Annual Monitoring Network Plan

Effective: July 2023

Clark County Department of Environment and Sustainability

4701 W. Russell Road, Suite 200, Las Vegas, Nevada 89118

Executive Summary

This Annual Monitoring Network Plan reports the status of the Clark County air monitoring network in 2023 as required by 40 Code of Federal Regulations (CFR) Part 58. This document describes network operation, changes planned for 2023 and beyond, and the ways in which Clark County disseminates network data to the public in a timely manner.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
AQS	Air Quality System
CAA	Clean Air Act
CBSA	Core-Based Statistical Area
CFR	Code of Federal Regulations
CO	carbon monoxide
DAQ	Division of Air Quality
DES	Department of Environment and Sustainability
EE	Exceptional Event
EPA	U.S. Environmental Protection Agency
FEM	federal equivalent method
FRM	federal reference method
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standards
NCore	National Core Multi-Pollutant Monitoring Network
NDOT	Nevada Department of Transportation
NEI	National Emissions Inventory
NO_X	oxides of nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPAP	National Performance Audit Program
O_3	ozone
PAMS	Photochemical Assessment Monitoring Stations
Pb	lead
PEP	Performance Evaluation Program
PM	particulate matter
$PM_{2.5}$	particulate matter 2.5 micrometers in diameter or smaller
PM_{10}	particulate matter 10 micrometers in diameter or smaller
PM Coarse	particulate matter between 2.5 to 10 micrometers in diameter
POC	parameter occurrence code
PWEI	Population Weighted Emissions Index
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RA	Regional Administrator
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring System
SO_2	sulfur dioxide
SPM	Special Purpose Monitor
TTP	through-the-probe
VOC	Volatile Organic Compounds

SCIENTIFIC UNITS

m	meters
$\mu g/m^3$	micrograms per cubic meter
s	seconds

1.0 INTRODUCTION

This Annual Network Plan (Plan) serves as a review of the current Clark County Department of Environment and Sustainability, Division of Air Quality (DAQ) ambient air monitoring network and as a plan for future network activities. This Plan is written to comply with 40 CFR 58.10 and refers to Appendix D of Part 58. The DAQ network includes monitoring stations that can include FRM, FEM and SPM monitors that are part of SLAMS, NCore, CSN, PAMS and Near-Road stations. All monitoring stations and monitors meet the technical requirements of 40 CFR 58.11 and Appendices A, B, C, D, and E of Part 58, where applicable.

DAQ submitted its 2022 Annual Network Plan to EPA on June 14, 2022, and received approval of the Plan on October 28, 2022. No significant changes to the monitoring program are planned during 2023. The information for each monitoring site in the DAQ network specified in 40 CFR 58.10(b) is provided in subsequent sections of this Plan. This information includes updated population and design values, and recent pollutant levels measured in the network. The most recent five-year network assessment mentioned in 40 CFR 58.10(d) is dated July 22, 2020.

The DAQ ambient air quality surveillance program follows these approved quality program plans (See Appendix A):

1. Quality Management Plan dated February 1, 2022.
2. Quality Assurance Project Plan for Ambient and NCore Air Quality Monitoring, Rev. 0, February 4, 2021.
3. Quality Assurance Project Plan for the Photochemical Assessment Monitoring Stations (PAMS) Required Site Network for Speciated Volatile Organic Compounds, Carbonyls, and Meteorological Parameters Including Mixing Layer Height, approved December 21, 2020.

The following information describes the current attainment status with NAAQS. The Las Vegas Intrastate Air Quality Control Region is identified in 40 CFR 81.80 to be Clark County, in the State of Nevada. The attainment status for the State of Nevada is in 40 CFR 81.329, presented by pollutant with geographic descriptions:

- 2010 Sulfur Dioxide (SO_2) NAAQS: Attainment/Unclassifiable.
- Carbon Monoxide: Las Vegas Area: Attainment since 2010, the remainder of Clark County: Unclassifiable/Attainment.
- Particulate Matter (PM) as PM_{10}: Las Vegas planning area, attainment since November 5, 2014; the rest of Clark County is Unclassifiable.
- Fine Particulate Matter as $PM_{2.5}$ for the 2012 Annual NAAQS and the 2006 24-hr NAAQS: both are Unclassifiable/Attainment.
- 2010 Nitrogen Dioxide (NO_2) 1-hr Standard: Unclassifiable/Attainment
- 2015 Ozone (O_3) 8-hour NAAQS in Las Vegas, hydrographic area 212 (HA 212): moderate nonattainment as of January 5, 2023. the remainder of Clark County is Unclassifiable/Attainment.
- 2008 Lead (Pb) NAAQS: Unclassifiable/Attainment.

Currently, the Las Vegas Valley, defined as Hydrographic Area (HA) 212, in Clark County is designated as moderate nonattainment for the 2015 ozone NAAQS and attainment/unclassifiable for all other criteria pollutants. Portions of Clark County are subject to maintenance plans for PM_{10}, CO, and O_3. To address CO, DAQ submitted a CO State Implementation Plan (SIP) in 2000 that described the control measures and technologies required to bring the Las Vegas

Valley into compliance with the CO NAAQS. The CO SIP was approved by EPA, effective October 21, 2004 (69 FR 56351). A Federal Register notice denoting EPA's determination of attainment of the CO NAAQS within the valley was issued in June 2005 (70 FR 31353). In 2008, DAQ submitted a CO Request for Re-designation and Maintenance Plan, which was approved by EPA, effective September 27, 2010 (75 FR 59090). A Second 10-Year CO Limited Maintenance Plan was submitted on June 18, 2019, and was approved by EPA as published in the Federal Register on October 22, 2021, with an effective date of November 22, 2021 (86 FR 58579).

2.0 MONITORING PROGRAM

To better characterize ambient air quality given the large area, population, the diverse topography and land use of Clark County, the DAQ monitoring network was designed to meet or exceed the minimum pollutant-specific design criteria found in 40 CFR 58, Appendix D, Sections 2, 3 and 4 for SLAMS, NCore and PAMS monitoring. The requirements from 40 CFR 58, Appendix D are reviewed in Section 2 of this Plan, which includes summary statements on the number of monitors in the DAQ network. Individual site descriptions are in Section 3 of this Plan, including the spatial scales where appropriate.

Additional requirements for near-road monitoring are included in Appendix D in the pollutant-specific sections for NO_2, CO, and fine $PM_{2.5}$. DAQ operates two near-road sites: one is the Rancho-Teddy site (AQS ID: 32-003-1501), and the other is the Casino Center site (AQS ID: 32-003-1502).

Clark County maps with the monitoring station locations by pollutant are presented in Section 4 of this Plan. Both narrative and graphical descriptions show the wide spatial coverage of monitors throughout Clark County. Table 3-1 of this Plan summarizes the distribution of monitors in the DAQ network.

Population information applies to some pollutants. Population estimates for 2022 obtained from the Clark County Department of Comprehensive Planning are: Clark County estimate is 2,331,934, and the Las Vegas Valley Urban Area estimate is 2,264,576. (Historical Population by Place, 2022 Population Estimates). The Las Vegas Valley Urban Area includes three cities and various unincorporated areas. Tables in Appendix D of Part 58 have criteria for Metropolitan Statistical Area (MSA) populations over 1,000,000 persons.

The tables below show that the Clark County air quality network meets or exceeds the 2023 minimum requirements of 40 CFR Part 58. Population census information was obtained from the Clark County Department of Comprehensive Planning 2020 report, which was based on the Metropolitan Statistical Area (MSA) and the Core-Based Statistical Area (CBSA). All particulate matter (PM) monitoring instruments are low-volume instruments (flow rates less than 200 liters per minute). The Jerome Mack monitoring site is DAQ's NCore and PAMS site.

2.1 Ozone Monitoring Design

SLAMS sites O_3 monitoring requirements (40 CFR 58, Appendix D, Section 4.1) include the most recent 3-year design value concentrations. The 3-year O_3 8-hour design-value concentrations for 2020-2022 in Clark County range from 0.064 parts per million by volume (ppm) to 0.075 ppm; the highest value applies to the Paul Meyer site (AQS ID: 32-003-0043), which is in the southwestern portion of the Las Vegas Valley, in HA 212. Since the most recent 3-year design value concentrations are at least 85% of an applicable O_3 NAAQS; the SLAMS minimum O_3 monitoring requirement from Table D-2 of Appendix D of Part 58 is two stations. This 85% value is 0.060 ppm for the 8-hour O_3 Standard in 40 CFR 50.19, 0.070 ppm.

The DAQ network includes SLAMS O_3 monitoring at nine stations in the Las Vegas Valley. Table 2-1 of this Plan summarizes the distribution of monitors in the DAQ network. One of these stations, Jerome Mack (AQS ID: 32-003-0540) is also operated as the NCore and PAMS site for the network. Five more SLAMS stations are in the rest of Clark County; two of these five

stations are approved for seasonal operation from April through September. Operation of the relocated Apex seasonal site (AQS ID: 32-003-0022) is currently anticipated to begin by mid-June of 2023. One additional station is operated as a Special Purpose Monitor (SPM), the Spring Mountain Youth Camp (AQS ID: 32-003-7771). Data from this SPM station is intended to support Exceptional Events analyses and air quality forecasting purposes. Measurements at this site are made for special studies only.

The distribution of O_3 monitoring sites in Clark County reflects the O_3 design criteria given in section 4.1 of Appendix D of Part 58, with consideration given to the population distribution and expansion in the Las Vegas Valley, spatial occurrences of higher O_3 concentrations observed in the County, and improved understanding of weather patterns and external influences causing higher O_3 concentrations. The site descriptions and maps in Sections 3 and 4 of this Plan identify the representative spatial scales and specific purposes applicable to the sites. The following table identifies how DAQ's network meets the minimum requirements for Ozone monitoring in Clark County:

Table 2-1. Minimum Monitoring Requirements for Ozone

MSA	County	Population & Census year	8-hr Design Value [ppb], DV Years[1]	Design Value site (name, AQS ID)[2]	# Required Sites	# Active Sites	# Additional Sites Needed
Las Vegas-Paradise (29820)	Clark, NV	2,322,985[1] (2022)	67 (2020)[4]	Apex (32-003-0022)	1	13	0
			64 (2020-2022)	Virgin Valley (32-003-0024)	1		
			75 (2020-2022)	Paul Meyer (32-003-0043)	1		
			67 (2020-2022)	Mountains Edge (32-003-0044)	1		
			74 (2020-2022)	Walter Johnson (32-003-0071)	1		
			71 (2020-2022)	Palo Verde (32-003-0073)	1		
			74 (2020-2022)	Joe Neal (32-003-0075)	1		
			70 (2020-2022)	Green Valley (32-003-0298)	1		
			73 (2020-2022)	Liberty H.S. (32-003-0299)	1		
			68 (2020-2022)	Jerome Mack (32-003-0540)	1		
			67 (2020-2022)	Garrett Jr. H.S. (32-003-0602)	1		
			68 (2020-2022)	Jean (32-003-1019)	1		
			73 (2020-2022)	Walnut Rec. (32-003-2003)	1		
			*[5] (2020-2022)	Spring Mtn Youth Camp (32-003-7771)	0	1[5]	0
			68[6] (2020-2022)	Indian Springs (32-003-7772)	0	1[6]	0

[1] Population Estimates taken from U.S. Census Bureau, Population Division.
[2] AQS (site) Identification.
[3] Table excludes measurements with regionally concurred event flags (as stated in the AQS AMP480 Report)
[4] Apex data was 2020 only; The site was removed from service in 2021 pending relocation expected in summer 2023.
[5] No design value; The site is seasonally operated as a SPM site.
[6] The site is seasonally operated as a SLAMS site.

2.2 Carbon Monoxide Monitoring Design

CO monitoring requirements are in 40 CFR 58, Appendix D, Section 4.2. DAQ operates four SLAMS CO monitors; two of these are multi-purpose monitors. Three more stations include SPM monitors. Design values are not calculated for CO. Table 2-1 of this Plan summarizes the distribution of CO monitors in the DAQ network.

Section 4.2.1(a) in 40 CFR 58, Appendix D requires one CO monitor to operate collocated with a near-road NO_2 monitor. This requirement is met with monitoring at the Rancho-Teddy site (AQS ID: 32-003-1501).

Pursuant to Section 4.2.2(3) in 40 CFR 58, Appendix D a Regional Administrator may require additional monitoring to characterize "CO concentrations in areas that are subject to high ground level CO concentrations particularly due to topographical or meteorological impacts." The Sunrise Acres (AQS ID: 32-003-0561) and Jerome Mack (AQS ID: 32-003-540) sites are in the central Las Vegas valley east of the original downtown where historically the higher CO concentrations in the DAQ network occurred. Topography and local meteorology may be conducive to nocturnal air stagnation periods often associated with higher concentrations of pollutants emitted in the near-surface environment. Monitoring purposes at the Jerome Mack site include the NCore and PAMS programs.

DAQ also plans to operate four SPM CO monitors at different stations during the O_3 season to support ozone Exceptional Event analyses. The SPM monitors are planned for: Green Valley (AQS ID: 32-003-0298), Joe Neal (32-003-0075), Paul Meyer (32-003-0043), which are operated in accordance with applicable portions of 40 CFR Part 58, Appendix A, and the Spring Mountain Youth Camp (AQS ID: 32-003-7772) which is operated solely for research purposes. The following table identifies how DAQ'snetwork meets the minimum requirements for Carbon Monoxide monitoring in Clark County:

Table 2-2. Minimum Monitoring Requirements for CO

CBSA	Population and Census Year	Number of Required Near-Road Monitors	Number of Active Near-Road Monitors	Number of Additional Monitors Needed
Las Vegas-Paradise (29820)	2,322,985[1] (2022)	1	1	0

[1] Population Estimates taken from U.S. Census Bureau, Population Division.

Notes: Monitors required for SIP or maintenance plan: CO monitoring in the Las Vegas Valley is expected for ongoing demonstration of the CO Maintenance Plan.
EPA RA-required monitors per 40 CFR 58, App. D, Sec. 4.2.2: 0
This network meets the minimum monitoring requirement for the referenced criteria pollutant.

2.3 Nitrogen Dioxide Monitoring Design

NO_2 monitoring requirements are in 40 CFR 58, Appendix D, Section 4.3, including the near-road requirements in Section 4.3.2, and area-wide requirements in Section 4.3.3. The design level for the 24-hour NO_2 NAAQS is 100 parts per billion by volume (ppb). Design values calculated for the six DAQ stations with NO_2 monitors are approximately one-half of the design level.

