm STP	81102	1	01-Jul-1998
Paul Meyer Park	0043	O_3	44201	1	01-Jul-1998
Paul Meyer Park	0043	PM_{10} total 0-10 µm STP	81102	1	01-Jan-1998
Sunrise Acres	0561	CO	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	O_3	44201	1	01-Aug-1998
Winterwood	0538	CO	42101	1	01-Jan-1998
Winterwood	0538	O_3	44201	2	01-Jul-1979

Note: STP = standard temperature and pressure.

10 Monitoring Site Traffic Count Summary

The following table 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]
Boulder City	57 m to Industrial	18,000		40,000/20,000
J.D. Smith	180 m to Bruce	7,600		70,000/60,000
Jean	1287 m to State Hwy. 161	1,700		110,000/60,000
Green Valley	12.2 m to Santiago	3,900		10,000/10,000
Jerome Mack	484 m to Lamb	28,000		70,000/60,000
Joe Neal	12.2 m to Rebecca	Not available	4,000	10,000/10,000
Palo Verde	14.7 m to Pavilion	Not available	7,000	10,000/10,000
Paul Meyer	102 m to New Forrest Dr.	Not available	5,000	70,000/30,000
Sunrise Acres	128 m to Sunrise	Not available	3,000	70,000/40,000
Walter Johnson	13 m to Villa Monterrey	7,100		10,000/≤10,000
Winterwood	33.8 m to Club House Dr.	Not available	400	20,000/15,000

[1]Distance from monitoring path to edge of roadway.
[2]Traffic study counts taken or derived from nearest study performed by the Nevada Department of Transportation.
[3]Tables E-1 & E-2 in 40 CFR 58, Appendix E, are used to determine the minimum and maximum distance from the edge of the roadway to the monitoring path or probe. Table E-1 = O_3 and NO_2 for urban and neighborhood scale; Table E-2 = CO for neighborhood scale.

11 Probe and Path Siting for 2011

Monitoring stations:

- Apex
- Boulder City
- Green Valley
- J.D. Smith
- Jean
- Jerome Mack
- Joe Neal
- Mesquite
- Palo Verde
- Paul Meyer
- Sunrise Acres
- Walter Johnson
- Winterwood.

Visibility site:

- North Las Vegas Airport.

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
Universal Transverse Mercator (UTM) X-Coordinate: 667652.800; UTM Y-Coordinate: 4004823.000
Operative Schedule: 24 hours during O_3 season (April–September)
Predominant Wind Direction: South
Photograph Direction: East

	O_3
Spatial scale	Regional
Monitoring objective	Regional transport
Vertical probe placement	3.8 m
Unrestricted airflow	360°
Spacing from trees	None
Spacing from station to road	108 m
Distance between collocated monitors	—
Ground cover	—
Spacing from supporting structure	1.3 m
Obstructions on roof	—
Obstacle distance	None
Probe material	Teflon
Residence time	1.9 s

Figure 3: Boulder City.

Type: SLAMS
Boulder City (BC) (32-003-0601)
Location: 1005 Industrial Rd., Boulder City, NV 89005
Closest Roads: U.S. Hwy. 93, Industrial Rd.
UTM X-Coordinate: 694175.800; UTM Y-Coordinate: 3983670.000
Operative Schedule: 24 hours
Predominant Wind Direction: Southwest
Photograph Direction: Northwest

	PM_{10}	**O_3**
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	5.2 m	4.1 m
Unrestricted airflow	360°	360°
Spacing from trees	None	None
Spacing from station to road	58.0 m	58.0 m
Distance between collocated monitors	Not applicable	—
Ground cover	Paved, native desert	—
Spacing from supporting structure	—	1.2 m
Obstructions on roof	None	—
Obstacle distance	None	None
Probe material	—	Teflon
Residence time	—	2.82 s

Figure 4: 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
Predominant Wind Direction: Southwest
Photograph Direction: North

	PM_{10}	$PM_{2.5}$ Continuous
Spatial scale	Middle	Middle
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.8 m	4.9 m
Unrestricted airflow	360°	360°
Spacing from trees	4.6 m	2.0 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	—	—
Obstructions on roof	—	—
Obstacle distance	6.9 m	6.3 m
Probe material	—	—
Residence time	—	—

Figure 5: 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
Predominant Wind Direction: Southwest
Photograph Direction: North

	PM_{10}	CO	$PM_{2.5}$ (FRM)	NO_2	O_3	$PM_{2.5}$ Continuous
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure	Population exposure	Highest concentration	Population exposure	Population exposure
Vertical probe placement	4.7 m	3.7 m	3.6 m	3.7 m	3.7 m	4.8 m
Unrestricted airflow	360°	360°	360°	360°	360°	360°
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	2.6 m	—	NA	—	—	2.6 m
Ground cover	Paved, grass	—	Paved, grass	—	—	Paved, grass

	PM_{10}	CO	$PM_{2.5}$ (FRM)	NO_2	O_3	$PM_{2.5}$ Continuous
Spacing from supporting structure	—	1.2 m	—	1.2 m	1.2 m	—
Obstructions on roof	None	—	None	—	—	None
Obstacle distance	3.3 m to wall	—	5.1 m to wall	4.2 m to wall	4.2 m to wall	5.9 m to wall
Probe material	—	Teflon	—	Teflon	Teflon	—
Residence time	—	3.0 s	—	2.54 s	4.69 s	—

Figure 6: Jean.

Type: SLAMS
Jean (JN) (32-003-1019)
Location: State Route 161, Jean, NV 89019
Roads: State Route 161, I-15
UTM X-Coordinate: 648490.100; UTM Y-Coordinate: 3961425.000
Operative Schedule: 24 hours
Predominant Wind Direction: Southeast
Photograph Direction: Southeast

	PM_{10}	**$PM_{2.5}$ Continuous**	**O_3**	**$PM_{2.5}$ (FRM)**
Spatial scale	Regional	Regional	Regional	Regional
Monitoring objective	Background	General/Background	Regional transport	Background
Vertical probe placement	4.8 m	4.8 m	4 m	2.1 m
Unrestricted airflow	360°	360°	360°	360°
Spacing from trees	—	—	—	—
Spacing from station to road	1,287 m	1,287 m	1,287 m	1,287 m
Distance between collocated monitors	2.7 m	2.7 m	—	20 m
Ground cover	Native desert, gravel	Native desert, gravel	—	Native desert, gravel
Spacing from support-ing structure	—	—	1.4 m	—
Obstructions on roof	—	—	—	—
Obstacle distance	—	—	—	—
Probe material	—	—	Teflon	—
Residence time	—	—	2.95 s	—

Figure 7: Jerome Mack .

Type: NCore
Jerome Mack (JM) (32-003-0540)
Location: 4250 Karen Ave., 89121-1832: 1758' elevation
Three Closest Roads: Lamb Blvd., Nellis Blvd., and E. Sahara Ave.
UTM X-Coordinate:36.138467; UTM Y-Coordinate: 115.073854
Operative Schedule: 24 hours
Predominant Wind Direction: South (light and variable)
Photograph Direction: Southwest

	PM_{10} Cont.	$PM_{2.5}$ Cont.	$PM_{10-2.5}$ Cont.	$PM_{2.5}$ (FRM)	Speciation SASS	Speciation URG	O_3	NO_Y	Trace CO	Trace SO_2
Spatial scale	—	—	—	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Urban	Neighborhood	Urban
Monitoring objective	—	—	—	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure
Vertical probe placement	—	—	—	2.1 m	1.6 m	1.8 m	12.8 m	13.6 m	12.8 m	12.8 m
Unrestricted airflow	—	—	—	360°	360°	360°	360°	360°	360°	360°
Spacing from trees	—	—	—	25 m	25 m	25 m	18 m	19 m	18 m	18 m
Spacing from station to road	—	—	—	482 m	482 m	482 m	482 m	482 m	482 m	482 m
Distance between collocated monitors	—	—	—	—	2.3 m	2.3 m	—	—	—	—
Ground cover	—	—	—	Concrete/ grass	Concrete/ grass	Concrete/ grass	Grass	Grass	Grass	Grass
Spacing from sup-porting structure	—	—	—	Freestanding	Freestanding	Freestanding	1.3 m	7.0 m	1.3 m	1.3 m
Obstructions on roof	—	—	—	—	—	—	None	None	None	None
Obstacle distance	—	—	—	25 m	25 m	25 m	19 m	19 m	19 m	19 m
Probe material	—	—	—	—	—	—	Teflon	Teflon	Teflon	Teflon
Residence time	—	—	—	—	—	—	3.92s	—	2.2 s	5.85 s

Figure 8: 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
Predominant Wind Direction: Northwest
Photograph Direction: West

	PM_{10}	O_3	NO_2
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Highest concentration	Population exposure
Vertical probe placement	4.7 m	3.8 m	3.8 m
Unrestricted airflow	360°	360°	360°
Spacing from trees	8.2 m	5.7 m	5.7 m
Spacing from station to road	12.6 m	12.6 m	12.6 m
Distance between collocated monitors	—	—	—
Ground cover	Gravel, grass, natural desert	—	—
Spacing from supporting structure	—	1.4 m	1.4 m
Obstructions on roof	None	—	—
Obstacle distance	None	None	None
Probe material	—	Teflon	Teflon
Residence time	—	2.34 s	3.92 s

Figure 9: 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 during O_3 season (April–September)
Predominant Wind Direction: Southwest
Photograph Direction: Southwest

	O_3
Spatial scale	Neighborhood
Monitoring objective	Population exposure
Vertical probe placement	3.6 m
Unrestricted airflow	360°
Spacing from trees	24.0 m
Spacing from station to road	7.7 m
Distance between collocated monitors	—
Ground cover	—
Spacing from supporting structure	1.2
Obstructions on roof	—
Obstacle distance	None
Probe material	Teflon
Residence time	11.06 s

Figure 10: 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
Predominant Wind Direction: Southwest
Photograph Direction: West

	PM_{10}	**O3**
Spatial scale	Middle	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	4.9 m	3.7 m
Unrestricted airflow	360°	360°
Spacing from trees	16.7 m	19.9 m
Spacing from station to road	14.7 m	14.7 m
Distance between collocated monitors	NA	—
Ground cover	Paved	Paved
Spacing from supporting structure	—	1.4 m
Obstructions on roof	—	—
Obstacle distance	—	—
Probe material	—	Teflon
Residence time	—	2.29 s