DAQ operates six NO_2 SLAMS monitors; Table 3-1 of this Plan summarizes the distribution of

NO_2 monitors in the DAQ network. The monitors at the Rancho-Teddy site (AQS ID: 32-003-1501) and the Casino Center site (AQS ID: 32-003-1502) are located for Near-road monitoring purposes. Two stations are operated for area-wide purposes, Joe Neal site (AQS ID: 32-003-0075) and Walnut Recreation Center site (AQS ID: 32-003-2003). Additionally, the Jerome Mack site (AQS ID: 32-003-0540) includes the NCore and PAMS programs, and the Sunrise Acres site (AQS ID: 32-003-0561) serves as the designated RA40 monitor for NO_2. The following table identifies how DAQ's network meets the minimum requirements for Nitrogen Dioxide monitoring in Clark County:

Table 2-3. Minimum Monitoring Requirements for NO_2

CBSA	Population and Census Year	Max AADT Counts[1] (2021)	Number of Required Near-Road Monitors[2]	Number of Active Near-Road Monitors	Number of Additional Near-Road Monitors Needed	Number of Required Area-wide Monitors	Number of Active Area-wide Monitors[3]	Number of Additional Area-wide Monitors Needed
Las Vegas-Paradise (29820)	2,322,985[4] (2022)	368,167	2	2	0	2	4	0

[1] This number represents the highest AADT count of any roadway segment in Clark County as measured by NDOT (counting station 0030074) on Interstate-15, 0.5 miles north of the Spring Mountain Interchange (Exit 39). This traffic counter is approximately 0.5 miles south of the Rancho & Teddy near-road monitoring site along the Interstate-15 corridor, both the monitoring site and traffic counting station have similar traffic patterns, and it is presumed that high traffic count locations are indicative of maximum hourly NO_2 concentrations. Due to potential inconsistencies with the 2020 AADT count related to COVID-19, the 2021 AADT estimate was obtained from NDOT through direct correspondence.

[2] Two near-road NO_2 monitors are required in any CBSA with one or more roadway segments having an AADT of 250,000 or more and population of 1,000,000 or more (40 CFR 58, App. D, Sec. 4.3.2(a)).

[3] This number includes Regional Administrator (RA) 40, PAMS true NO_2, and general/background monitors.

[4] Population Estimates taken from U.S. Census Bureau, Population Division.

Notes: Monitors required for SIP or maintenance plan: NA.
DAQ is required to have an area-wide monitor in a location of expected highest NO_2 concentrations representing the neighborhood or larger spatial scales. Sunrise Acres meets this requirement, and this site also has the designated RA40 monitor for NO_2.
Monitors required for Photochemical Assessment Monitoring Station (PAMS): 1

2.4 Sulfur Dioxide Monitoring Design

SO_2 monitoring requirements are in 40 CFR 58, Appendix D, Section 4.4. The only criterion for SO_2 monitoring is stated in Section 4.4.5 in Appendix D, referring to NCore monitoring, as discussed in Section 2.9 of this Plan. The DAQ station with SO_2 monitoring is Jerome Mack (AQS ID: 32-003-0540). The following table identifies how DAQ'snetwork meets the minimum requirements for Sulfur Dioxide monitoring in Clark County:

Table 2-4. Minimum Monitoring Requirements for SO_2

CBSA	County	Population and Census Year[1]	Total SO_2[2] [tons/year]	Population Weighted Emissions Index[3] [million persons-tons/year]	Number of Required Monitors	Data Requirements Rule Source(s) Using Monitoring	Number of Active Monitors	Number of Additional Monitors Needed
Las Vegas-Paradise (29820)	Clark, NV	2,322,985[4] (2022)	1,227	2,850	1	0	1	0

[1] Used for Population Weighted Emissions Index (PWEI) calculation.

[2] Stationary source SO_2 emissions are based on 2019 data. All other categories are based on the 2017 National Emissions Inventory (NEI).

[3] Calculated by multiplying CBSA population by total SO_2 and dividing product by one million.

[4] Population Estimates taken from U.S. Census Bureau, Population Division.

Notes: PWEI, RA, and Data Requirements Rule met.
Monitors required for SIP or maintenance plan: NA.
EPA RA-required monitors per 40 CFR 58, App. D, Sec. 4.4.3: 0.
This network meets the minimum monitoring requirement for the referenced criteria pollutant.

2.5 PM_{10} Monitoring Design

PM_{10} monitoring requirements are in 40 CFR 58, Appendix D, Section 4.6, Table D-4 which shows the approximate number of stations per MSA. The number of stations is dependent on how ambient concentrations relate to the PM_{10} NAAQS, which is a 24-hour average concentration of 150 micrograms per cubic meter ($\mu g/m^3$). DAQ data from 2022 show ambient concentrations of PM_{10} exceeding the NAAQS by 20% or more. Therefore, DAQ is using the "high concentration" range of station numbers in Table D-4, which for the population category of the MSA over 1,000,000 is six to ten stations.

Table 3-1 of this Plan summarizes the distribution of fourteen PM_{10} monitors in the DAQ network operated for SLAMS and NCore purposes. The maps of stations with PM_{10} monitors in the DAQ network show the broad spatial distribution of monitors. The following table identifies how DAQ's network meets the minimum requirements for PM_{10} monitoring in Clark County:

Table 2-5. Minimum Monitoring Requirements for PM_{10}

MSA	County	Population and Census Year	Maximum 24-Hour Concentration [$\mu g/m^3$] (2021)	Maximum 24-Hour Concentration Site (name, AQS ID) (2021)	Number of Required SLAMS Sites	Number of Active SLAMS Sites[1]	Number of Additional SLAMS Sites Needed
Las Vegas-Paradise (29820)	Clark, NV	2,322,985[4] (2022)	586 (2022)	Green Valley (32-003-0298)	6-10	13	0

[1] Meets requirements in 40 CFR 58 App. D, Table D-4. Number of active sites falls within the required range of 6-10.
[2] Population Estimates taken from U.S. Census Bureau, Population Division.
Notes: Monitors required for SIP or maintenance plan: NA
This network meets the minimum monitoring requirement for the referenced criteria pollutant.

2.6 Fine Particulate Matter as $PM_{2.5}$ Monitoring Design

Fine particulate matter as $PM_{2.5}$ minimum monitoring requirements are in 40 CFR 58, Appendix D, Section 4.7.1(a), Table D-5 which shows the minimum number of stations per MSA, and whether the most recent 3-year design value of any $PM_{2.5}$ NAAQS is greater or less than 85% of the NAAQS. Based on the 2022 design values, only DAQ's Sunrise Acres site (AQS ID: 32-003-0561) exceeds the 85% value for the 24-hour NAAQS. Therefore, the applicable number of monitoring sites in Table D-5 is three monitors.

Appendix D, Section 3.0(b) addresses NCore requirements, which include "using continuous and integrated/filter-based samplers". The primary and collocated $PM_{2.5}$ monitors at the Jerome Mack site (AQS ID: 32-003-0540) are filter based FRM samplers, fulfilling this requirement.

Appendix D, Section 4.7.1(b) continues with further specific design criteria to represent both collocated monitoring and area-wide air quality. Like CO, the $PM_{2.5}$ monitor located at the Rancho-Teddy site (AQS ID: 32-003-1501) is collocated with a near-road NO_2 monitor. DAQ's broad distribution of SLAMS $PM_{2.5}$ monitors achieves high area-wide coverage.

Appendix D, Section 4.7.2 addresses the requirement for continuous $PM_{2.5}$ monitoring. All sites in DAQ's network that measure $PM_{2.5}$ utilize continuous monitors.

Appendix D, Section 4.7.3 addresses the requirement for at least one $PM_{2.5}$ monitor to be located at both a background and at a regional transport site. The $PM_{2.5}$ monitors at the Virgin Valley site in Mesquite (AQS ID: 32-003-0024) and at the Garret Junior High site in Boulder City (AQS ID: 32-003-0602) are considered background locations. In addition, the rural Jean site located south of the Las Vegas Valley (AQS ID: 32-003-1019) serves as both background and regional transport characterization of particulate matter.

Appendix D, Section 4.7.4 addresses the requirement for $PM_{2.5}$ chemical speciation. $PM_{2.5}$ samplers at the Jerome Mack site (AQS ID: 32-003-0540) fulfill this requirement. The following tables identifies how DAQ's network meets the minimum requirements for $PM_{2.5}$ monitoring in Clark County:

Table 2-6. Minimum Monitoring Requirements for $PM_{2.5}$ (FRM[2] – Filter Based)

MSA	County	Population and Census Year	Annual Design Value ($\mu g/m^3$), Design Value Years[1,3]	Annual Design Value Site (name, AQS ID)	Daily Design Value ($\mu g/m^3$), Design Value Years[1,3]	Daily Design Value Site (name, AQS ID)	Number of Required SLAMS Sites[4]	Number of Active SLAMS FRM Sites[5]	Number of Additional SLAMS Sites Needed[5]
Las Vegas-Paradise (29820)	Clark, NV	2,322,985[4] (2022)	10.8, (2020-2022)	Sunrise Acres (32-003-0561)	32, (2020-2022)	Sunrise Acres (32-003-0561)	2	2 + collocation	0

[1] $\mu g/m^3$ = micrograms per cubic meter.
[2] FRM stands for federal reference method.
[3] Design Value Years = the three years for which the design value was calculated (i.e., 2019-2021).
[4] Pursuant to 40 CFR 58 App. D, Sec. 4.7.1 and 4.7.2, the number of required SLAMS sites includes both FRM and federal equivalent method (FEM) instruments.
[5] Meets requirements in 40 CFR 58 App. D, Sec. 4.7.2 based on total number of FRM and FEM instruments.

Notes: Monitors required for SIP or maintenance plan: NA.
This network meets the minimum monitoring requirement for the referenced criteria pollutant.

Table 2-7. Minimum Monitoring Requirements for $PM_{2.5}$ (FEM[2] – Continuous)

MSA	County	Population and Census Year	Annual Design Value ($\mu g/m^3$), Design Value Years[1,3]	Annual Design Value Site (name, AQS ID)	Daily Design Value ($\mu g/m^3$), Design Value Years[1,3]	Daily Design Value Site (name, AQS ID)	Number of Required Continuous FEM Sites	Number of Active Continuous FEM Sites	Number of Additional Continuous FEM Sites Needed
Las Vegas-Paradise (29820)	Clark, NV	2,322,985[4] (2022)	10.8, (2020-2022)	Sunrise Acres (32-003-0561)	32, (2020-2022)	Sunrise Acres (32-003-0561)	1	9	0

[1] $\mu g/m^3$ = micrograms per cubic meter.
[2] FEM stands for federal equivalent method.
[3] Design Value Years = the three years for which the design value was calculated (i.e., 2019-2021).
[4] Pursuant to 40 CFR 58 App. D, Sec. 4.7.1 and 4.7.2, the number of required SLAMS sites includes both FRM and federal equivalent method (FEM) instruments.
[5] Meets requirements in 40 CFR 58 App. D, Sec. 4.7.1 based on total number of FRM and FEM instruments.

Notes: Monitors required for SIP or maintenance plan: NA.
This network meets the minimum monitoring requirement for the referenced criteria pollutant.

2.7 Coarse Particulate Matter ($PM_{10-2.5}$) Monitoring Design

Coarse particulate matter ($PM_{10-2.5}$) monitoring requirements are in 40 CFR 58, Appendix D, Section 4.8. $PM_{10-2.5}$ is included with other parameters required for NCore monitoring, as discussed in Section 2.9 of this Plan. Currently, DAQ measures $PM_{10-2.5}$ at its Jerome Mack site (AQS ID: 32-003-0540).

2.8 Lead Monitoring Design

Pb monitoring requirements are in 40 CFR 58, Appendix D, Section 4.5. Monitoring criteria include proximity to sources that are expected to contribute to higher concentrations than the applicable NAAQS criteria, and for certain airports in shown in Table D-3A of Appendix D. Neither criterion applies to Clark County, therefore, DAQ lead monitoring was discontinued in 2016.

2.9 NCore Monitoring Design

NCore monitoring requirements are in 40 CFR 58, Appendix D, Section 3. To meet the NCore requirements, DAQ operates, a continuous $PM_{2.5}$ sampler, filter-based speciated $PM_{2.5}$, $PM_{10-2.5}$ particle mass, O_3, SO_2, CO, NO and NO_Y, wind speed, wind direction, relative humidity, and ambient temperature at the Jerome Mack site (AQS ID: 32-003-0540).

2.10 Photochemical Assessment Monitoring Station Design

PAMS monitoring requirements are in 40 CFR 58, Appendix D, Section 5. The Jerome Mack site (AQS ID: 32-003-0540) fulfills the PAMS site, including Sections 5(b)(1) through 5(b)(13). The first year of formal operation of the PAMS measurements was 2021, they were continued in 2022, and are planned for 2023 and beyond.

Table 2-8. Summary of DAQ Air Monitoring Network for 2023

Site, AQS ID	O_3	NO_2	CO	$PM_{2.5}$ FRM	$PM_{2.5}$ FEM	PM_{10} FEM	Met Data[4]
Apex, 32-003-0022	SLAMS[1]						Met
Virgin Valley, 32-003-0024	SLAMS				SLAMS	SLAMS	Met
Paul Meyer, 32-003-0043	SLAMS		SPM[1]		SLAMS	SLAMS	Met
Mountains Edge, 32-003-0044	SLAMS				SLAMS	SLAMS	Met
Walter Johnson, 32-003-0071	SLAMS				SLAMS	SLAMS	Met
Palo Verde, 32-003-0073	SLAMS				SLAMS & collocated	SLAMS	Met
Joe Neal, 32-003-0075	SLAMS	SLAMS	SPM[1]		SLAMS	SLAMS	Met
Green Valley, 32-003-0298	SLAMS		SPM[1]		SLAMS	SLAMS	Met
Liberty H.S. 32-003-0299	SLAMS				SLAMS	SLAMS	Met
Jerome Mack, 32-003-0540[2, 3]	SLAMS	SLAMS	SLAMS	SLAMS & collocated	SLAMS	SLAMS	Met
Sunrise Acres, 32-003-0561		SLAMS	SLAMS	collocated for FEM	SLAMS	SLAMS	Met
Garrett Jr. H.S. 32-003-0602	SLAMS				SLAMS	SLAMS	Met
Jean, 32-003-1019	SLAMS				SLAMS	SLAMS	Met
Rancho & Teddy, 32-003-1501[5]		SLAMS	SLAMS		SLAMS		Met
Casino Center, 32-003-1502[5]		SLAMS					Met
Walnut Rec Center, 32-003-2003	SLAMS	SLAMS	SLAMS		SLAMS	SLAMS	Met
Spring Mtn Youth Camp, 32-003-7771	SPM[1]						
Indian Springs, 32-003-7772	SLAMS[1]						
Total monitors	**15**	**6**	**7**	**3**	**15**	**13**	**16 sites**

[1] ozone seasonal only (Apr-Sept)
[2] additional for NCore: NO/NO_y, SO_2, PMc, speciated $PM_{2.5}$; Relative humidity, plus barometric pressure, rain
[3] added for PAMS: June-Sept: VOC and carbonyls; year-round: solar, UV, and mixing height.
[4] wind speed, wind direction, air temperature
[5] near road

3.0 2022 SITE TABLES

Figure 1: Casino Center: Near-Road Site 2.

Casino Center Near-Road Site 2 is in the parking lot of Las Vegas Fire and Rescue, which is southeast of E. Bonanza Road and N. Veterans Memorial Drive, and adjacent to US Highway 93. This monitoring station is the second near-road site in the network. Casino Center Near-Road Site 2 was approved by EPA in 2014, and DAQ deployed it in July 2016.

At the request of NDOT, DAQ deployed CO, PM_{10} and $PM_{2.5}$ SPM monitors in addition to existing near-road NO_2 and meteorological monitors. Data from these monitors will be used for an Environmental Impact Statement related to the expansion of the US-95. These monitors were operated through June 30, 2022.

Meteorological measurements at this site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Casino Center (32-003-1502)**
GPS Coordinates (latitude, longitude)	+36.174365°, -115.139770°

Local Site Name (AQS ID)	Casino Center (32-003-1502)
Street Address	500 N. Casino Center Boulevard, Las Vegas, NV
Distance to roadways (m)	U.S. Highway 93: 16; N. Casino Center Boulevard 120; Bonanza Road:180
Traffic counts (AADT, year)	U.S. Highway 93: 154,000; N. Casino Center Boulevard 4,300; Bonanza Road: 14,000 (2020)
Ground cover	Paved
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	NO_2, 1	CO, 1	PM_{10}, 1	$PM_{2.5}$ (continuous), 3
Parameter code	42602	42101	81102	88101
Basic monitoring objective(s)	NAAQS comparison	Research support	Research support	Research support
Site type(s)	Source oriented; Highest concentration	Source oriented	Source oriented	Source oriented
Network affiliation	Near Road	NA	NA	NA
Monitor type(s)	SLAMS	SPM	SPM	SPM
Primary, QA Collocated, or Other	Primary	Primary	Primary	Primary
Instrument manufacturer and model	TAPI 500 series	TAPI 300 series	Teledyne T640X	Teledyne T640X
Method code	EQNA-0514-212	RFCA-1093-093	EQPM-0516-239	EQPM–0516–238
FRM/FEM/ARM/other	FEM	other	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ	DAQ
Spatial scale	Microscale	Microscale	Microscale	Microscale
Monitoring date	07/01/2016	08/01/2021 – 6/30/2022	09/01/2021 – 6/30/2022	08/01/2021 – 6/30/2022
Current sampling frequency	Continuous	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round	Year-round
Probe height (m)	4.9	4.9	4.9	4.9
Distance from supporting structure (m)	2.2	2.2	2.1	2.1
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	30	30	30	30
Distance from obstructions not on roof – vertical height (m)	10	10	10	10
Does obstruction(s) not on roof impede flow	No	No	No	No
Obstruction height above probe (m)	NA	NA	NA	NA
Distance from trees (m)	31.7	31.7	31.7	31.7

Pollutant, POC	NO_2, 1	CO, 1	PM_{10}, 1	$PM_{2.5}$ (continuous), 3
Distance to furnace or incinerator flue (m)	NA	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA	NA
Distance to nearest PM instrument (m)	NA	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360	360
Probe material for reactive gases	Teflon	Teflon	NA	NA
Residence time for reactive gases (s)	7.3	3.7	NA	NA
Will there be changes within the next 18 months? (Y/N)	N	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	N	N	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	NA	NA	Monthly	Monthly
Frequency of one-point QC check for gaseous instruments	Weekly	Weekly	NA	NA
Last annual performance evaluation for gaseous parameters	9/23/2022	NA	NA	NA
Last two semiannual flow rate audits for PM monitors	NA	NA	2/18/2022 and 6/16/2022[1]	2/18/2022 and 6/16/2022[1]

[1] Monitoring began 9/1/2021, ended 6/30/2022.
[2] Monitoring began 8/1/2021, ended 6/30/2022.

Figure 2: Garrett Junior High.

The Garrett Junior High School Monitoring Site has replaced the Boulder City site. This new location is more representative of Boulder City at the neighborhood scale and provides better population coverage. $PM_{2.5}$ was started as SPM with potential for SLAMS monitoring, and the new site has a meteorological tower. Meteorological measurements at this site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Garrett Junior High (32-003-0602)**
GPS Coordinates (latitude, longitude)	+35.969848°, -114.835007°
Street Address	1200 Ave G , Boulder City, NV
Distance to roadways (m)	Adams Blvd: 133 Avenue G: 305
Traffic counts (AADT, year)	Adams Blvd: 4,250; Avenue G: 1,550: (2020)
Ground cover	Grass, unpaved, paved
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$ (continuous), 3**	**O_3, 1**
Parameter code	81102	88101	44201
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure
Network affiliation	NA	NA	NA
Monitor type(s)	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Primary	Primary
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	TAPI 400 series
Method code	EQPM-0516-239	EQPM–0516–238	EQOA-0992-087
FRM/FEM/ARM/other	FEM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	4/1/2021	4/1/2021	4/1/2021
Current sampling frequency	NA	NA	NA
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.7	4.7	4.6
Distance from supporting structure (m)	2.0	2.0	1.9
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	50	50	50
Distance from obstructions not on roof – vertical height (m)	10	10	10
Distance from trees (m)	50	50	50
Distance from drip line of trees (m)	45	45	45
Distance to furnace or incinerator flue (m)	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA
Distance to nearest PM instrument (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360
Probe material for reactive gases	NA	NA	Teflon
Residence time for reactive gases (s)	NA	NA	7.0
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	NA
Frequency of one-point QC check for gaseous instruments	NA	NA	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	3/25/2022
Last two semiannual flow rate audits for PM monitors	8/30/22, 11/10/2022	8/30/22, 11/10/2022	NA

Figure 3: Green Valley.

The Green Valley site in Henderson was established in 2015 to monitor O_3, PM_{10} and $PM_{2.5}$. Meteorological measurements at the Green Valley site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Green Valley (32-003-0298)**
GPS Coordinates (latitude, longitude)	+36.048705°, -115.052942°
Street Address	298 Arroyo Grande Blvd., Henderson, NV 89014
Distance to roadways (m)	Santiago Drive: 18; Arroyo Grande Blvd: 198; North Stephanie: 533
Traffic counts (AADT, year)	Santiago Drive: 3,800 (est.); Arroyo Grande Blvd: 9,550; North Stephanie: 33,000 (2020)
Ground cover	Paved, gravel
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$ (continuous), 3**	**O_3, 1**	**CO, 1**
Parameter code	81102	88101	44201	42101
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison	Research support
Site type(s)	Population exposure	Population exposure	Population exposure, regional transport	Population exposure
Network affiliation	NA	NA	NA	NA
Monitor type(s)	SLAMS	SLAMS	SLAMS	SPM
Primary, QA Collocated, or Other	Primary	Primary	Primary	Primary
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	TAPI 400 series	TAPI 300 series
Method code	EQPM-0516-239	EQPM–0516–238	EQOA-0992-087	RFCA-1093-093
FRM/FEM/ARM/other	FEM	FEM	FEM	other
Collecting agency	DAQ	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	06/02/2015	06/02/2015	07/01/2015	04/01/2021
Current sampling frequency	Continuous	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round	04/01 – 09/30
Probe height (m)	4.8	4.8	4.5	4.5
Distance from supporting structure (m)	2.0	2.0	1.7	1.7
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	12	12	15	15
Distance from obstructions not on roof – vertical height (m)	4	4	4	4
Distance from trees (m)	12	12	15	15
Distance from drip line of trees (m)	10.5	10.5	13.2	13.2
Distance to furnace or incinerator flue (m)	NA	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA	NA

Pollutant, POC	PM_{10}, 1	$PM_{2.5}$ (continuous), 3	O_3, 1	CO, 1
Distance to nearest PM instrument (m)	NA	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360	360
Probe material for reactive gases	NA	NA	Teflon	Teflon
Residence time for reactive gases (s)	NA	NA	10.4	4.9
Will there be changes within the next 18 months? (Y/N)	N	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	NA	NA
Frequency of one-point QC check for gaseous instruments	NA	NA	Weekly	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	4/8/2022	NA[1]
Last two semiannual flow rate audits for PM monitors	2/8/2022, 6/8/2022, 8/30/2022, 11/10/2022	2/8/2022, 6/8/2022, 8/30/2022, 11/10/2022	NA	NA

[1]No audit conducted on special study SPM.

Figure 4: Indian Springs.

The O_3 monitor at Indian Springs is helpful in identifying high O_3 concentrations, characterizing transport, and filling spatial gaps. Additional justification for this site is provided in the 5-Year Network Assessment. This Indian Springs location is approximately 45 miles northwest of Las Vegas and may provide high-O_3 triangulation between Joe Neal and the Las Vegas Paiute Tribe (when active), which appears to be the highest O_3 location within Clark County. DAQ will continue to work with EPA in evaluating high O_3 locations within its jurisdiction.

Local Site Name (AQS ID)	**Indian Springs (32-003-7772)**
GPS Coordinates (latitude, longitude)	+36.569333°, -115.676651°
Street Address	668 Gretta Ln., Indian Springs, NV
Distance to roadway (m)	Gretta Ln: 97
Traffic count (AADT, year)	< 1,000 (2020)
Ground cover	Native desert
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**O_3, 1**
Parameter code	44201
Basic monitoring objective(s)	NAAQS comparison
Site type(s)	Regional transport
Network affiliation	NA
Monitor type(s)	SLAMS
Instrument manufacturer and model	TAPI 400 series

Pollutant, POC	**O_3, 1**
Method code	EQOA-0992-087
FRM/FEM/ARM/other	FEM
Collecting agency	DAQ
Analytical lab	NA
Reporting agency	DAQ
Spatial scale	Regional
Monitoring start date	05/11/2010
Current sampling frequency	Continuous, seasonal
Calculated sampling frequency	Continuous, seasonal
Sampling season	Seasonal: contingent upon waiver
Probe height (m)	5
Distance from supporting structure (m)	1.9
Distance from obstructions on roof – horizontal distance (m)	NA
Distance from obstructions on roof – vertical height (m)	NA
Distance from obstructions not on roof – horizontal distance (m)	4.1
Distance from obstructions not on roof – vertical height (m)	1.0 (building/obstruction is below probe)
Obstruction height above probe (m)	NA (probe is above obstruction)
Distance from trees (m)	NA
Distance to furnace or incinerator flue (m)	NA
Distance between collocated monitors (m)	NA
Unrestricted airflow (degrees)	360
Probe material for reactive gases	Teflon
Residence time for reactive gases (s)	8.3
Will there be changes within the next 18 months? (Y/N)	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	NA
Frequency of flow rate verification for manual PM samplers	NA
Frequency of flow rate verification for automated PM analyzers	NA
Frequency of one-point QC check for gaseous instruments	Weekly
Last annual performance evaluation for gaseous parameters	7/7/2022
Last two semiannual flow rate audits for PM monitors	NA

Figure 5: Jean.

The Jean site is approximately 30 miles south of Las Vegas. This site was originally set up as an upwind background site, and it still serves this purpose for PM, when winds are generally from the south. Its primary objective for O_3 monitoring is measuring transport from Southern California. Meteorological measurements at the Jean site include wind speed, wind direction, and ambient temperature. During 2022, the property area owned by the Las Vegas Valley Water District was expanded and a new ground-water pump was added. The area around the site has little vehicle traffic, and the surface is well stabilized.

Local Site Name (AQS ID)	**Jean (32-003-1019)**
GPS Coordinates (latitude, longitude)	+35.785665°, -115.357087°
Street Address	1965 State Route 161, Jean, NV 89019
Distance to roadways (m)	State Route 161: 1,043
Traffic counts (AADT, year)	State Route 161: 1,800 (2020)
Ground cover	Gravel, native desert
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**O_3, 1**	**$PM_{2.5}$ Primary (continuous), 3**
Parameter code	81102	44201	88101
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Regional transport	Regional transport	Regional transport
Network affiliation	NA	NA	NA
Monitor type(s)	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Primary	Primary
Instrument manufacturer and model	Teledyne T640X	API 400 series	Teledyne T640X
Method code	EQPM-0516-239	EQOA-0992-087	EQPM–0516–238
FRM/FEM/ARM/other	FEM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ
Spatial scale	Regional	Regional	Regional
Monitoring start date	06/08/2017	08/01/1998	06/08/2017
Current sampling frequency	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.7	4.0	4.7
Distance from supporting structure (m)	2.1	1.5	2.1
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions not on roof – vertical height (m)	NA	NA	NA
Distance from trees (m)	NA	NA	NA
Distance to furnace or incinerator flue (m)	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA
Distance to nearest PM instrument (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360
Probe material for reactive gases	NA	Teflon	NA
Residence time for reactive gases (s)	NA	6.3	NA
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	N	Y
Frequency of flow rate verification for manual PM samplers	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	NA	Monthly

Pollutant, POC	**PM_{10}, 1**	**O_3, 1**	**$PM_{2.5}$ Primary (continuous), 3**
Frequency of one-point QC check for gaseous instruments	NA	Weekly	NA
Last annual performance evaluation for gaseous parameters	NA	4/19/2022	NA
Last two semiannual flow rate audits for PM monitors	2/8/2022, 6/24/2022, 8/15/2022, 11/4/2022	NA	2/8/2022, 6/24/2022, 8/15/2022, 11/4/2022

Figure 6: Jerome Mack.

The Jerome Mack site in east Las Vegas is the Clark County NCore and PAMS site. Its primary objective is to monitor trace-level gaseous pollutants, O_3 and O_3 precursors, PM parameters (including PM_{10}, $PM_{2.5}$, particulate matter between 2.5 and 10 micrometers in diameter (PM Coarse), and speciated PM parameters), and meteorological measurements as part of the nationwide NCore network. This site operates the $PM_{2.5}$ QA collocated FRM sampler for the $PM_{2.5}$ FRM network. The SASS (parameter code 88502) and URG (parameter code 88355) are non-regulatory speciation samplers and are operated as non-FRM/FEM.

This site began PAMS operations as of June 2019. These operations are described in the PAMS Quality Assurance Project Plan (QAPP), which was approved on December 22, 2020.