Figure 11: 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
Predominant Wind Direction: South
Photograph Direction: Southwest

	PM_{10}	O_3
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	6.3 m	4.0 m
Unrestricted airflow	360°	360°
Spacing from trees	17.1 m	21 m
Spacing from station to road	102.0 m	102.0 m
Distance between collocated monitors	—	—
Ground cover	Paved, grass, concrete	—
Spacing from supporting structure	—	1.4 m
Obstructions on roof	None	—
Obstacle distance	None	—
Probe material	—	Teflon
Residence time	—	2.95 s

Figure 12: 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
Predominant Wind Direction: South
Photograph Direction: East

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

	PM_{10}	CO	$PM_{2.5}$ (FRM)	$PM_{2.5}$ FRM Collocated	$PM_{2.5}$ Continuous
Spacing from supporting structure	—	1.2 m	—	—	—
Obstructions on roof	None	—	—	—	None
Obstacle distance	—	—	8 m to wall	7 m to wall	—
3.99 building height	6.5 m to building	—	—	—	—
Probe material	—	Teflon	—	—	—
Residence time	—	2.13 s	—	—	—

Figure 13: 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
Predominant Wind Direction: Southwest
Photograph Direction: Northeast

	O_3
Spatial scale	Neighborhood
Monitoring objective	Population exposure
Vertical probe placement	3.7 m
Unrestricted airflow	360°
Spacing from trees	16.5 m
Spacing from station to road	13.0 m
Distance between collocated monitors	—
Ground cover	—
Spacing from supporting structure	1.4 m
Obstructions on roof	—
Obstacle distance	18.4 m
Probe material	Teflon
Residence time	2.31 s

Figure 14: Winterwood.

Type: NAMS/SLAMS
Winterwood (WW) (32-0030-538)
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
Predominant Wind Direction: Southeast
Photograph Direction: North

	CO	O_3
Spatial scale	Neighborhood	Neighborhood
Monitoring objective	Population exposure	Population exposure
Vertical probe placement	3.9 m	3.9 m
Unrestricted airflow	360°	360°
Spacing from trees	26.4 m	26.4 m
Spacing from station to road	42 m	42 m
Distance between collocated monitors	—	—
Ground cover	Paving, grass, rock	—
Spacing from supporting structure	0.5 m	1.2 m
Obstructions on roof	—	—
Obstacle distance	—	—
Probe material	—	Teflon
Residence time	3.54 s	2.95 s

Figure 15: North Las Vegas Airport.

Type: Visibility Camera (Visibility Monitoring Network)
North Las Vegas Airport
Location: 2730 Airport Dr., North Las Vegas, NV 89032
Three closest roads: Cheyenne Ave., North Decatur Blvd., North Rancho Dr.
Equipment: High-resolution digital camera system, Olympus E-420 Series

12 Clark County Monitoring Network Sites in 2011

Figure 16: CO Monitors.

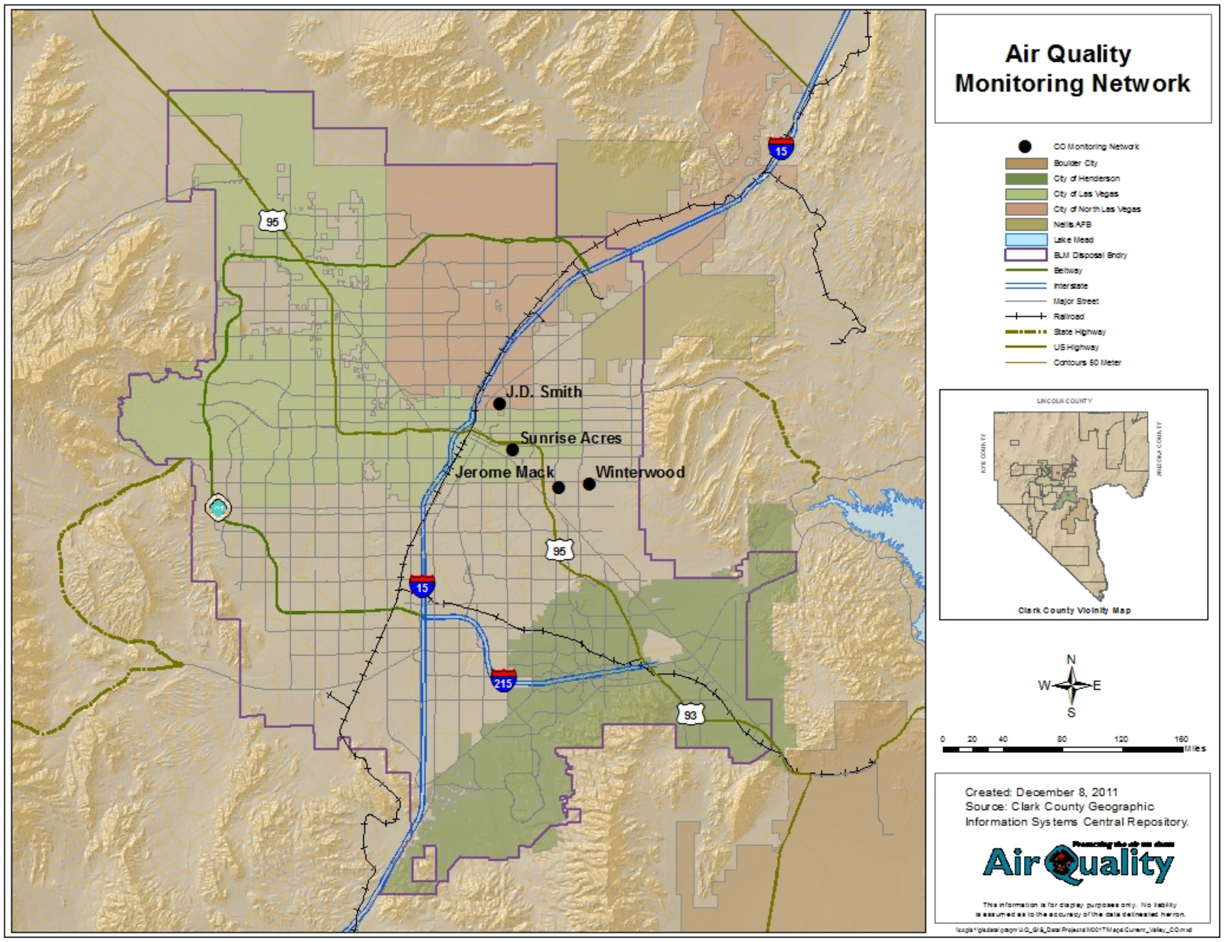


Figure 17: O_3 Monitors.

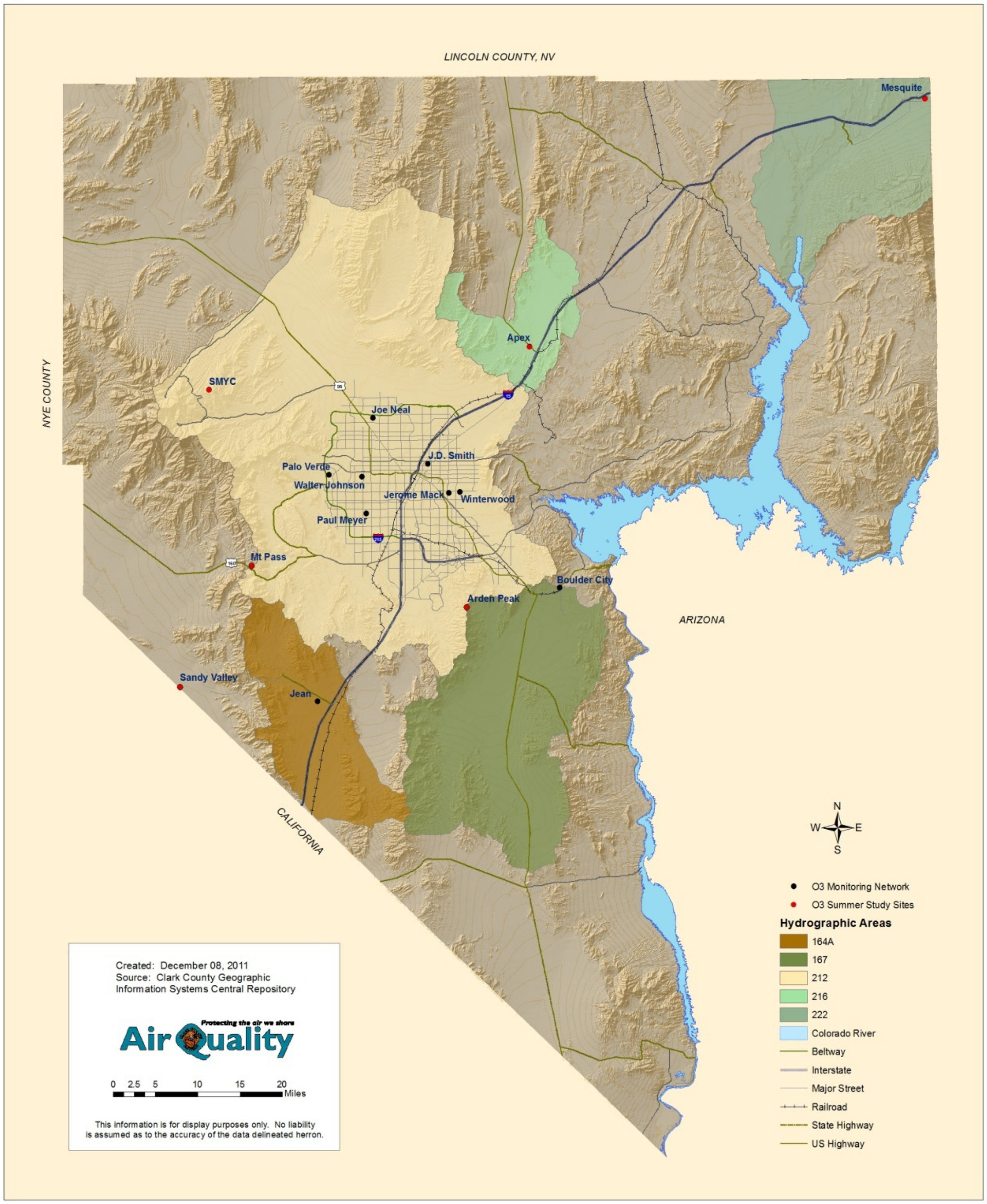


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Figure 18: NO_x Monitors.