Meteorological measurements at this site include wind speed, wind direction, ambient temperature, relative humidity, precipitation, barometric pressure, cloud mixing layer height, solar and UV radiation.

Local Site Name (AQS ID)	**Jerome Mack (32-003-0540)**
GPS Coordinates (latitude, longitude)	+36.141875°, -115.078742°
Street Address	4250 Karen Avenue, Las Vegas, NV 89121
Distance to roadways (m)	Sahara: 244; Lamb: 351; Karen: 130
Traffic counts (AADT, year)	Sahara: 27,700; Lamb: 26,000; Karen: 3,000 (est.) (2020)
Ground cover	Concrete, grass
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	PM_{10}, 3	$PM_{2.5}$ continuous, 3	$PM_{10-2.5}$ continuous, 3	$PM_{2.5}$ Primary (FRM), 1	$PM_{2.5}$ Collocated (FRM), 2	Speciation SASS, 5	Speciation URG, 5	O_3, 1	NO, 1	NO_2, 1	NO_Y, 1	Trace CO, 1	Trace SO_2, 1
Parameter code	81102	88101	86101	88101	88101	88502 Speciation, non-regulatory	88355 Speciation, non-regulatory	44201	42601	42602	42600	42101	42401
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	Research support	NAAQS comparison	NAAQS comparison	Research support	Research support	NAAQS comparison	Research support	NAAQS comparison	Research support	Research support, NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure; 2nd highest concentration	Population exposure	Population exposure	Population exposure
Network affiliation	NCore	NCore	NCore	NCore	NCore	CSN Supple-mental, NCore	CSN Supple-mental, NCore	NCore	NCore	NCore	NCore	NCore	NCore
Monitor type(s)	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Other	Primary	Primary	QA Collocated	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	Teledyne T640X	Met One E-SEQ-FRM	Met One E-SEQ-FRM	Met One Super SASS	URG 3000	TAPI 400 series	TAPI 200 series	TAPI 500 series	TAPI 200 series	TAPI 300 series	TAPI 100 series
Method code	EQPM-0516-239	EQPM–0516–238	EQPM–0516–240	RFPS-0717-245	RFPS-0717-245	811, 812	838	EQOA-0992-087	RFNA-1194-099	EQNA-0514-212	RFNA-1194-099	RFCA-1093-093	EQSA-0495-100
FRM/FEM/ARM/other	FEM	FEM	FEM	FRM Primary	FRM Collocated	Other	Other	FEM	Other	FEM	Other	FRM	FEM
Collecting agency	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA	Weigh	Weigh	UC Davis	UC Davis	NA	NA	NA	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ	DAQ	DAQ	Sonoma Tech	Sonoma Tech	DAQ	DAQ	DAQ	DAQ	DAQ	DAQ
Spatial scale	Neighbor-hood	Neighborhood	Neighborhood	Neighborhood	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighborhood	Neighbor-hood	Neighbor-hood	Neighbor-hood
Monitoring start date	01/30/2018	01/30/2018	01/30/2018	01/01/2019	01/01/2019	05/2010	05/2010	01/01/2011	01/01/2011	05/01/2017	01/01/2011	01/01/2011	01/01/2011
Current sampling frequency	Continuous	Continuous	Continuous	1:3	1:3	1:3	1:3	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous	1:3	1:3	1:3	1:3	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round
Probe height (m)	5.2	5.2	5.2	3.1	3.1	3.0	3.3	3.4	7.0	3.4	7.0	3.4	3.4

Pollutant, POC	PM_{10}, 3	$PM_{2.5}$ continuous, 3	$PM_{10-2.5}$ continuous, 3	$PM_{2.5}$ Primary (FRM), 1	$PM_{2.5}$ Collocated (FRM), 2	Speciation SASS, 5	Speciation URG, 5	O_3, 1	NO, 1	NO_2, 1	NO_Y, 1	Trace CO, 1	Trace SO_2, 1
Distance from supporting structure (m)	2.0	2.0	2.0	2.9	2.9	2.9	3.1	1.1	7.0	1.1	7.0	1.1	1.1
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	16.1	16.1	16.1	5.4	3.0	7.2	5.3	15.5	14.5	15.5	14.5	15.5	15.5
Distance from obstructions not on roof – vertical obstruction height (m)	6	6	6	3.1	3.1	3.0	3.3	NA	NA	NA	NA	NA	NA
Obstruction height above probe (m)	3	3	3	0.2	0.2	0.3	0.4	3	3	3	3	3	3
Distance from trees (m)	16.1	16.1	16.1	22.0	18.3	20.3	19.4	15.5	14.5	15.5	14.5	15.5	15.5
Distance to furnace or incinerator flue (m)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA	3.6	3.6	NA	NA	NA	NA	NA	NA	NA	NA
Distance to nearest PM instrument (m)	8.4	8.4	8.4	3.6	3.6	2.8	2.2	NA	NA	NA	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360	360	360	360	360	360	360	360	360	360	360
Probe material for reactive gases	NA	NA	NA	NA	NA	NA	NA	Teflon	Teflon	Teflon	Teflon	Teflon	Teflon
Residence time for reactive gases (s)	NA	NA	NA	NA	NA	NA	NA	8.5	9.8	7.4	9.8	4.3	10.2
Will there be changes within the next 18 months? (Y/N)	N	N	N	N	N	N	N	N	N	N	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N	Y	Y	N	N	N	N	N	N	N	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA	Monthly	Monthly	Monthly	Monthly	NA	NA	NA	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	Monthly	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Pollutant, POC	PM_{10}, 3	$PM_{2.5}$ continuous, 3	$PM_{10-2.5}$ continuous, 3	$PM_{2.5}$ Primary (FRM), 1	$PM_{2.5}$ Collocated (FRM), 2	Speciation SASS, 5	Speciation URG, 5	O_3, 1	NO, 1	NO_2, 1	NO_Y, 1	Trace CO, 1	Trace SO_2, 1
Frequency of one-point QC check for gaseous instruments	NA	NA	NA	NA	NA	NA	NA	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	NA	NA	NA	NA	NA	4/15/2022	10/25/2022	8/3/2022	10/25/2022	8/125/2022	8/11/2022
Last two semiannual flow rate audits for PM monitors	3/2/2022, 6/22/2022, 8/16/2022, 11/9/2022	3/2/2022, 6/22/2022, 8/16/2022, 11/9/2022	3/2/2022, 6/22/2022, 8/16/2022, 11/8/2022	3/2/2022, 6/17/2022, 8/16/2022, 11/9/2022	3/2/2022, 6/17/2022, 8/16/2022, 11/9/2022	3/4/2022, 6/17/2022, 8/16/2022, 11/9/2022	3/4/2022, 6/17/2022, 8/16/2022, 11/8/2022	NA	NA	NA	NA	NA	NA

Figure 7: Joe Neal.

The primary objectives of the Joe Neal site, located in northwest Las Vegas, are to monitor O_3 and NO_2 in an area of high O_3 concentrations, and to support DAQ modeling efforts. Due to topography at this location, the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. Although Joe Neal tends to measure the highest O_3 concentrations within the network, DAQ will continue working with EPA to evaluate if there are higher O_3 locations within Clark County. Meteorological measurements at the Joe Neal site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Joe Neal (32-003-0075)**
GPS Coordinates (latitude, longitude)	+36.270592°, -115.238282°
Street Address	6651 W. Azure Way, Las Vegas, NV 89130
Distance to roadways (m)	Rebecca: 12.6; Azure: 213; Tropical: 130; North Rainbow: 366
Traffic counts (AADT, year)	Rebecca: 3,000 (est.); Azure 2,750; Tropical 3,850; North Rainbow 2,650 (2020)
Ground cover	Gravel, grass, pavement
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$, 3**	**O_3, 1**	**NO_2, 1**	**CO, 1**
Parameter code	81102	88101	44201	42602	42101
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison	Research support, NAAQS comparison	Research support
Site type(s)	Population exposure	Population exposure	Max.O3 concentration	Population exposure	Population exposure
Network affiliation	NA	NA	NA	NA	NA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$, 3**	**O_3, 1**	**NO_2, 1**	**CO, 1**
Monitor type(s)	SLAMS	SLAMS	SLAMS	SLAMS	SPM
Primary, QA Collocated, or Other	Primary	Primary	Primary	Primary	Primary
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	TAPI 400 series	TAPI 500 series	TAPI 300 series
Method code	EQPM-0516-239	EQPM–0516–238	EQOA-0992-087	EQNA-0514-212	RFCA-1093-093
FRM/FEM/ARM/other	FEM	FEM	FEM	FEM	other
Collecting agency	DAQ	DAQ	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	09/19/2017	09/19/2017	07/01/2000	10/01/2015	04/01/2020
Current sampling frequency	Continuous	Continuous	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round	Year-round	04/01/2021 – 09/30/2021
Probe height (m)	4.9	4.9	3.9	3.9	3.9
Distance from supporting structure (m)	2.4	2.4	1.3	1.3	1.3
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	17.6	17.6	17.8	17.8	17.8
Distance from obstructions not on roof – vertical height (m)	4	4	4	4	4
Distance from trees (m)	15	15	15	15	15
Distance from drip line of trees (m)	17.6	17.6	17.8	17.8	17.8
Distance to furnace or incinerator flue (m)	NA	NA	NA	NA	NA

Pollutant, POC	PM_{10}, 1	$PM_{2.5}$, 3	O_3, 1	NO_2, 1	CO, 1
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA	NA	NA
Distance to nearest PM instrument (m)	NA	NA	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360	360	360
Probe material for reactive gases	NA	NA	Teflon	Teflon	Teflon
Residence time for reactive gases (s)	NA	NA	7.2	5.9	3.4
Will there be changes within the next 18 months? (Y/N)	N	N	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N	N	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	NA	NA	NA
Frequency of one-point QC check for gaseous instruments	NA	NA	Weekly	Weekly	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	5/24/2022	10/4/2022	NA[1]
Last two semiannual flow rate audits for PM monitors	2/11/2022, 5/19/2022, 8/26/2022,11/1/2021	2/11/2022, 5/19/2022, 8/26/2022,11/1/2021	NA	NA	NA

[1]No audit conducted on special study SPM.

Figure 8: Liberty High School.

The Liberty High School site was established to fill a spatial gap in the southeast Las Vegas Valley. The site measures O_3, PM_{10} and $PM_{2.5}$ (SPM). Meteorological measurements at the Liberty High School site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Liberty High School (32-003-0299)**
GPS Coordinates (latitude, longitude)	+35.987908°, -115.148885°
Street Address	3700 Liberty Heights Ave. Henderson, NV
Distance to roadway (m)	Liberty Heights Ave: 16; Chaparral Rd: 16; Bermuda Rd: 575
Traffic count (AADT, year)	Liberty Heights Ave: 1,000 (est.); Chaparral Rd: 1,000 (est.); Bermuda Rd: 6,550 (2020)
Ground cover	Asphalt, gravel, and grass
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$**	**O_3, 1**
Parameter code	81102	88101	44201
Basic monitoring objective(s)	NAAQS comparison	Provide air pollution data to public in a timely manner.	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure
Monitor type(s)	SLAMS	SLAMS	SLAMS

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$**	**O_3, 1**
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	API 400 series
Method code	EQPM-0516-239	EQPM–0516–238	EQOA-0992-087
FRM/FEM/ARM/other	FEM	FEM	FEM
Collecting agency	DES	DES	DES
Analytical lab	NA	NA	NA
Reporting agency	DES	DES	DES
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	5/1/2021	5/1/2021	5/1/2021
Current sampling frequency	NA	NA	NA
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.8	4.8	4.3
Distance from supporting structure (m)	2.2	2.2	1.6
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	42	42	42
Distance from obstructions not on roof – vertical height (m)	3	3	3
Distance from trees (m)	42	42	42
Distance from drip line of trees (m)	41	41	41
Distance to furnace or incinerator flue (m)	NA	NA	NA
Distance between collocated monitors (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360
Probe material for reactive gases	NA	NA	Teflon
Residence time for reactive gases (s)	NA	NA	6.6
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	NA
Frequency of one-point QC check for gaseous instruments	NA	NA	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	4/1/2022
Last two semiannual flow rate audits for PM monitors	2/18/2022, 6/10/2022, 8/15/2022, 11/3/2022	2/18/2022, 6/10/2022, 8/15/2022, 11/3/2022	NA

Figure 9: Mountains Edge Park.

The Mountains Edge site was established to fill a spatial gap in the southwest Las Vegas Valley. The site measures O_3, PM_{10} and $PM_{2.5}$ (SPM). Meteorological measurements at the Mountains Edge site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Mountains Edge Park (32-003-0044)**
GPS Coordinates (latitude, longitude)	+36.004787°, -115.267671°
Street Address	8101 W Mountains Edge Pkwy, Las Vegas, NV
Distance to roadway (m)	Mountains Edge Pkwy.: 46; S. Buffalo Dr.: 488; Rumrill St.: 100
Traffic count (AADT, year)	Mountains Edge Pkwy.: 5,200; Buffalo Dr.: 10,300; Rumrill St.: <1,000 (est.) (2020)
Ground cover	Asphalt and gravel
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$**	**O_3, 1**
Parameter code	81102	88101	44201

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$**	**O_3, 1**
Basic monitoring objective(s)	NAAQS comparison	Provide air pollution data to public in a timely manner.	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure
Monitor type(s)	SLAMS	SLAMS	SLAMS
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	API 400 series
Method code	EQPM-0516-239	EQPM–0516–238	EQOA-0992-087
FRM/FEM/ARM/other	FEM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	10/1/2020	10/1/2020	10/1/2020
Current sampling frequency	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.7	4.7	4.6
Distance from supporting structure (m)	2.0	2.0	1.9
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	15	15	15
Distance from obstructions not on roof – vertical height (m)	2	2	2
Distance from trees (m)	15	15	15
Distance from drip line of trees (m)	13.4	13.4	13.4
Distance to furnace or incinerator flue (m)	NA	NA	NA
Distance between collocated monitors (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360
Probe material for reactive gases	NA	NA	Teflon
Residence time for reactive gases (s)	NA	NA	6.5
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	NA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$**	**O_3, 1**
Frequency of one-point QC check for gaseous instruments	NA	NA	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	3/18/2022
Last two semiannual flow rate audits for PM monitors	2/18/2022, 6/10/22, 8/16/2022, 12/4/2022	2/18/2022, 6/10/22, 8/16/2022, 12/4/2022	NA

Figure 10: Palo Verde.

The primary objective of the Palo Verde site in west Las Vegas is to monitor O_3, but it also monitors PM_{10} and $PM_{2.5}$ with a primary and collocated monitor. Due to topography at this location, the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. Meteorological measurements at the Palo Verde site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Palo Verde (32-003-0073)**
GPS Coordinates (latitude, longitude)	+36.173415°, -115.332728°
Street Address	333 Pavilion Center Dr., Las Vegas, NV 89144
Distance to roadways (m)	Pavilion Center Dr.: 14.7; Greenmoor Lane: 15.0
Traffic counts (AADT, year)	Pavilion Center Dr.: 7,000 (est.); Greenmoor Lane: 4,000 (est.) (2020)
Ground cover	Paved
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$, 3**	**$PM_{2.5}$, 4**	**O_3, 1**
Parameter code	81102	88101	88101	44201
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure	Population exposure
Network affiliation	NA	NA	NA	NA
Monitor type(s)	SLAMS	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Primary	QA Collocated	Primary
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	Teledyne T640X	API 400 series
Method code	EQPM-0516-239	EQPM–0516–238	EQPM–0516–238	EQOA-0992-087
FRM/FEM/ARM/other	FEM	FEM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	09/12/2017	1/1/2020	10/1/2021	07/01/1998
Current sampling frequency	Continuous	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round	Year-round
Probe height (m)	4.7	4.7	4.7	3.7
Distance from supporting structure (m)	2.3	2.3	2.3	1.4
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	2	2	2	2
Distance from obstructions not on roof – horizontal distance (m)	NA	NA	NA	NA
Distance from obstructions not on roof – vertical height (m)	2	2	2	2
Distance from trees (m)	16	16	16	16
Distance from drip line of trees (m)	15.0	15.0	15.0	13.7
Distance to furnace or incinerator flue (m)	NA	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	2.0	2.0	NA
Distance to nearest PM instrument (m)	NA	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360	360
Probe material for reactive gases	NA	NA	NA	Teflon
Residence time for reactive gases (s)	NA	NA	NA	6.3
Will there be changes within the next 18 months? (Y/N)	N	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	Y	N

Pollutant, POC	PM_{10}, 1	$PM_{2.5}$, 3	$PM_{2.5}$, 4	O_3, 1
Frequency of flow rate verification for manual PM samplers	NA	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	Monthly	NA
Frequency of one-point QC check for gaseous instruments	NA	NA	NA	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	NA	3/15/2022
Last two semiannual flow rate audits for PM monitors	2/9/2022, 5/19/2022, 8/16/2022, 11/2/2022	2/9/2022, 5/19/2022, 8/16/2022, 11/2/2022	2/9/2022, 5/19/2022, 8/16/2022, 11/2/2022	NA

Figure 11: Paul Meyer.

The primary objective of the Paul Meyer site in southwest Las Vegas is to monitor O_3, but it also monitors PM_{10} and $PM_{2.5}$. Due to topography at this location, the summertime loft brings higher O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. Meteorological measurements at the Paul Meyer site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Paul Meyer (32-003-0043)**
GPS Coordinates (latitude, longitude)	+36.106389°, -115.253333°
Street Address	4525 New Forest Dr., Las Vegas, NV 89147
Distance to roadways (m)	New Forest Dr.: 102; South Tenaya Way: 160
Traffic counts (AADT, year)	New Forest Dr.: 3,000 (est.); South Tenaya Way: 3,400 (2020)
Ground cover	Concrete, grass
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$, 3**	**O_3, 1**
Parameter code	81102	88101	44201
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure
Network affiliation	NA	NA	NA
Monitor type(s)	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Primary	Primary
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	API 400 series
Method code	EQPM-0516-239	EQPM–0516–238	EQOA-0992-087
FRM/FEM/ARM/other	FEM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	09/12/2017	06/15/2017	07/01/1998
Current sampling frequency	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.6	4.6	4.3
Distance from supporting structure (m)	1.9	1.9	1.6
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	12	12	13
Distance from obstructions not on roof – vertical height (m)	3	3	3
Distance from trees (m)	10.8	10.8	11.9
Distance from trees (m)	12	12	13
D1.5istance to furnace or incinerator flue (m)	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA
Distance to nearest PM instrument (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360
Probe material for reactive gases	NA	NA	Teflon
Residence time for reactive gases (s)	NA	NA	7.0
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	NA

Pollutant, POC	PM_{10}, 1	$PM_{2.5}$, 3	O_3, 1
Frequency of one-point QC check for gaseous instruments	NA	NA	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	3/9/2022
Last two semiannual flow rate audits for PM monitors	2/9/2022, 6/15/2022, 8/26/2022, 11/1/2022	2/9/2022, 6/15/2022, 8/26/2022, 11/1/2022	NA

Figure 12: Sunrise Acres.

Monitoring at the Sunrise Acres site near the center of the Las Vegas Valley began as part of a CO study in the 1990s. The primary objective of the Sunrise Acres site is to monitor CO, NO_2, and PM. DAQ is conducting area-wide NO_2 monitoring, which meets RA 40 requirements outlined in 40 CFR 58, App. D, Sec. 4.3.4 at this site. The site monitors $PM_{10}$and $PM_{2.5}$ using both filter-based and continuous methodologies. The $PM_{2.5}$ FEM is the primary monitor at this site, and it is collocated with a $PM_{2.5}$ FRM. Meteorological measurements at the Sunrise Acres site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Sunrise Acres (32-003-0561)**
GPS Coordinates (latitude, longitude)	+36.163962°, -115.113930°
Street Address	2501 Sunrise Ave., Las Vegas, NV 89101
Distance to roadways (m)	Sunrise Ave: 128; Eastern Ave: 160
Traffic counts (AADT, year)	Sunrise Ave: 4,000 (est.); Eastern Ave: 28,500 (2020)
Ground cover	Paved
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**PM_{10}, 1**	**CO, 1**	**$PM_{2.5}$ Collocated FRM, 1**	**$PM_{2.5}$ Primary FEM (continuous), 3**	**NO_2, 1**
Parameter code	81102	42101	88101	88101	42602
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Highest concentration	Highest concentration	Highest concentration	Population exposure; highest concentration
Network affiliation	NA	NA	NA	NA	NA
Monitor type(s)	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Primary	QA Collocated	Primary	Primary
Instrument manufacturer and model	Teledyne T640X	API 300 series	Met One E-SEQ-FRM	Teledyne T640X	TAPI 500 series
Method code	EQPM-0516-239	RFCA-1093-093	RFPS-0717-245	EQPM–0516–238	EQNA-0514-212
FRM/FEM/ARM/other	FEM	FRM	FRM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ	DAQ	DAQ
Analytical lab	NA	NA	Weigh	NA	NA
Reporting agency	DAQ	DAQ	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	09/25/2017	10/01/1996	01/01/2019	09/25/2017	01/01/2013
Current sampling frequency	Continuous	Continuous	1:3	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	1:3	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round	Year-round	Year-round
Probe height (m)	4.7	3.6	3.0	4.7	3.6
Distance from supporting structure (m)	2.2	1.0	2.1	2.2	1.0
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	NA	NA	2.1	NA	NA
Distance from obstructions not on roof – vertical height (m)	NA	NA	0.5 [1]	NA	NA

Pollutant, POC	PM_{10}, 1	CO, 1	$PM_{2.5}$ Collocated FRM, 1	$PM_{2.5}$ Primary FEM (continuous), 3	NO_2, 1
Distance from trees (m)	NA	NA	NA	NA	NA
Distance to furnace or incinerator flue (m)	NA	NA	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	Distance between $PM_{2.5}$ FRM and $PM_{2.5}$ FEM is 3.8	Distance between $PM_{2.5}$ FRM and $PM_{2.5}$ FEM is 3.8	NA
Distance to nearest PM instrument (m)	3.8	NA	3.8	3.8	NA
Unrestricted airflow (degrees)	360	360	360	360	360
Probe material for reactive gases	NA	Teflon	NA	NA	Teflon
Residence time for reactive gases (s)	NA	2.9	NA	NA	5.8
Will there be changes within the next 18 months? (Y/N)	N	N	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	N	Y	Y	N
Frequency of flow rate verification for manual PM samplers	NA	NA	Monthly	NA	NA
Frequency of flow rate verification for automated PM analyzers	Monthly	NA	NA	Monthly	NA
Frequency of one-point QC check for gaseous instruments	NA	Weekly	NA	NA	Weekly
Last annual performance evaluation for gaseous parameters	NA	8/24/2022	NA	NA	10/5/2022
Last two semiannual flow rate audits for PM monitors	1/19/2022, 6/22/2022, 8/23/2022, 11/8/2022	NA	3/4/2022, 6/23/2023, 8/23/2023, 11/8/2022	1/19/2022, 6/22/2022, 8/23/2022, 11/8/2022	NA

[1] Inlet above obstruction.

Figure 13: Rancho & Teddy: Near-Road Site 1.

Rancho & Teddy is the first near-road monitoring site that DAQ deployed, and it began operating in 2015. The site is in Las Vegas and at the southeast side of the intersection of South Rancho Drive and Teddy Drive, which is adjacent to Interstate 15. Meteorological measurements at this site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Rancho & Teddy (32-003-1501)**
GPS Coordinates (latitude, longitude)	+36.139707°, -115.175654°
Street Address	2755 S. Rancho Drive, Las Vegas, NV
Distance to roadways (m)	Interstate 15: 13; South Rancho Drive: 8; Teddy Drive: 31
Traffic counts (AADT, year)	Interstate 15: 368,167 (2021); South Rancho Drive: 4,000; Teddy Drive: 4,000 (est.) (2020)
Ground cover	Gravel
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**NO_2, 1**	**CO, 1**	**$PM_{2.5}$, 1**
Parameter code	42602	42101	88101
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Highest concentration	Highest concentration	Highest concentration
Network affiliation	Near Road	Near Road	Near Road
Monitor type(s)	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Primary	Primary
Instrument manufacturer and model	TAPI 500 series	API 300 series	Teledyne T640X
Method code	EQNA-0514-212	RFCA-1093-093	EQPM–0516–236
FRM/FEM/ARM/other	FEM	FRM	FEM
Collecting agency	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ
Spatial scale	Microscale	Microscale	Microscale
Monitoring start date	08/01/2015	01/01/2017	01/01/2017
Current sampling frequency	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.6	4.6	4.9
Distance from supporting structure (m)	1.8	1.8	2.1
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	101	103	103
Distance from obstructions not on roof – vertical height (m)	4	4	4
Distance from trees (m)	101	103	103
Distance to furnace or incinerator flue (m)	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA
Distance to nearest PM instrument (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360

Pollutant, POC	**NO_2, 1**	**CO, 1**	**$PM_{2.5}$, 1**
Probe material for reactive gases	Teflon	Teflon	NA
Residence time for reactive gases (s)	7.4	4.0	NA
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	N	Y
Frequency of flow rate verification for manual PM samplers	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	NA	NA	Monthly
Frequency of one-point QC check for gaseous instruments	Weekly	Weekly	NA
Last annual performance evaluation for gaseous parameters	9/22/2022	8/24/2022	NA
Last two semiannual flow rate audits for PM monitors	NA	NA	2/18/2022, 5/25/2022, 8/25/2025, 11/3/2022

Figure 14: Virgin Valley High School.

The Virgin Valley site is approximately 80 miles north of Las Vegas and monitors O_3, PM_{10} and $PM_{2.5}$ (as SPM). The site sits along a transport and exit corridor connecting jurisdictional boundaries and serves as an indicator of population exposure to pollutants. Meteorological measurements at this site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Virgin Valley High School (32-003-0024)**
GPS Coordinates (latitude, longitude)	+36.815897°, -114.050347°
Street Address	820 Valley View Dr., Mesquite, NV
Distance to roadway (m)	Valley View Dr.: 39; Hillside Dr.: 124; Interstate 15: 402
Traffic count (AADT, year)	Valley View Dr.: < 3,000 (est.); Hillside Dr.: 4,450; Interstate 15: 26,100 (2020)

Local Site Name (AQS ID)	Virgin Valley High School (32-003-0024)
Ground cover	Asphalt, gravel, and grass
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	PM_{10}, 1	$PM_{2.5}$ (continuous), 3	O_3, 1
Parameter code	81102	88101	44201
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure, regional transport
Monitor type(s)	SLAMS	SLAMS	SLAMS
Instrument manufacturer and model	Teledyne T640X	Teledyne T640X	API 400 series
Method code	EQPM-0516-239	EQPM–0516–238	EQOA-0992-087
FRM/FEM/ARM/other	FEM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	1/1/2021	1/1/2021	1/1/2021
Current sampling frequency	NA	NA	NA
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.9	4.9	3.6
Distance from supporting structure (m)	2.4	2.4	1.2
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	30.5	30.5	30.5
Distance from obstructions not on roof – vertical height (m)	3	3	3
Distance from trees (m)	30.5	30.5	30.5
Distance to furnace or incinerator flue (m)	NA	NA	NA
Distance between collocated monitors (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360
Probe material for reactive gases	NA	NA	Teflon
Residence time for reactive gases (s)	NA	NA	5.5
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	Y	N
Frequency of flow rate verification for manual PM samplers	NA	NA	NA

Pollutant, POC	**PM_{10}, 1**	**$PM_{2.5}$ (continuous), 3**	**O_3, 1**
Frequency of flow rate verification for automated PM analyzers	Monthly	Monthly	NA
Frequency of one-point QC check for gaseous instruments	NA	NA	Weekly
Last annual performance evaluation for gaseous parameters	NA	NA	3/23/2022
Last two semiannual flow rate audits for PM monitors	3/23/2023; 6/15/2022; 9/23/2022; 12/8/2022	3/23/2023; 6/15/2022; 9/23/2022; 12/8/2022	NA

Figure 15: Walnut Community Center.