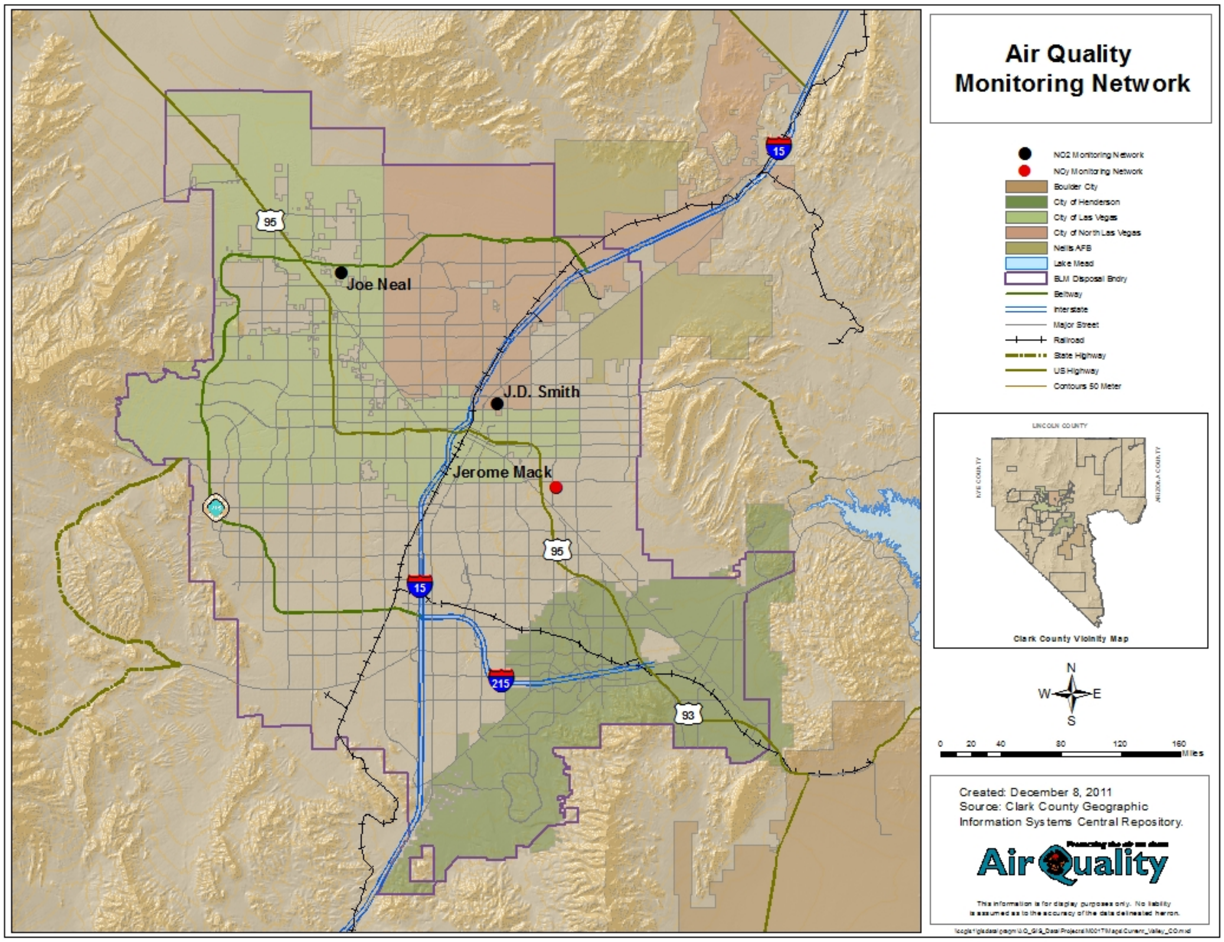

Figure 19: SO_2 Monitors.

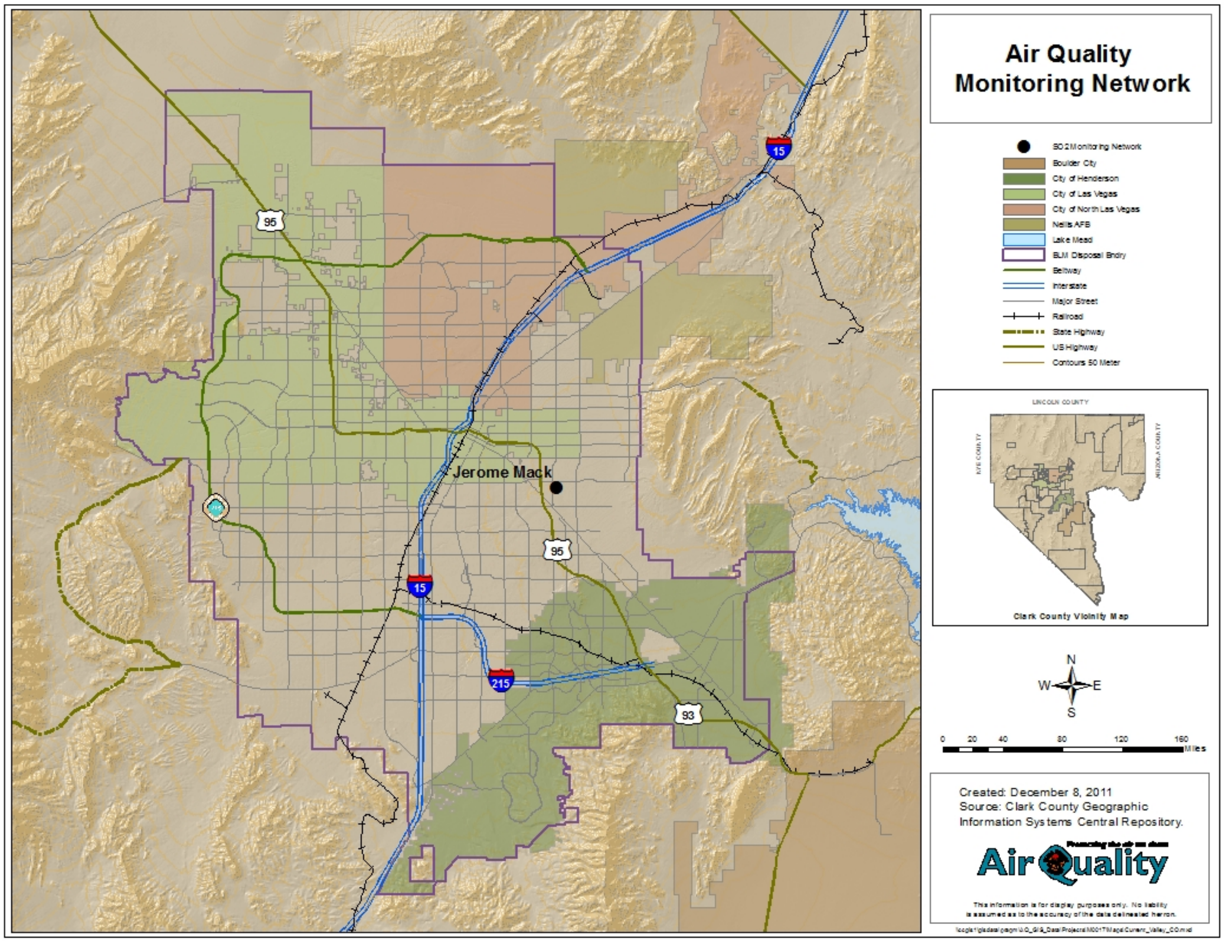

Figure 20: Continuous PM_{10} Monitors.

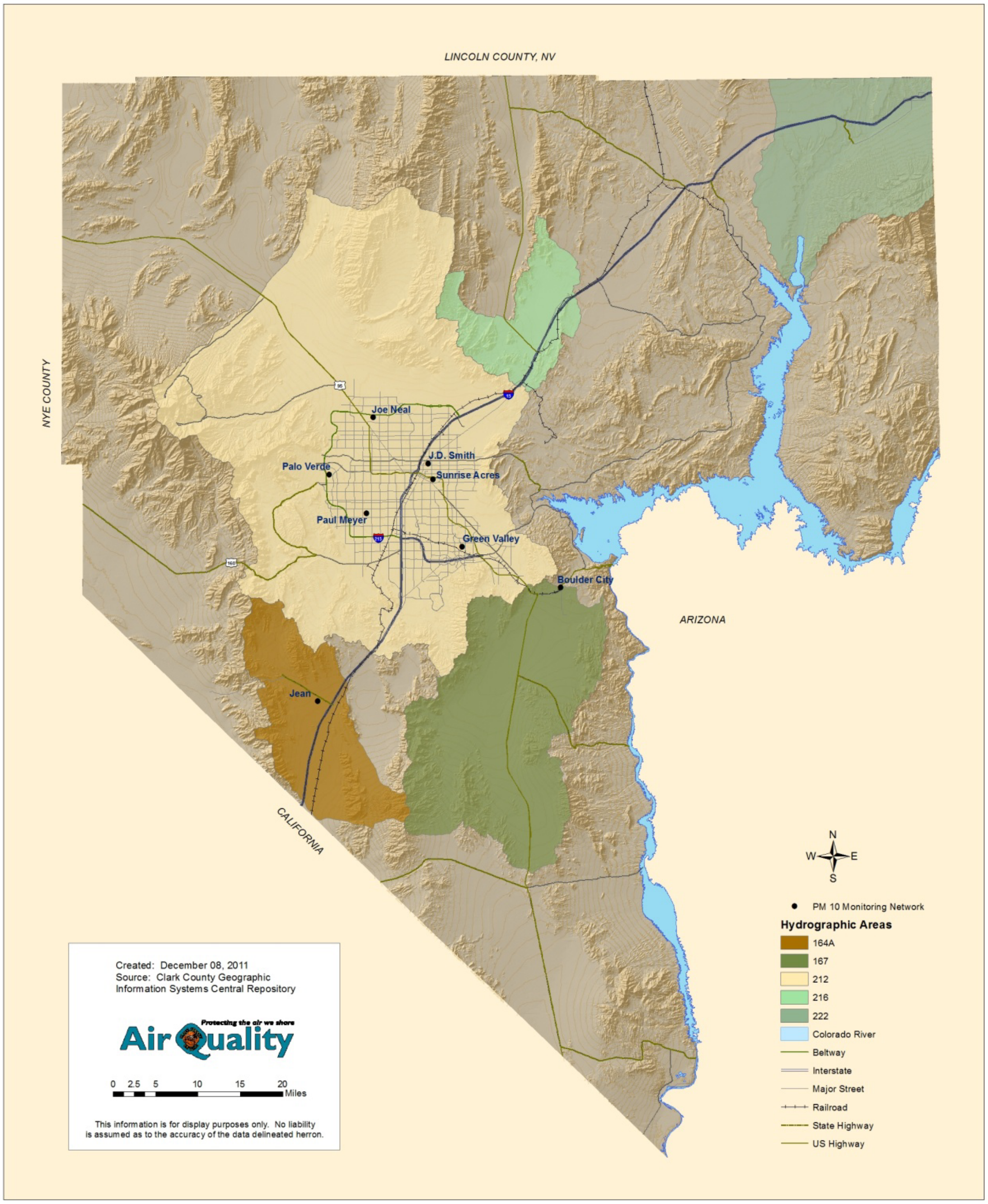

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Figure 21: Continuous $PM_{2.5}$ Monitors.