The Walnut Community Center site began operation in June 2021. This site was a replacement for the JD Smith site, which was shut down in December 2017 due to poor siting. This site measures O_3, CO, NO_2, PM_{10} and $PM_{2.5}$. All criteria pollutant measurements are SLAMS. Meteorological measurements at the Walnut site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Walnut (32-003-2003)**
GPS Coordinates (latitude, longitude)	+36.214465°, -115.091437°
Street Address	3075 N Walnut Rd, Las Vegas, NV 89115
Distance to roadway (m)	Cecile Ave. 21, W. Walnut Rd. 125, E. Cheyenne Ave. 375

Local Site Name (AQS ID)	Walnut (32-003-2003)
Traffic count (AADT, year)	Cecile Ave. 1,000 (est.), W. Walnut Rd.: 4,000, E. Cheyenne Ave. 17,000 (2020)
Ground cover	Concrete, grass
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	O_3, 1	CO, 1	NO_2, 1	PM_{10}	$PM_{2.5}$
Parameter code	44201	42101	42602	81102	88101
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure
Monitor type(s)	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS
Instrument manufacturer and model	TAPI 400 series	TAPI 300 series	TAPI 500 series	Teledyne T640X	Teledyne T640X
Method code	EQOA-0992-087	RFCA-1093-093	EQNA-0514-212	EQPM-0516-239	EQPM–0516–238
FRM/FEM/ARM/other	FEM	FRM	FEM	FEM	FEM
Collecting agency	DES	DES	DES	DES	DES
Analytical lab	NA	NA	NA	NA	NA
Reporting agency	DES	DES	DES	DES	DES
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	6/1/2021	6/1/2021	6/1/2021	6/1/2021	6/1/2021
Current sampling frequency	Continuous	Continuous	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round	Year-round	Year-round
Probe height (m)	4.5	4.5	4.5	4.9	4.9
Distance from supporting structure (m)	1.8	1.8	1.8	2.2	2.2
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	11	11	11	10.5	10.5
Distance from obstructions not on roof – vertical height (m)	2	2	2	2	2
Distance from trees (m)	11	11	11	10.5	10.5
Distance to furnace or incinerator flue (m)	NA	NA	NA	NA	NA
Distance between collocated monitors (m)	NA	NA	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360	360	360

Pollutant, POC	O_3, 1	CO, 1	NO_2, 1	PM_{10}	$PM_{2.5}$
Probe material for reactive gases	Teflon	Teflon	Teflon	NA	NA
Residence time for reactive gases (s)	6.4	3.0	5.2	NA	NA
Will there be changes within the next 18 months? (Y/N)	N	N	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	NA	NA	NA	NA	Y
Frequency of flow rate verification for manual PM samplers	NA	NA	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	NA	NA	NA	Monthly	Monthly
Frequency of one-point QC check for gaseous instruments	Weekly	Weekly	Weekly	NA	NA
Last annual performance evaluation for gaseous parameters	4/5/2022	8/25/2022	9/30/2022	NA	NA
Last two semiannual flow rate audits for PM monitors	NA	NA	NA	2/18/2022, 6/22/2022, 8/25/2022,	2/18/2022, 6/22/2022, 8/25/2022,

Figure 16: Walter Johnson.

The primary objective of the Walter Johnson site, located on the west side of Las Vegas, is to monitor O_3, PM_{10} and $PM_{2.5}$. Due to topography at this location, the summertime loft brings high O_3 and precursor levels toward this site from the east end of the Las Vegas Valley. Meteorological measurements at the Walter Johnson site include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Walter Johnson (32-003-0071)**
GPS Coordinates (latitude, longitude)	+36.169760°, -115.263038°
Street Address	7701 Ducharme Ave., Las Vegas, NV 89145
Distance to roadways (m)	Villa Monterey Drive: 13.0; Ducharme Avenue: 46; South Buffalo Drive: 270
Traffic counts (AADT, year)	Villa Monterey Drive: 3,000 (est.); Ducharme Avenue: 5,000 (est.); South Buffalo Drive: 28,600 (2020)
Ground cover	Concrete/asphalt, grass
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**O_3, 1**	**PM_{10}, 1**	**$PM_{2.5}$, 3**
Parameter code	44201	81102	88101
Basic monitoring objective(s)	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site type(s)	Population exposure	Population exposure	Population exposure
Network affiliation	NA	NA	NA
Monitor type(s)	SLAMS	SLAMS	SLAMS
Primary, QA Collocated, or Other	Primary	Primary	Primary
Instrument manufacturer and model	API 400 series	Teledyne T640X	Teledyne T640X
Method code	EQOA-0992-087	EQPM-0516-239	EQPM–0516–238
FRM/FEM/ARM/other	FEM	FEM	FEM
Collecting agency	DAQ	DAQ	DAQ
Analytical lab	NA	NA	NA
Reporting agency	DAQ	DAQ	DAQ
Spatial scale	Neighborhood	Neighborhood	Neighborhood
Monitoring start date	08/01/1998	09/12/2017	1/1/2020
Current sampling frequency	Continuous	Continuous	Continuous
Calculated sampling frequency	Continuous	Continuous	Continuous
Sampling season	Year-round	Year-round	Year-round
Probe height (m)	4.3	5.0	5.0
Distance from supporting structure (m)	1.5	2.2	2.2
Distance from obstructions on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	NA	NA	NA
Distance from obstructions not on roof – vertical height (m)	NA	NA	NA
Distance from trees (m)	17.8	16.6	16.6
Distance to furnace or incinerator flue (m)	NA	NA	NA
Distance between monitors fulfilling QA collocation requirements (m)	NA	NA	NA
Distance to nearest PM instrument (m)	NA	NA	NA
Unrestricted airflow (degrees)	360	360	360
Probe material for reactive gases	Teflon	NA	NA
Residence time for reactive gases (s)	6.6	NA	NA
Will there be changes within the next 18 months? (Y/N)	N	N	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	N	Y
Frequency of flow rate verification for manual PM samplers	NA	NA	NA
Frequency of flow rate verification for automated PM analyzers	NA	Monthly	Monthly
Frequency of one-point QC check for gaseous instruments	Weekly	NA	NA
Last annual performance evaluation for gaseous parameters	3/22/2022	NA	NA
Last two semiannual flow rate audits for PM monitors	NA	2/11/2022, 5/24/2024, 8/16/ 2022, 11/2/2022	2/11/2022, 5/24/2024, 8/16/ 2022, 11/2/2022

4.0 MAPS OF CRITERIA POLLUTANT MONITORING STATIONS IN 2022

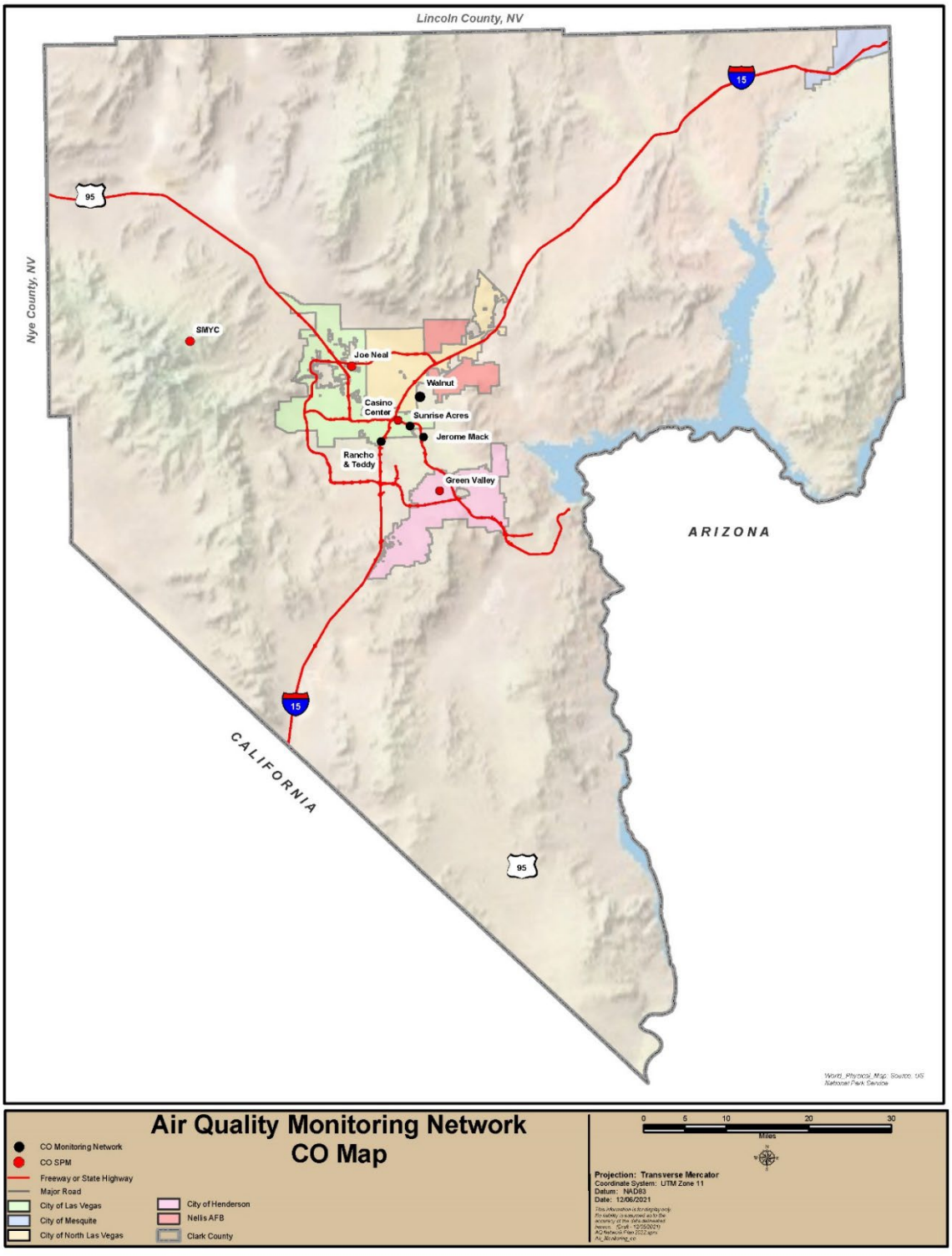

Figure 17: CO Monitors

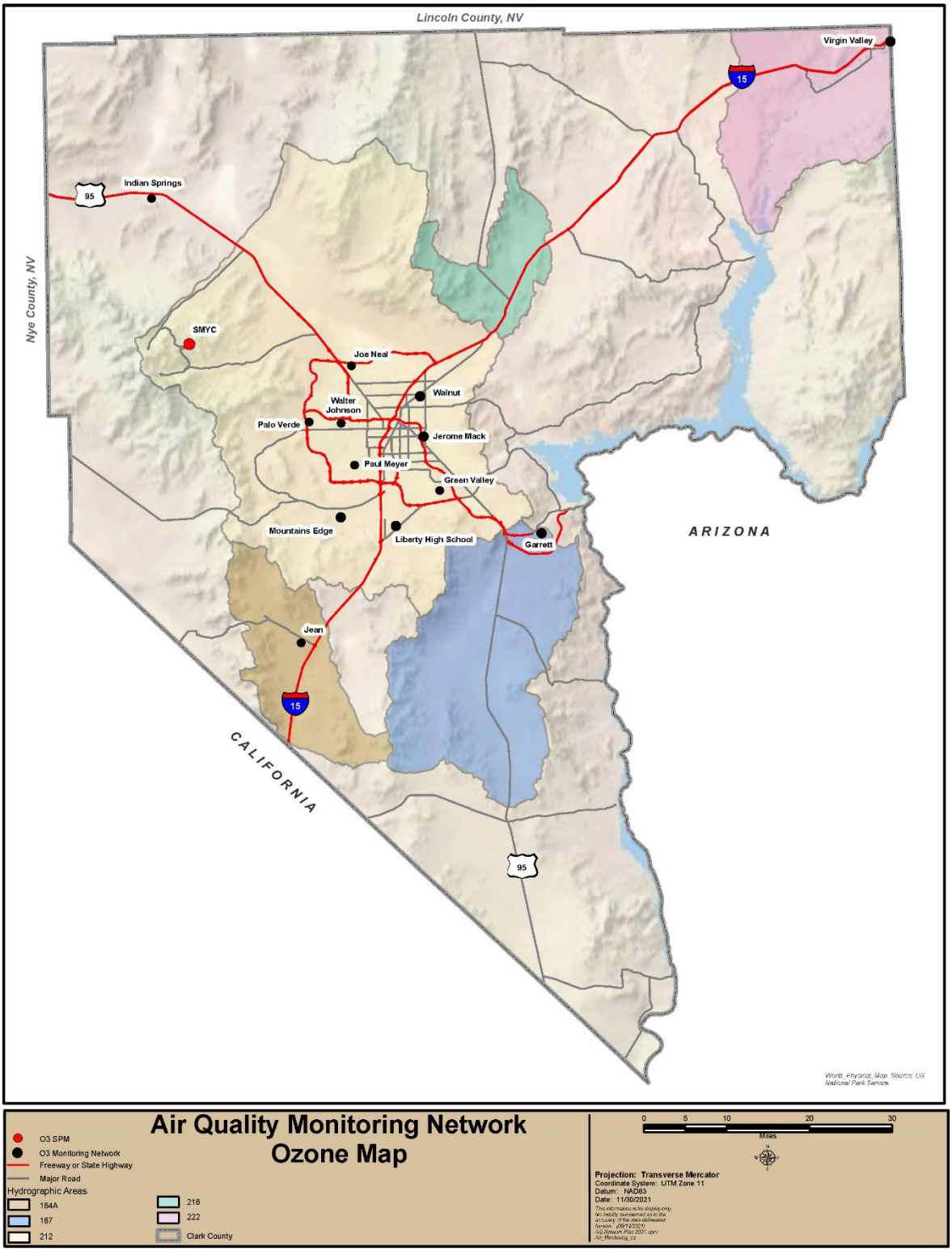

Figure 18: O_3 Monitors.

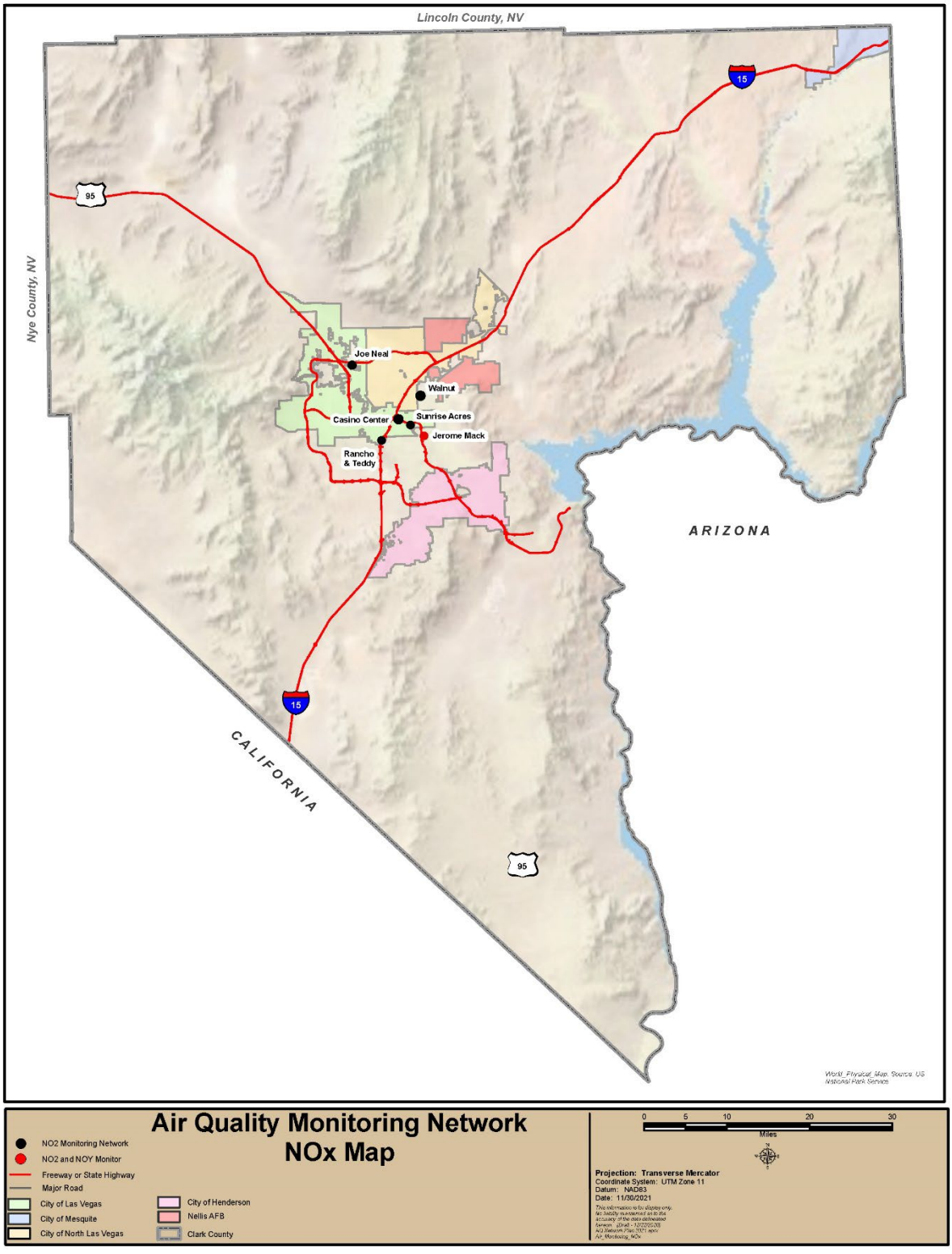

Figure 19: NO_X Monitors.

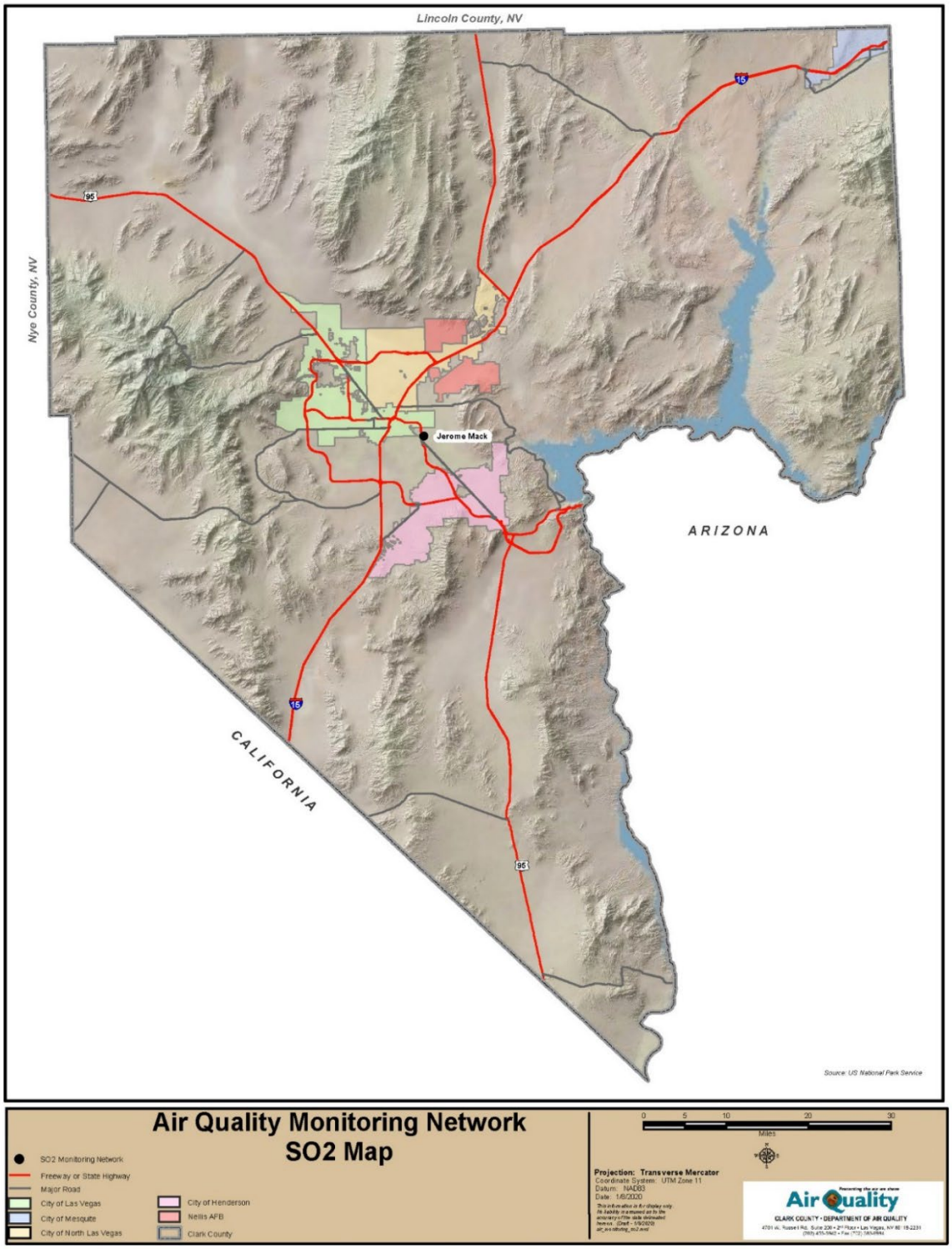

Figure 20: SO_2 Monitor.

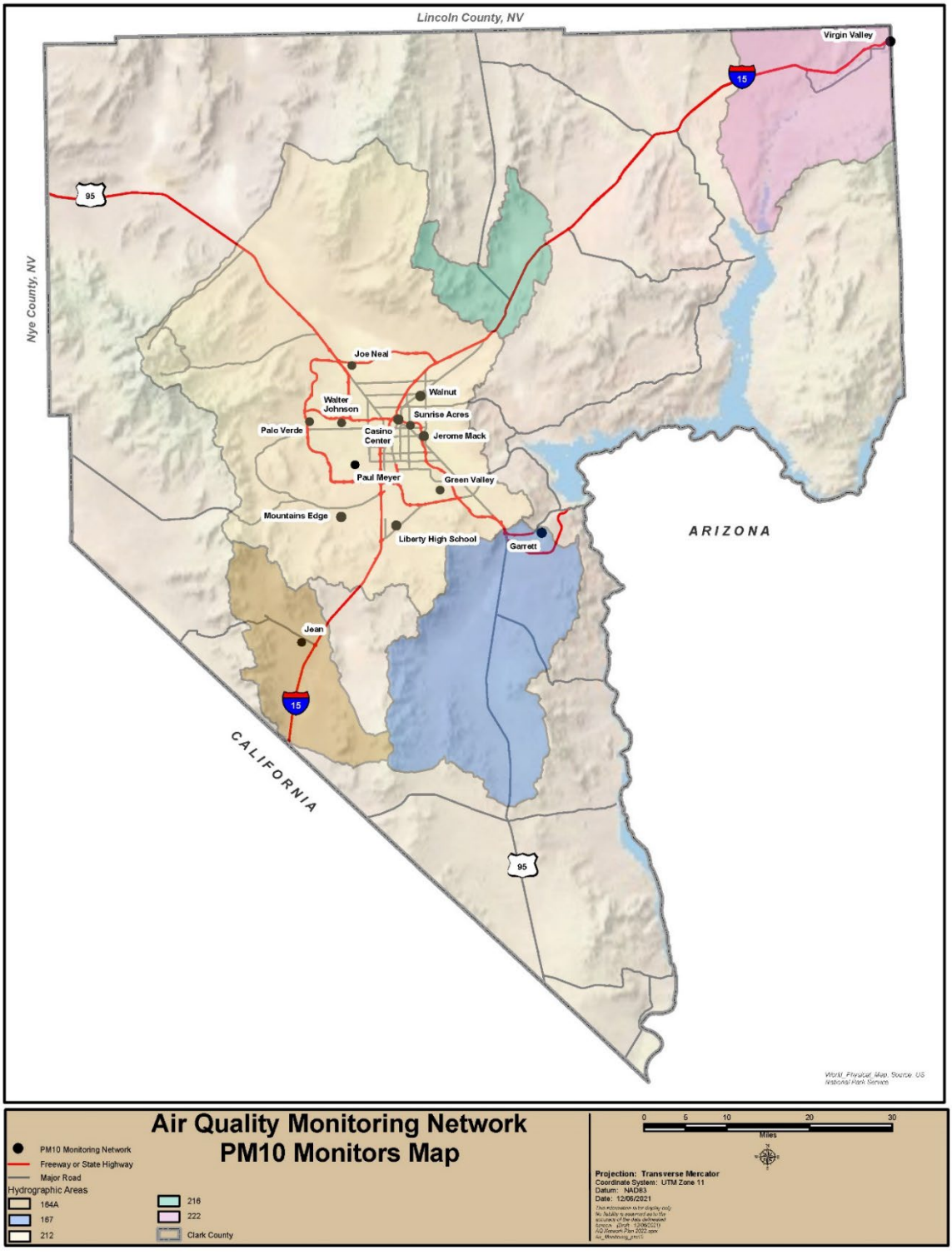

Figure 21: Continuous PM_{10} Monitors.

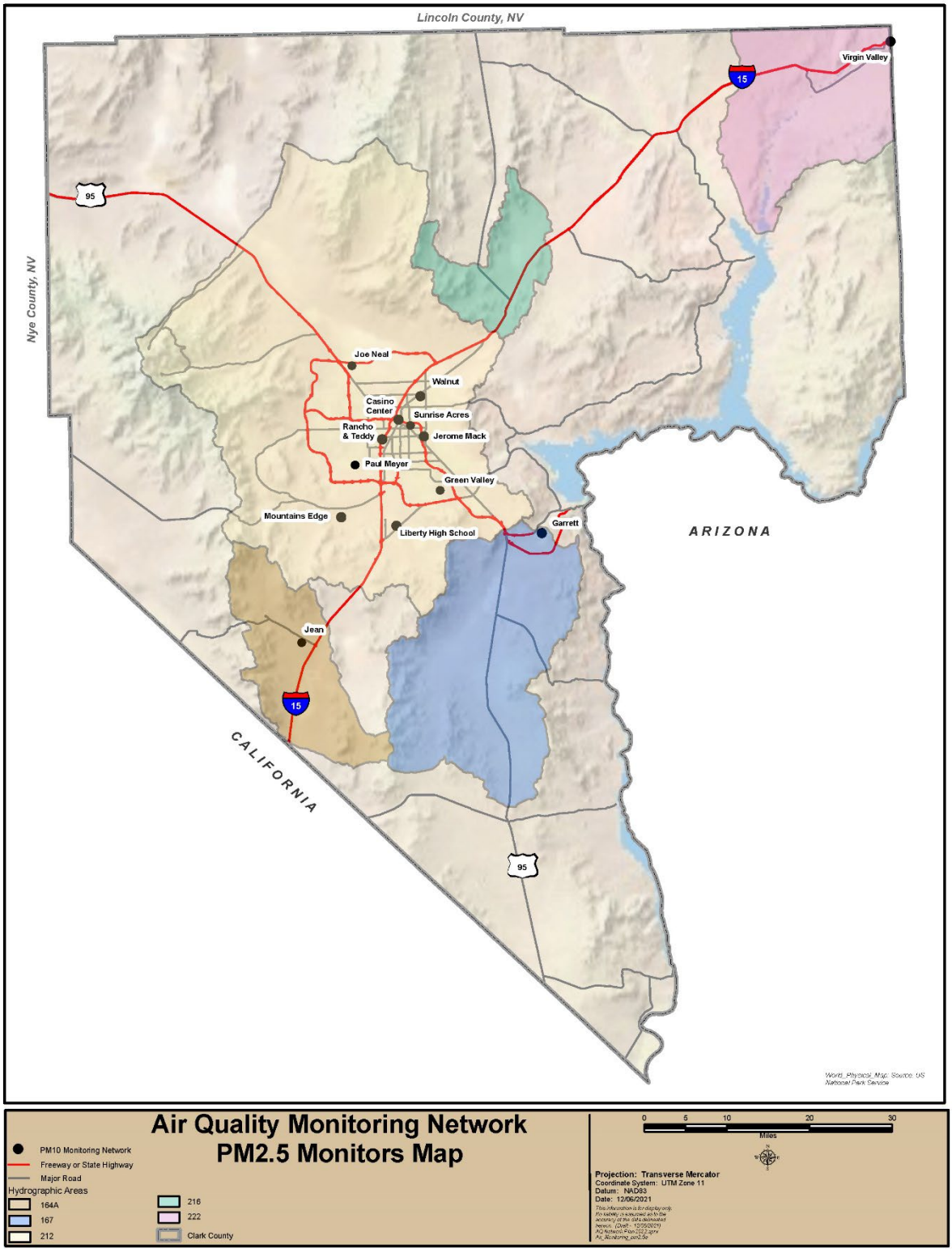

Figure 22: Continuous $PM_{2.5}$ Monitors.