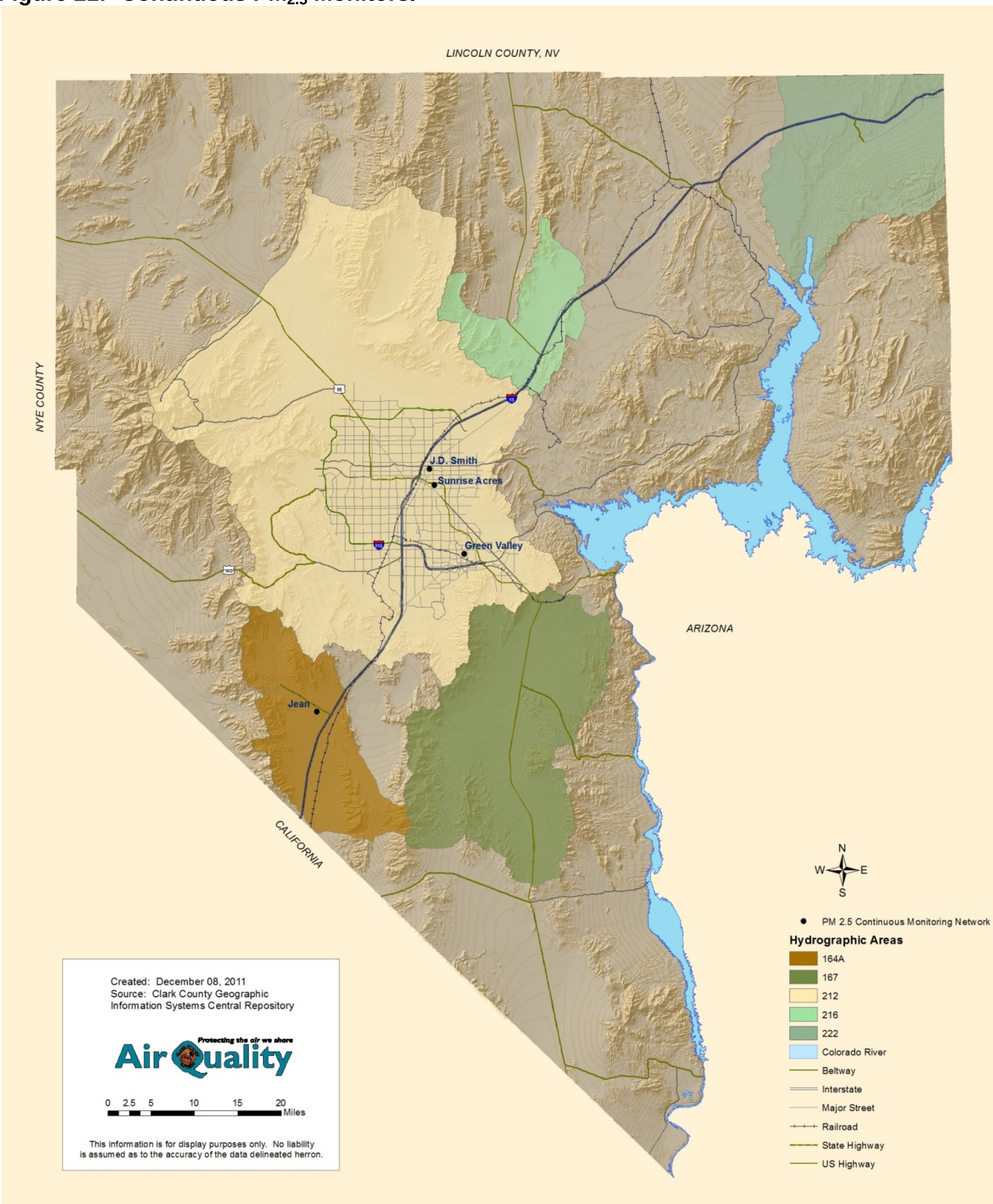
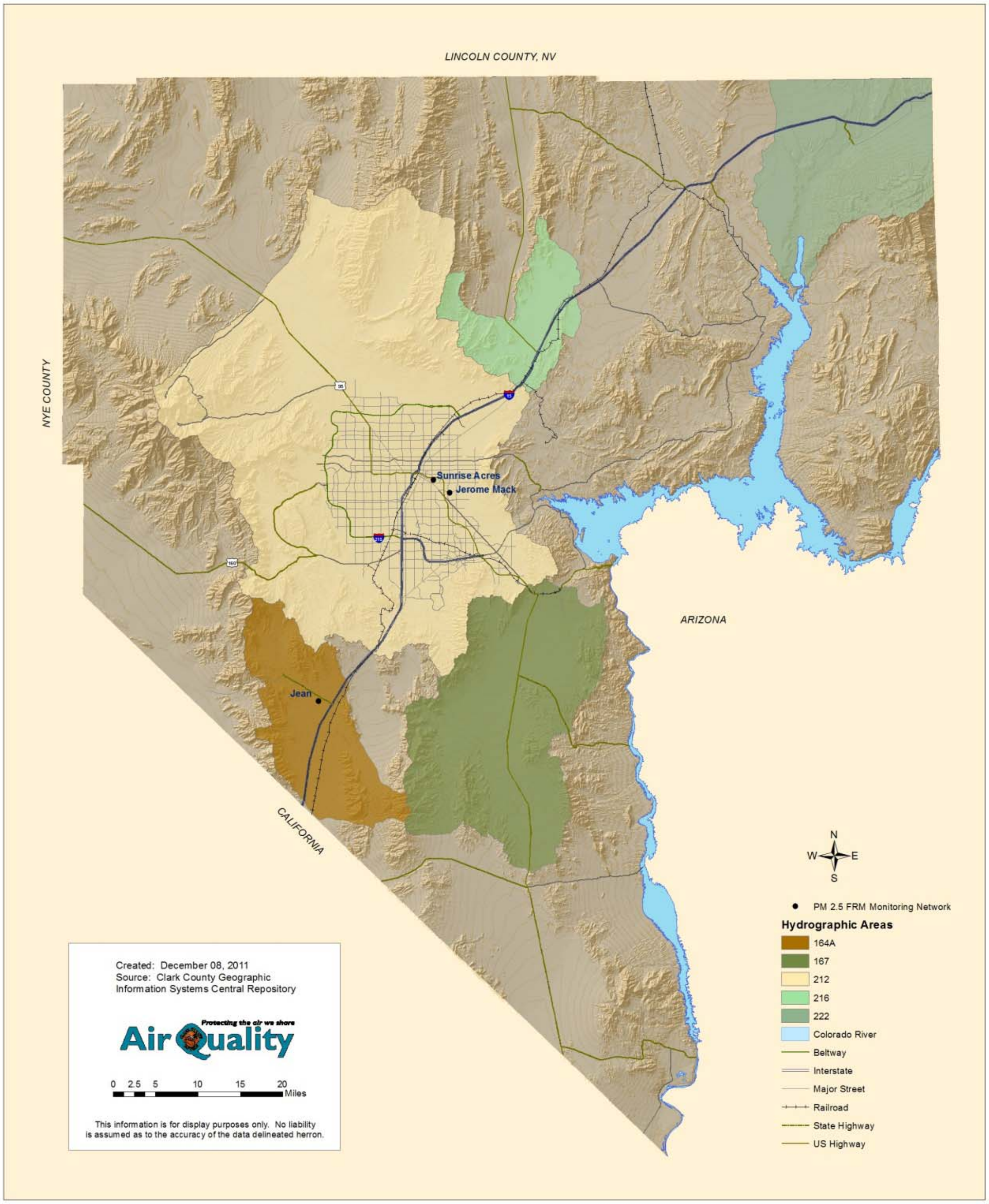


Figure 22: Filter-Based $PM_{2.5}$ Sampler.



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13 Effect of New Regulations on Air Quality Monitoring

On November 12, 2008, EPA released the revised NAAQS for Pb, and Air Quality submitted a QAPP for Pb to EPA on June 30, 2010. The EPA revisions were finalized on December 27, 2010 in volume 75 of the *Federal Register* (p. 81126). Because of these changes, Clark County must now address two Pb monitoring requirements: ambient nonsource-oriented monitoring and ambient source-oriented monitoring.

Air Quality initiated ambient nonsource-oriented monitoring for Pb at the NCore site at the beginning of January 2012, and has asked Region 9 for authorization to use the nationally contracted RTI laboratory for sample analysis. Pb sampling began using a low-volume PM_{10} sampler, but Air Quality plans to transition to high-volume total suspended particulate National Performance Audit Program Pb sampling before 2013.

The source emission threshold for the ambient source-oriented monitoring requirement is 0.50 tons per year. Air Quality has not identified sources that might trigger this requirement, and a preliminary assessment has shown no such sources within Clark County.

On June 2, 2010, EPA strengthened the primary NAAQS for SO_2: it revoked the two existing standards, 140 ppb in 24 hours and 30 ppb in a year, and established a new 1-hour standard of 75 ppb. Newly sited SO_2 monitors must be operational by January 1, 2013. In addition to 1-hour averages, Air Quality also reports maximum 5-minute-block averages in accordance with the revised SO_2 rule. Historically, SO_2 data in Clark County is well below the NAAQS; therefore, Air Quality is operating just one SO_2 monitor at the NCore site.

13.1 Near Road Monitoring

On January 22, 2010, in volume 75 of the *Federal Register* (p. 6474), EPA revised the primary NAAQS for NO_2. On December 21, 2011, EPA released a technical assistance document (TAD), which Air Quality is using to plan and implement its near-road NO_2 monitoring network. EPA established requirements for a network with monitors sited where maximum NO_2 concentrations are expected, including within 50 m of major roadways, and with monitors sited to measure the areawide NO_2 concentrations that occur more broadly across communities.

Air Quality is investigating site locations, and City Center (AQS # 32-003-0016) may meet EPA requirements. It is one of the valley's highest traffic count areas. Its diverse mix includes older vehicles, and traffic there is significantly congested at least twice a day. It is situated in a unique topographic area that, because of predominant wind flow, receives transport from the resort corridors on both I-15 and South Las Vegas Boulevard (the Las Vegas Strip), as well as roadside emissions from U.S. Highway 95. Since the site is within 50 m of U.S. 95, it may also be suitable for microscale monitoring; a previous study determined that O_3 was undergoing titration by NO_x from vehicles on U.S. 95. In addition, City Center has the flexibility to qualify for neighborhood scale monitoring.

New near-road NO_2 monitors must begin operating no later than January 1, 2013. Figure 23 shows a ranking of potential NO_2 near-road sites using the TAD and 40 CFR 58.10(b)(12). The

City Center site, highlighted in yellow (bottom three rows of Figure 23), ranks seventh and eighth.

From a pragmatic perspective, the City Center site is the only probability Air Quality has for implementing near road monitoring in the near future. At this time, there are three significant obstacles to establishing a new near road site. The first is that nearly every location adjacent to the high traffic highway areas are under construction, adjacent to construction between the potential site and the roadway, have sound barriers, are above or below grade, have mature landscaping, and/or would require locating more than 100 meters from the road. Most of the construction will continue for years into the future. Second is unavailability of funds. EPA is aware of this and has made or will make funding available. While Air Quality is grateful for the funding, this is half of the obstacle. The other half is that these site projects cost Air Quality two to three times the cost of the national average for a site installation. This is due to requirements in state law, county code and county standards. The third obstacle is time. In the twelve years that the Air Quality program has been part of the county, one monitoring site has been added. The effort took over four years from inception to start up. If Air Quality started today, it is likely that 2016 would be the date of the first new near road site. However, before Air Quality can start the process, Air Quality must have the money and transfer it to a dedicated construction fund. Without intervention from an outside source, it will easily take six or more years to build a site that can fully comply with the near road requirements.

Figure 23: Annual Average Daily Traffic Counts in Clark County.

State of Nevada Department of Transportation Annual Average Daily Traffic Count		AADT	Truck	T AADT	FE	FE AADT		Mix			Congestion	Sum	Overall
Route / Location	**AADT 2010**	**Rank**	**AADT**	**Rank**	**AADT**	**Rank**	**Mix %**	**Rank**	**Lanes**	**Congest**	**Rank**	**Rank**	**Rank**
IR15, .3 mi S of the Spring Mtn Rd Intch 'Exit 39'	257,000	1	6750	4	317,750	1	2.63	12	8	32125	1	19	**1**
IR15, .5 mi N of the Spring Mtn Rd Intch 'Exit 39'.	257,000	1	6710	5	317,390	2	2.61	13	8	32125	1	22	**2**
IR15, .4 mi S of the Flamingo Rd Intch 'Exit 38'.	255,000	2	6750	4	315,750	3	2.65	11	9	28333	2	22	**2**
IR15, btwn Charleston Bl Intch 'Exit 41' & Las Vegas Ex Intch 'Exit 42'.	251,000	3	6865	2	312,785	4	2.74	8	10	25100	5	22	**2**
IR15, S of the Tropicana Av Intch 'Exit 37'.	222,000	4	6800	3	283,200	5	3.06	5	12	18500	17	34	**3**
US95, .4 mi E of Rancho Dr (between Rancho & MLK)	219,000	5	2490	7	241,410	6	1.14	22	12	18250	18	58	**10**
US95, .3 mi S of Decatur Bl.	209,000	6	2490	7	231,410	7	1.19	21	12	17416	21	62	**11**
US95, 1.1 mi N of Rancho Dr.	207,000	7	2490	7	229,410	8	1.2	20	14	14785	20	62	**11**
US95, 300' S of Summerlin/Rainbow Intch 'Exit 81'.	202,000	8	2490	7	224,410	9	1.23	19	10	20200	15	58	**10**
IR215, Btwn Las Vegas Bl Intch & the Warm Springs Rd-Airport Co Intch.	183,000	9	U	10	#VALUE!	23	U	24	8	22875	8	74	**15**
IR215, E of SR-604 (Las Vegas Bl).	168,000	10	U	10	#VALUE!	23	U	24	8	21000	13	80	**19**
IR215, Btwn the Decatur Bl Intch & the IR-15 Intch.	162,000	11	1710	9	177,390	16	1.06	23	8	20250	14	73	**14**
IR15, .1 mi S of the D St/Washington Intch 'Exit 42' (add 03-0099,105,408 SB & 97 NB).	158,000	12	6865	2	219,785	11	4.35	4	10	15800	26	55	**9**
US95, .3 mi S of the Lake Mead Bl Intch (Exit 82).	158,000	12	2470	7	180,230	15	1.56	18	7	22571	11	63	**12**
IR15, N of the 'D' & 'Washington' St Intch 'Exit 44'.	156,000	13	7520	1	223,680	10	4.82	3	8	19500	16	43	**6**
US95, btwn Downtown Ex Intch & Casino Center Intch.	154,000	14	3510	6	185,590	14	2.28	15	6	25666	3	52	**7**
US95, Maine St, btwn Las Vegas Bl 'Exit 74-A' & Casino Center Dr 'Exit 75-B'.	154,000	14	3510	6	185,590	14	2.28	15	6	25666	3	52	**7**
US95, btwn the Las Vegas Bl Intch 'Exit 75-B' & the Eastern Av Intch 'Exit 73'.	153,000	15	3510	6	184,590	14	2.29	14	6	25500	4	53	**8**

On August 12, 2011, EPA retained the existing NAAQS for CO. Although the primary standard did not change, EPA now requires one CO monitor to be collocated with a subset of the NO_2 monitors required as part of the January 2010 NO_2 NAAQS revision. Air Quality anticipates collocating near-road CO monitoring with the near-road NO_2 monitor at the City Center location.

40 CFR 58.10 (a)(3) requires that NCore stations be operational by January 1, 2011. Air Quality is operating a new NCore monitoring station at Jerome Mack Middle School in accordance with 40 CFR 58, Appendix D. PM coarse monitoring began at Jerome Mack on January 1, 2012.

All monitoring instruments are operated continuously year-round except $PM_{2.5}$ FRM samplers, speciation samplers, the Pb sampler, seasonal O_3 monitors at Mesquite and Apex, and special studies monitors.

14 Summary of Monitoring Requirements

40 CFR 58 dictates the maintenance requirements for ambient air monitoring networks. Air Quality continuously considers those requirements in its network design, and the results are listed below each requirement.

1. Determine the highest NAAQS concentration areas in the network.
   - The area of highest CO concentration is the Sunrise Acres station at 2501 Sunrise Ave., Las Vegas, NV.
   - The area of highest O_3 concentration is the Joe Neal station at 6651 W. Azure Way, Las Vegas, NV.
   - The area of highest PM_{10} concentration is the Sunrise Acres station at 2501 Sunrise Ave., Las Vegas, NV. The second highest is the J.D. Smith station at 1301b E. Tonopah Dr., Las Vegas, NV.
   - The area of highest annual average $PM_{2.5}$ concentration is the Sunrise Acres station.
   - The area of highest annual average NO_2 concentration is the J.D. Smith station at 1301b E. Tonopah Dr., Las Vegas, NV.

2. Determine representative concentrations in areas of high population density.
   - City of Las Vegas:
     - Annual average CO concentration is 0.59 ppm.
     - Annual average O_3 concentration is 0.039 ppm.
     - Annual average PM_{10} concentration is 26.66 $\mu g/m^3$.
     - Average $PM_{2.5}$ concentration is 8.4 $\mu g/m^3$.
     - Annual average NO_2 concentration is 0.013 ppm.
   - City of Henderson:
     - Annual average PM_{10} concentration is 17.28 $\mu g/m^3$.
     - Average $PM_{2.5}$ concentration is 6.24 $\mu g/m^3$.
   - City of Boulder City:
     - Annual average O_3 concentration is 0.041 ppm.
     - Annual average PM_{10} concentration is 13.54 $\mu g/m^3$.
   - City of Mesquite:
     - Annual average O_3 concentration is 0.034 ppm.

3. Determine the impact significant sources have on air quality.
   - CO sources: Vehicle and non-vehicle combustion sources.
     - Impact: Zero exceedance days.
   - NO_2 sources: Vehicle and non-vehicle combustion sources.
     - Impact: Zero exceedance days.
   - $PM_{2.5}$ sources: Vehicle and non-vehicle combustion sources, fugitive dust.
     - Impact: Two exceedance days because of fireworks.
   - PM_{10} sources: Non-vehicle combustion sources, fugitive dust, tire and brake ware, industrial processes.
     - Impact: One exceedance day because of fireworks.

4. Determine general background concentration levels.
   - Jean:
     - PM_{10}: 2011 average = 12.82 $\mu g/m^3$.
     - $PM_{2.5}$: 2011 average = 4.2 $\mu g/m^3$.
     - O_3: 2011 average = 0.041 ppm.

5. Determine the extent of regional pollutant transport among population areas.
   - Studies show that O_3 transport and regional contributors have an influence on Clark County, which may result in O_3 exceedances. Smoke from seasonal wildfires may contribute significantly to O_3 and PM levels in Clark County.

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

14.1 Clark County Air Monitoring Network

The table below shows the network meets or exceeds the minimum requirements of 40 CFR 58.

Pollutant	Monitors Required	Monitors in Service in 2011
CO	1 trace	3 + 1 trace
O_3	2	9 routine; 4 summer study
SO_2	1 trace	1 trace
NO_2	0	2
NOy	1	1
PM_{10} BAM	4-8	8
$PM_{2.5}$ BAM	0	4
$PM_{2.5}$ FRM	2 + collocation	3 + collocation

Air Quality uses the following criteria to evaluate the placement and function of the network and its ability to meet the requirements of 40 CFR 58:

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

Applicable state implementation and maintenance plans require no additional instrumentation.

15 Quality Assurance Program

Air Quality conducted performance field evaluations throughout 2011. These audits indicated that Air Quality 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, including two NO_2 instruments, five CO instruments, and thirteen O_3 instruments. Two O_3 sites, Apex and Mesquite, will be used for seasonal ozone monitoring. Air Quality's SO_2 instrument is at the NCore site.

Five RAAS300-2.5 samplers at three monitoring sites were evaluated, along with one SASS and one URG. The SASS and URG are sited at Jerome Mack Middle School to comply with NCore requirements. 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 VSCC as a second stage separator, and $PM_{2.5}$ FRM samplers are equipped primarily with VSCC separators. Well Impactor Ninety-Six impactors are used only during operational abnormalities. Each operational $PM_{2.5}$ FRM was audited quarterly in 2011, for a total of 16 evaluations of the three sites (including Sunrise Acres, which hosts the precision pair).

Evaluations were balanced over the calendar year. Any scheduling adjustments favored pollutant seasonality, e.g., more CO instruments were audited in the winter and more O_3 instruments were audited in the summer. Audit evaluations of the gaseous pollutants used the transmutation values of slope/intercept created by calibration activity from the IPS MeteoStar Leading Environment Analysis and Display System, Air Quality's data acquisition system. Assessments of data flow—from collection, to storage, to transfer, to processing with verification, to validation, to review and submittal—indicated consistent, thorough, and acceptable handling regimens. Routine, precise, and accurate data were uploaded to the AQS database in accordance with 40 CFR 58.16 requirements, and annual data certifications were completed in accordance with 40 CFR 58.15 requirements.

The table below summarizes the 2011 schedule for internal QA performance evaluations.

Date	Pollutant	Monitoring Station(s)
3/10/2011	PM_{10}	Green Valley, J.D. Smith, Sunrise Acres
3/14/2011	PM_{10}	Joe Neal
6/07/2011	PM_{10}	Jean, Paul Meyer, Palo Verde
9/16/2011	PM_{10}	Boulder City, Green Valley
9/23/2011	PM_{10}	J.D. Smith, Joe Neal, Sunrise Acres
10/20/2011	PM_{10}	Jean
11/10/2011	PM_{10}	Jerome Mack
12/13/2011	PM_{10}	Paul Meyer
3/10/2011	$PM_{2.5}$ continuous	Green Valley, J.D. Smith, Sunrise Acres
6/07/2011	$PM_{2.5}$ continuous	Jean
9/16/2011	$PM_{2.5}$ continuous	Green Valley

Date	Pollutant	Monitoring Station(s)
9/23/2011	$PM_{2.5}$ continuous	J.D. Smith, Sunrise Acres
10/20/2011	$PM_{2.5}$ continuous	Jean
12/13/2011	$PM_{2.5}$ continuous	Jerome Mack
3/23/2011	$PM_{2.5}$ filter-based	Sunrise Acres
3/31/2011	$PM_{2.5}$ filter-based	Jean, Jerome Mack
6/07/2011	$PM_{2.5}$ filter-based	Jean, Sunrise Acres
6/20/2011	$PM_{2.5}$ filter-based	Jerome Mack
7/15/2011	$PM_{2.5}$ filter-based	Jerome Mack, Sunrise Acres
7/28/2011	$PM_{2.5}$ filter-based	Jean
10/19/2011	$PM_{2.5}$ filter-based	Sunrise Acres
10/20/2011	$PM_{2.5}$ filter-based	Jean
12/19/2011	$PM_{2.5}$ filter-based	Jerome Mack
3/25/2011	CO	Sunrise Acres
6/30/2011	CO	J.D. Smith
9/30/2011	CO	Winterwood
12/14/2011	CO	Jerome Mack
3/14/2011	O_3	Boulder City, Joe Neal
6/17/2011	O_3	Jean
6/22/2011	O_3	Paul Meyer
9/15/2011	O_3	Apex, Mesquite
11/04/2011	O_3	Palo Verde
11/08/2011	O_3	J.D. Smith, Winterwood
11/10/2011	O_3	Walter Johnson
12/06/2011	NO_2	J.D. Smith

16 National Performance Audits

Air Quality participates in the EPA Region 9-sponsored National Performance Audit Program (NPAP). This Through-the-Probe (TTP) performance evaluation, which focuses on gaseous criteria pollutants, is contracted and scheduled by Region 9. In 2011, the NPAP initiated particulate matter external audit events. Air Quality received a “Pass” on the audit report for all its NPAP and TTP performance evaluations in 2011.

The table below shows the 2011 NPAP and TTP event schedule.

Monitoring Station	Pollutant	TTP Conducted
Palo Verde	O_3	5/2/2011
Paul Meyer	O_3	5/3/2011
Green Valley	PM 10, 2.5	1/18/2011

Each year, the $PM_{2.5}$ FRM sampling network undergoes a Performance Evaluation Program (PEP) audit. Through Region 9, an independent auditor is contracted to perform external field audits quarterly as well. The contractor submits evaluation results to the AQS database. Because of the manual methods used to audit FRM samplers, audit results (in $\mu g/m^3$) are generated and submitted to the national AQS database consistent with contract requirements.

The table below summarizes 2011 PEP audit event activity.

$PM_{2.5}$ Sampler Location	Date of PEP Audit
Jerome Mack, Sunrise Acres	1/18/2011
Jerome Mack, Sunrise Acres	5/03/2011

17 Network Modifications Completed in 2011

The table below summarizes 2011 network changes.

Action	Date	Reason
Jerome Mack: Meteorological, O_3, CO, SO_2, and NOy monitors began operation.	January 2011	NCore site operational.

18 Proposed Network Modifications

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

18.1 Termination Considerations

Financial, technical, staffing, and regulatory challenges may require terminating sites and equipment between 2012 and 2014. In addition, logistical issues (e.g., expired leases, leases due to expire, and administrative challenges) may require Air Quality to terminate sites and/or equipment beyond what is specified in this plan. The table below lists proposed site and equipment terminations over the next two years.

Site/Equipment Termination	Date	Explanation
$PM_{2.5}$ FRM at Jean site	To be determined	Anticipate continuous $PM_{2.5}$ FEM deployment; Sunrise Acres has primary and collocated $PM_{2.5}$ FRM for the network
CO monitoring at J.D. Smith, Orr, and Winterwood sites	To be determined	No current EPA requirement for non-trace CO monitoring
Jean site	To be determined	Unresolved lease issues
Additional site closures	To be determined	Sites closed because of resource limitations

$PM_{2.5}$ FRM sampler at Jean site. In 2011, Air Quality maintained operations in the $PM_{2.5}$ FRM filter-based network at a level that matched grant funding. If this network is reduced, Air Quality will continue to keep applying for, and using, grant funding based on the reduction. In addition, Air Quality will use grant funding for $PM_{2.5}$ BAM operations, $PM_{2.5}$ speciation sampling, applicable NCore monitoring, and related training. Future Air Quality goals include replacing current non-designated $PM_{2.5}$ BAMs with FEM-designated BAMs. Air Quality will continue collocating its $PM_{2.5}$ FRM and FEM network, as required by 40 CFR Part 58, Appendix A, Section 3.2.5.

CO monitoring at J.D. Smith, Orr, and Winterwood sites. Compliance with 40 CFR 58.14(c) no longer requires CO monitoring at these locations. Air Quality will evaluate the CO data from these sites, along with state implementation plan requirements, and may terminate CO monitoring at these sites to redirect program resources. Air Quality is conducting trace CO monitoring and anticipates conducting near-road CO monitoring based on the new CO rule.

Jean site. This site has a lease issue. Air Quality could be required to vacate with little or no notice, which would require terminating all monitoring operations.

Additional Site Closures. Reductions in budget and staff or equipment failures may require Air Quality to consider further site closures in 2012.

18.2 Installation Considerations

The following table lists proposed site and equipment installations over the next two years.

Site/Equipment Installation	Date	Explanation
Pb at Jerome Mack	January 2012	Required by 40 CFR 58
$PM_{10-2.5}$ at Jerome Mack	January 2012	Required by 40 CFR 58
Near-road NO_2 at City Center	January 2013	Required by 40 CFR 58, Appendix D
Near-road CO at City Center	January 2013	Required by 40 CFR 58, Appendix D
Apex SODAR	To be determined	Upper-air winds assessment

Note: SODAR = sonic detection and ranging.

Pb at Jerome Mack. Air Quality has begun Pb sampling at Jerome Mack using a low-volume PM_{10} sampler, and anticipates using the RTI lab for Pb analysis. Air Quality expects to transition to a high-volume total suspended particulate sampling system before 2013.

$PM_{10-2.5}$ at Jerome Mack. Air Quality began $PM_{10-2.5}$ monitoring at Jerome Mack in January 2012, using the continuous Met One BAM 1020 system.

Near-road NO_2 at City Center. Air Quality will initiate near-road NO_2 monitoring at the City Center site in January 2013. Air Quality will use the near-road site ranking process identified in the TAD, and will continue to explore ways to implement better near-road monitoring systems.

Near-road CO at City Center. Air Quality will also initiate near-road CO monitoring at the City Center site, in accordance with the revised CO rule.

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

18.3 Other Considerations

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

Spatial gaps and potential high pollutant sites. Air Quality has an interest in filling spatial monitoring gaps and monitoring high-concentration areas. Through special studies, modeling, forecasting, and a network assessment, Air Quality has projected spatial gaps and high pollutant concentrations in specific areas throughout the county. Indian Springs, Laughlin, Sandy Valley, the north-central and southwest areas of the valley, and mountain ranges surrounding the valley and including Mt. Charleston have been identified as potential monitoring sites when resources allow.

Collaboration. Air Quality may have opportunities to exchange data with other entities that monitor air quality, including the Las Vegas Paiute Tribe. Air Quality may also seek to augment its current data sets through data exchanges with other agencies, and may engage in operational exchanges while ensuring the integrity of associated data.

Mobile monitoring. Air Quality would like to implement a mobile monitoring system to evaluate PM_{10} and O_3 throughout Clark County. The system could move between various locations to assess air quality and help determine where to site permanent stations. Current resource limits will not support such a system, but Air Quality will continue to look for opportunities to fund this project.

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

1. Network assessment (submitted to EPA June 30, 2010).
2. *PM_{10} Saturation Study* (December 2005).
3. *Clark County Regional Ozone & Precursor Study* (March 2006).
4. "Field Measurements and Documentation of Wildfire Event Air Quality Impacts during the 2009 and 2010 Summer Wildfire Season" (February 2011).
5. Analysis to determine the O_3 nonattainment boundary area (July 2004).
6. *Carbon Monoxide Saturation Study* (April 2002), which confirmed that the network did not miss any CO hot spots at that time. Air Quality is reevaluating the CO network and now considering site closures.
7. The EPA designation of the Thermo Electron FH62C14 $PM_{2.5}$ BAM as an FEM and the potential for using the MetOne 1020 BAM as a designated $PM_{2.5}$ FEM.

19 Status of Monitoring Site Leases

The table below documents the status of leases for each monitoring site as of March 2012. Expired leases or related events may result in the closure of a particular monitoring station or site. This plan constitutes Clark County's official request to EPA Region 9 to discontinue monitoring under these or similar circumstances.

Site Agreements			
Site	**Documentation**	**Owner**	**Terms**
Apex	ROW	BLM	9/17/20
Boulder City	Agreement	Boulder City	11/30/15
Green Valley	Agreement	City of Henderson	5/2/12
J.D. Smith	MOU	CCSD	3/1/16
Joe Neal	MOU	CCSD	3/1/16
Mesquite	Grant of easement	Alcarza Family Trust	4/30/21
NLV Airport	Agreement	DOA	10/19/15
Orr	MOU	CCSD	3/1/16
Palo Verde	MOU	CCSD	3/1/16
Paul Meyer	Agreement	Clark County	4/14/14
Sunrise Acres	MOU	CCSD	3/1/16
Walter Johnson	MOU	CCSD	3/1/16
Winterwood	MOU	Clark County	6/30/25
Continuing Site Access Issues[1]			
Site	**Documentation**	**Owner**	**Terms**
City Center		NDOT	
Jean		BLM and Las Vegas Valley Water District	

Note: BLM = U.S. Bureau of Land Management; CCSD = Clark County School District; DOA = Clark County Department of Aviation; MOU = Memorandum of Understanding; NDOT = Nevada Department of Transportation; ROW = right-of-way.
[1]Agreements for these sites are under review; however, they may have to be abandoned with little or no notice.

20 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
Boulder City	O_3	Neighborhood	Population exposure
Boulder City	PM_{10} C-14	Neighborhood	Population exposure
Green Valley	PM_{10} C-14	Middle scale	Population exposure
Green Valley	$PM_{2.5}$ C-14	Middle scale	Population exposure
J.D. Smith	CO	Neighborhood	Population exposure
J.D. Smith	NO_x	Neighborhood	Highest concentration
J.D. Smith	NO_2	Neighborhood	Highest concentration
J.D. Smith	O_3	Neighborhood	Population exposure
J.D. Smith	PM_{10} C-14	Neighborhood	Population exposure
J.D. Smith	$PM_{2.5}$ FRM	Neighborhood	Population exposure
J.D. Smith	$PM_{2.5}$ C-14	Neighborhood	Population exposure
Jean	O_3	Regional scale	Regional transport
Jean	PM_{10} C-14	Regional scale	General/background
Jean	$PM_{2.5}$ FRM	Regional scale	General/background
Jean	$PM_{2.5}$ C-14	Regional scale	General/background
Jerome Mack	$PM_{2.5}$ FRM	Neighborhood	Population exposure
Jerome Mack	CO	Neighborhood	Population exposure
Jerome Mack	SO_2	Neighborhood	Population exposure
Jerome Mack	SO_2 max 5-min avg	Neighborhood	Population exposure
Jerome Mack	Reactive oxides of nitrogen	Urban scale	Population exposure
Jerome Mack	Nitric oxide	Urban scale	Population exposure
Jerome Mack	O_3	Neighborhood	Population exposure
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
Palo Verde	O_3	Neighborhood	Population exposure
Palo Verde	PM_{10} C-14	Neighborhood	Population exposure
Paul Meyer	O_3	Neighborhood	Population exposure
Paul Meyer	PM_{10} C-14	Neighborhood	Population exposure
Sunrise Acres	CO	Neighborhood	Highest concentration
Sunrise Acres	PM_{10} C-14	Neighborhood	Population exposure
Sunrise Acres	$PM_{2.5}$ FRM	Neighborhood	Highest concentration
Sunrise Acres	$PM_{2.5}$ FRM	Neighborhood	Highest concentration
Sunrise Acres	$PM_{2.5}$ C-14	Neighborhood	Highest concentration
Walter Johnson	O_3	Neighborhood	Population exposure

Site	Monitor	Measurement Scale	Monitor Objective Type
Winterwood	CO	Neighborhood	Population exposure
Winterwood	O_3	Neighborhood	Population exposure

21 Receptor-Measured Criteria Pollutant Trends

The following pages contain plots of criteria pollutant measurements. In general, all pollutants have declined over the years.

Figure 24: Carbon Monoxide Trends.

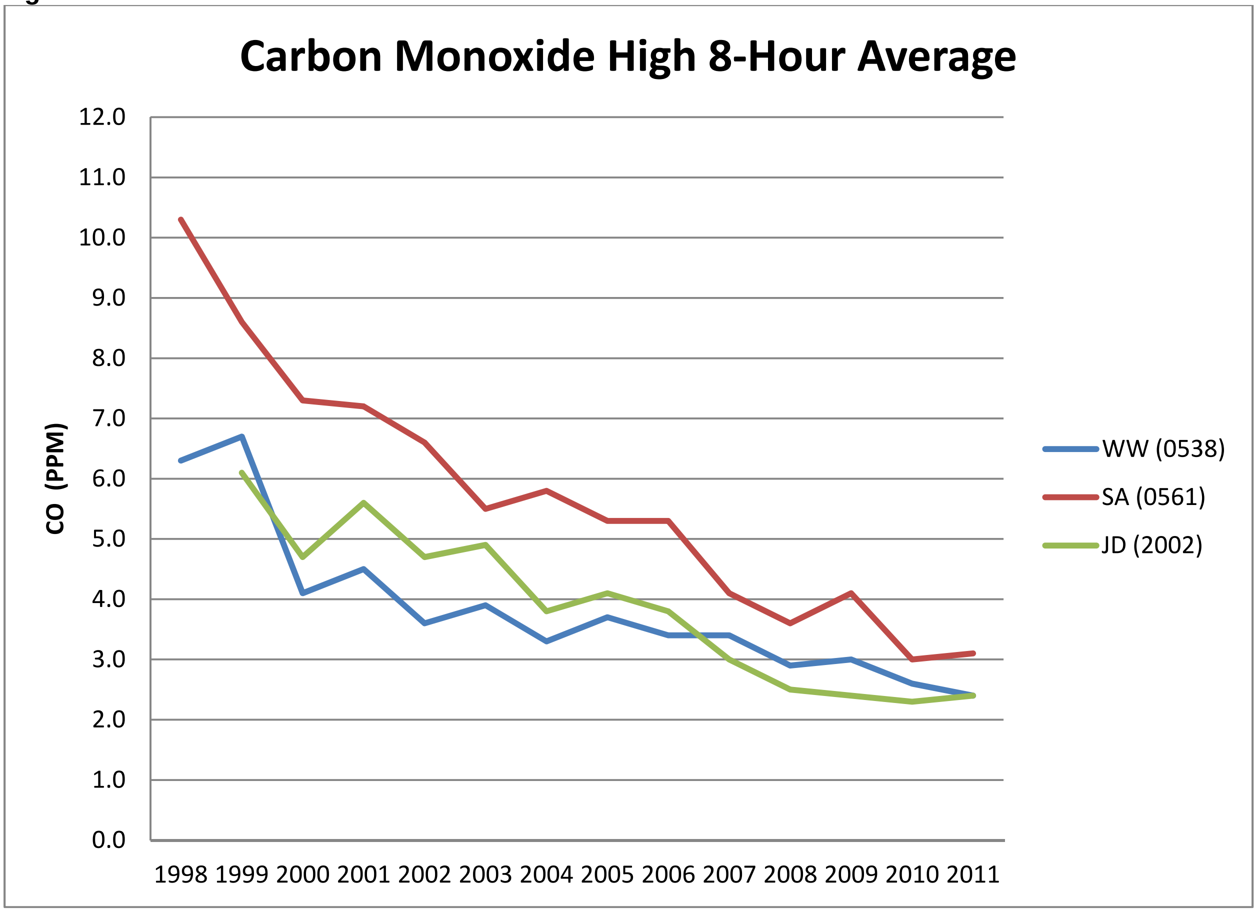

Figure 25: O_3 Trends.

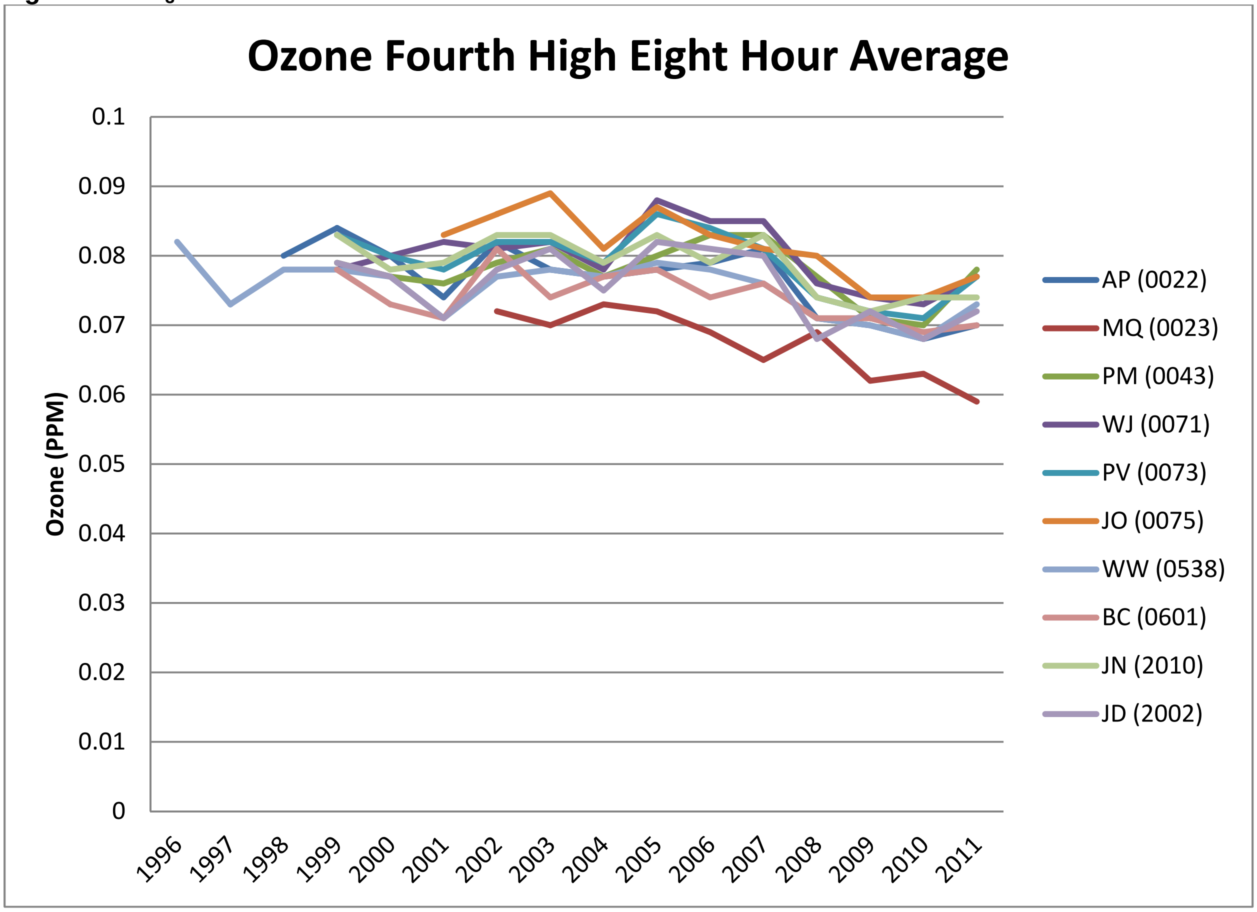

Figure 26: NO_2 Trends.

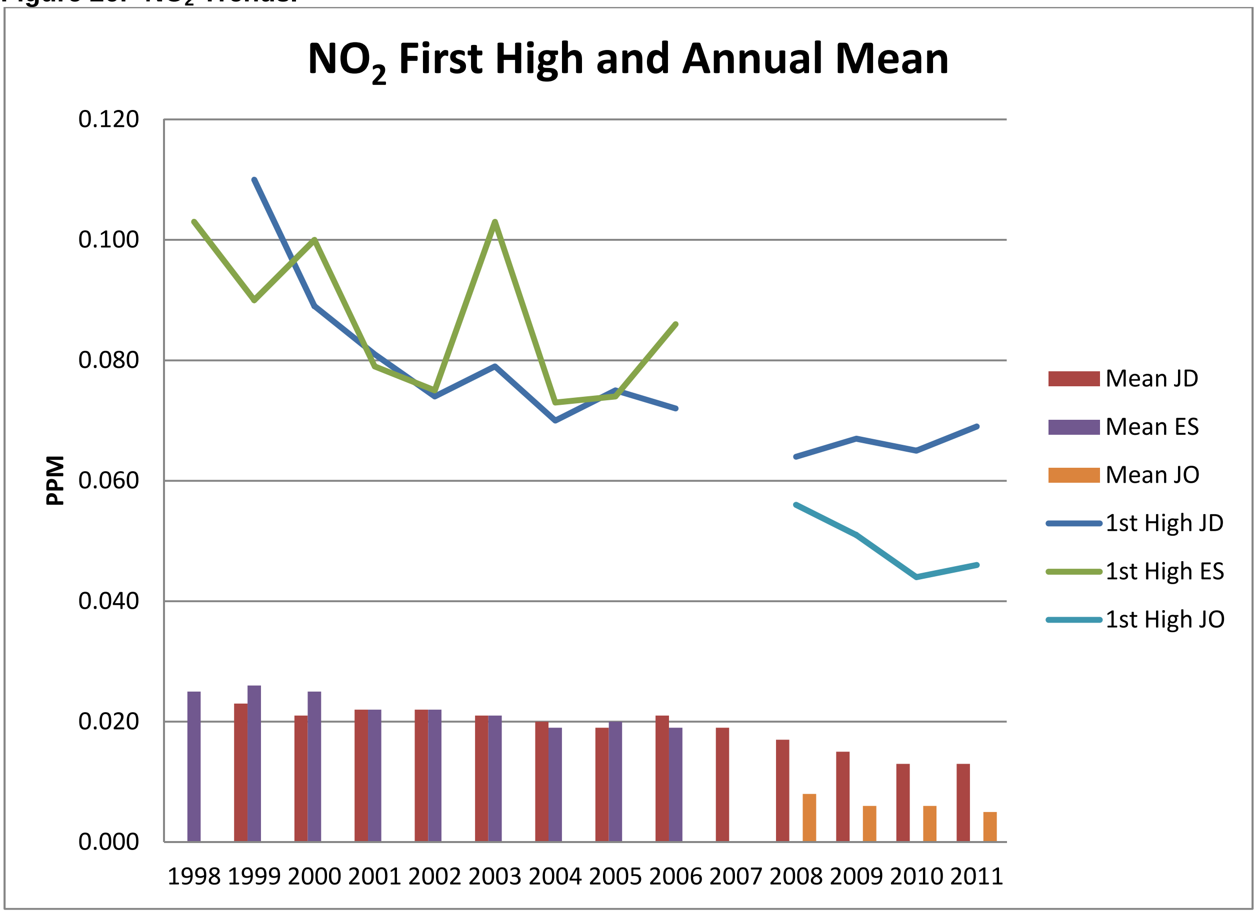

Figure 27: Continuous PM_{10} Trends.

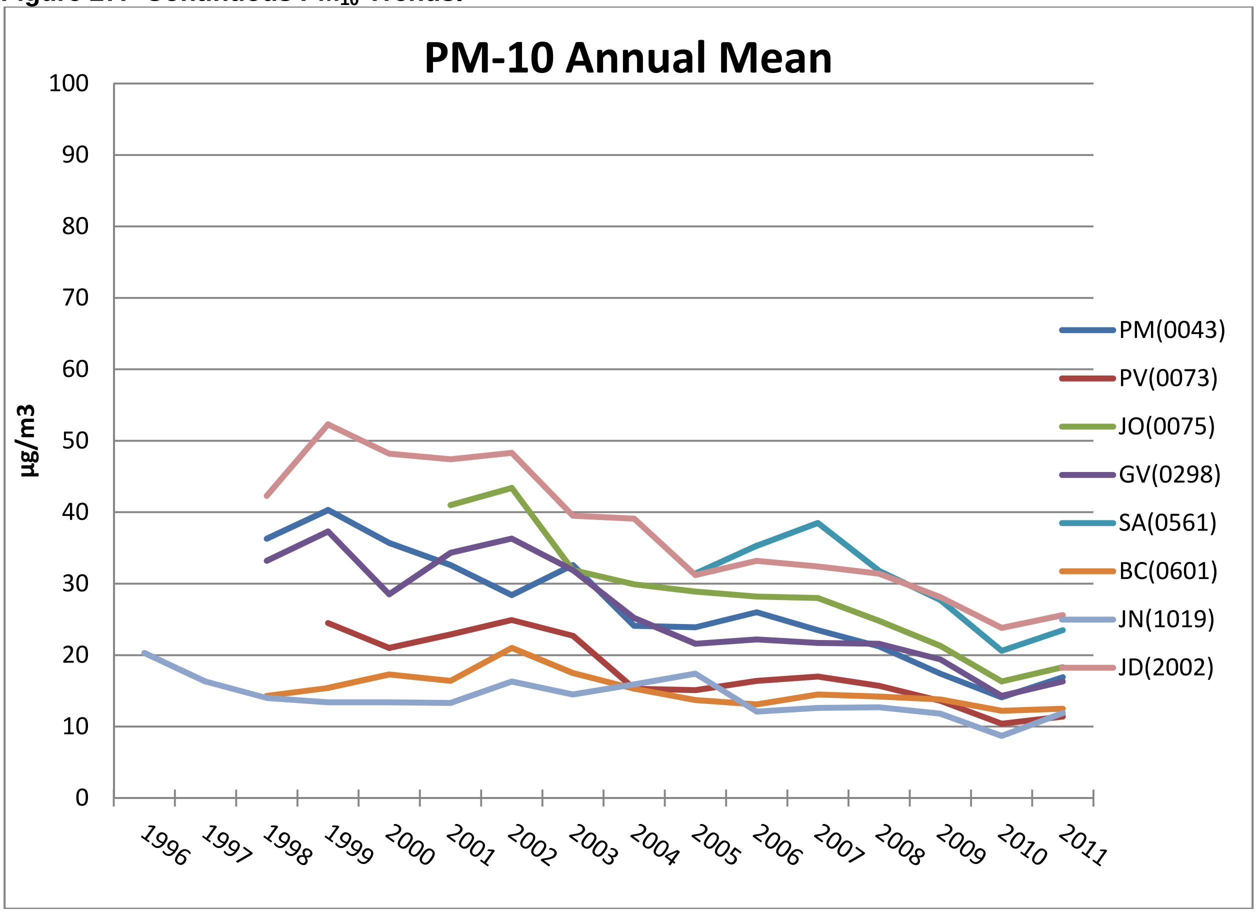

Figure 28: Filter-Based $PM_{2.5}$ FRM Trends.