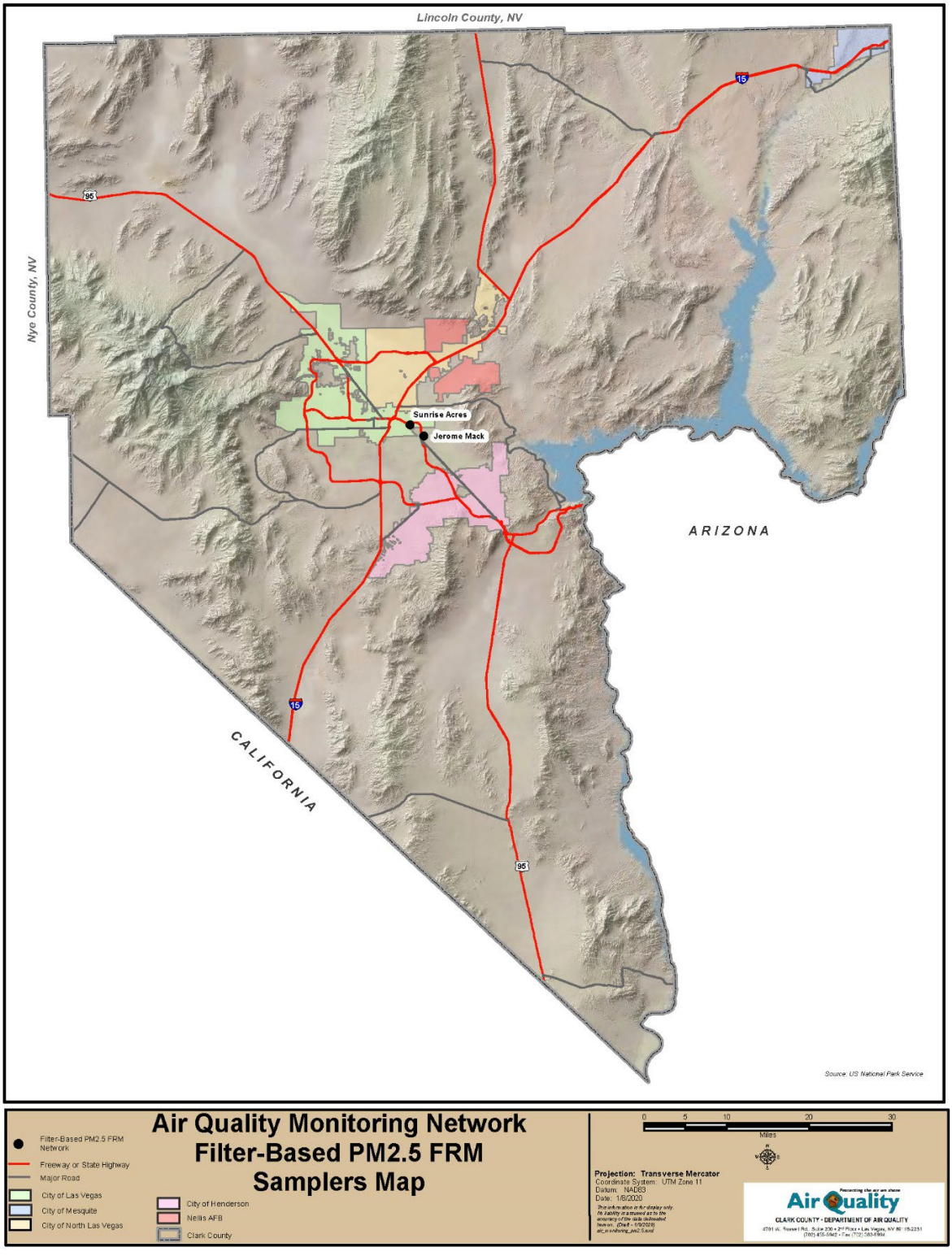

Figure 23: Filter-Based $PM_{2.5}$ FRM Samplers.

5.0 NATIONAL PERFORMANCE AUDIT PROGRAM AND PERFORMANCE EVALUATION PROGRAM

Each year, EPA Region 9 performs NPAP TTP performance evaluations in accordance with 40 CFR Part 58 Appendix A, which focus on gaseous criteria pollutants. EPA has not audited the direct NO_2 FEM instruments, and the TTP audits are carried out through a contractor.

Table 5-1. 2022 NPAP and TTP Evaluations

Monitoring Station	Pollutant	Evaluation Date
Liberty H.S. AQS ID: 32-003-0299	O_3	8/30/2022
Garrett Jr. H.S. AQS ID: 32-003-0602	O_3	8/30/2022

Each year, the $PM_{2.5}$ FRM sampling network undergoes Performance Evaluation Program (PEP) audits. PEP audit results (in $\mu g/m^3$) are generated by an independent lab and then submitted to the AQS database though an EPA contractor.

Table 5-2. 2022 PEP Audit Activity

Sampler/Monitor Location	Pollutant	Audit Date
Green Valley AQS ID: 32-003-0298	$PM_{2.5}$ FEM	3/2/2022
Jerome Mack AQS ID: 32-003-0540	$PM_{2.5}$ FRM	4/14/2022 & 8/3/2022
Joe Neal AQS ID: 32-003-0075	$PM_{2.5}$ FEM	4/14/2022

6.0 NETWORK MODIFICATIONS

6.1 Completed Changes

Effective January 1, 2022, DAQ migrated over to a new data acquisition system (DAS) called AirVision, purchased from Agilaire, LLC. This DAS utilizes modern data logging, database architectures, and reporting software.

6.2 Upcoming Changes and Request for Approval

This section describes anticipated changes to the monitoring network over the next year and beyond. If not already approved, the proposed changes will be carried out in accordance with 40 CFR 58.14, as applicable. The following constitutes Clark County's official request to EPA Region 9 for approval of upcoming and proposed changes as outlined in Table 6-1.

Table 6-1. Upcoming Site and Equipment Changes

Site/Equipment Change	Date of Proposed Change	Explanation
Redeploy O_3 and Trace CO SPMs at Spring Mountain Youth Camp.	April 2023	Monitoring anticipated to support DAQ Planning initiatives to assess stratospheric O_3 intrusions. An inverse CO to O_3 correlation will provide further weight of evidence for these intrusions. Furthermore, O_3 and CO are expected to show direct correlation/relationship during wildfire smoke events.
Redeploy trace CO SPM at Joe Neal, deploy trace CO SPM at Paul Meyer, and redeploy trace CO SPM at Green Valley if resources allow.	April 2023	Deployment will support DAQ Planning initiatives related to O_3 and PM measurements during wildfire smoke events. CO to O_3 correlation will also support EE demonstrations.
Apex site relocation.	June 2023	EPA approved the Apex site relocation (to a nearby location in the Apex Valley) on August 7, 2017. The BLM has approved a right-of-way agreement, but power hook-up issues have delayed site start-up until mid-2023. O3 SLAMS monitoring is planned for this site.

Figure 24: Spring Mountain Youth Camp (SPM Site).

DES routinely deploys O_3 monitoring at Spring Mountain Youth Camp (SMYC) to assist with the identification of stratospheric intrusions, pollutant mixing heights, and to assist with model validation. DES has recently introduced trace CO monitoring at SMYC, which provides an inverse O_3 correlation during stratospheric O_3 intrusion events. Measurements at this site are for special studies and strictly non-regulatory.

Local Site Name (AQS ID)	**Spring Mountain Youth Camp (32-003-7771)**
GPS Coordinates (latitude, longitude)	+ 36.318889 °, - 115.585278 °
Street Address	2400 Angel Peak Place
Distance to roadway (m)	30
Traffic count (AADT, year)	< 500 (est.) (2022)
Ground cover	Gravel, concrete
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**O_3, 1**	**Trace CO, 1**
Parameter code	44201	42101
Basic monitoring objective(s)	Research support	Research support
Site type(s)	Regional transport	Regional transport
Monitor type(s)	SPM (non-regulatory)	SPM (non-regulatory)

Pollutant, POC	O_3, 1	Trace CO, 1
Instrument manufacturer and model	TAPI 400 series	TAPI 300 series
Method code	EQOA-0992-087	RFCA-1093-093
FRM/FEM/ARM/other	other	other
Collecting agency	DAQ	DAQ
Analytical lab	NA	NA
Reporting agency	DAQ	DAQ
Spatial scale	Regional	Regional
Monitoring start date	04/1/2022 (anticipated)	4/1/2022 (anticipated)
Current sampling frequency	NA	NA
Calculated sampling frequency	Continuous	Continuous
Sampling season	Summer season	Summer season
Probe height (m)	6 (anticipated)	6 (anticipated)
Distance from supporting structure (m)	2 (anticipated)	2 (anticipated)
Distance from obstructions on roof – horizontal distance (m)	NA	NA
Distance from obstructions on roof – vertical height (m)	NA	NA
Distance from obstructions not on roof – horizontal distance (m)	1 (est.)	1 (est.)
Distance from obstructions not on roof – vertical height (m)	2 (est.)	2 (est.)
Distance from trees (m)	NA	NA
Distance to furnace or incinerator flue (m)	NA	NA
Distance between collocated monitors (m)	NA	NA
Unrestricted airflow (degrees)	360[1]	360[1]
Probe material for reactive gases	Teflon	Teflon
Residence time for reactive gases (s)	7.8 (previous operation)	3.5 (previous operation)
Will there be changes within the next 18 months? (Y/N)	N[2]	N[3]
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N	N
Frequency of flow rate verification for manual PM samplers	NA	NA
Frequency of flow rate verification for automated PM analyzers	NA	NA
Frequency of one-point QC check for gaseous instruments	Daily (anticipated)	Daily (anticipated)
Last annual performance evaluation for gaseous parameters	NA	NA
Last two semiannual flow rate audits for PM monitors	NA	NA

[1] Open fetch, but air flow is limited by obstructions.
[2] Anticipate O_3 monitor deployment.
[3] Anticipate CO monitor deployment.

6.2.1 Monitoring Site Relocation in the Apex Valley

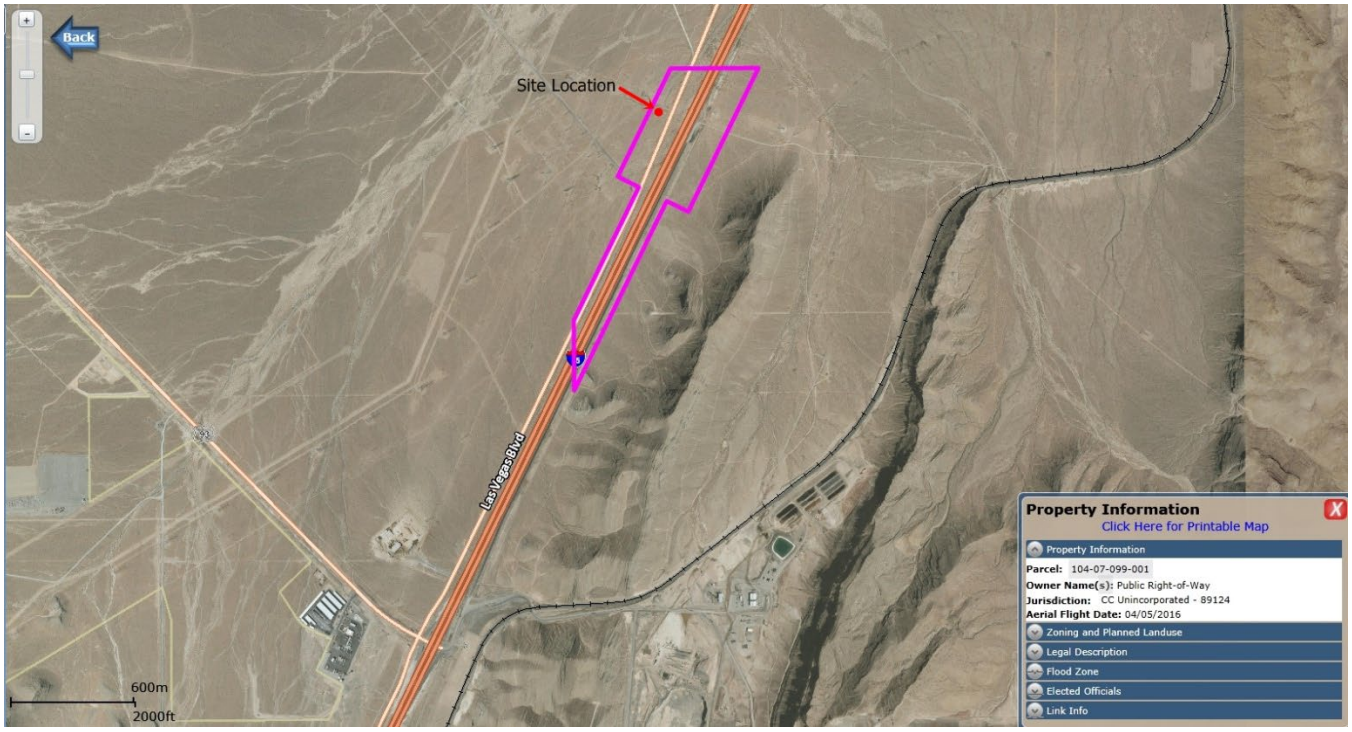

Figure 25: Apex (relocation).

The primary objective of the relocated Apex site, located approximately 25 miles northeast of Las Vegas, will be to monitor transport and the ambient impacts from nearby processing facilities and power plants. This site will be the monitoring station that serves the Apex Valley. Since the site is downwind from Las Vegas, it will also serve as an indicator of pollutant transport flow out of the Las Vegas Valley. Meteorological measurements at this site will include wind speed, wind direction, and ambient temperature.

Local Site Name (AQS ID)	**Apex Valley (32-003-0022)**
GPS Coordinates (latitude, longitude)	36.406213, -114.878635
Street Address	14601 North Las Vegas Blvd. Moapa, NV
Distance to roadway (m)	N. Las Vegas Blvd: 20m (est.); I-15: 50m (est.)
Traffic count (AADT, year)	N. Las Vegas Blvd: < 1,000 (est.); I-15: 24,900 (2021)
Ground cover	Native desert
Representative statistical area name	Las Vegas-Paradise, NV MSA

Pollutant, POC	**O_3, 1**
Parameter code	44201
Basic monitoring objective(s)	NAAQS comparison
Site type(s)	Regional transport
Monitor type(s)	SLAMS

Pollutant, POC	**O_3, 1**
Instrument manufacturer and model	API 400 series
Method code	EQOA-0992-087
FRM/FEM/ARM/other	FEM
Collecting agency	DES
Analytical lab	NA
Reporting agency	DES
Spatial scale	Regional
Monitoring start date	2022
Current sampling frequency	NA
Calculated sampling frequency	Continuous
Sampling season	Year-round
Probe height (m)	4.0 (anticipated)
Distance from supporting structure (m)	1.2 (anticipated)
Distance from obstructions on roof – horizontal distance (m)	NA
Distance from obstructions on roof – vertical height (m)	NA
Distance from obstructions not on roof – horizontal distance (m)	NA
Distance from obstructions not on roof – vertical height (m)	NA
Distance from trees (m)	>100m (est.)
Distance to furnace or incinerator flue (m)	NA
Distance between collocated monitors (m)	NA
Unrestricted airflow (degrees)	360
Probe material for reactive gases	Teflon
Residence time for reactive gases (s)	< 10 (est.)
Will there be changes within the next 18 months? (Y/N)	N
Is it suitable for comparison against the annual $PM_{2.5}$? (Y/N)	N
Frequency of flow rate verification for manual PM samplers	NA
Frequency of flow rate verification for automated PM analyzers	NA
Frequency of one-point QC check for gaseous instruments	Daily
Last annual performance evaluation for gaseous parameters	NA
Last two semiannual flow rate audits for PM monitors	NA

6.3 Availability of Plan for Public Inspection and Comment and DES Response

This plan was made available between 25 and May 25, 2023, for the required 30-day public inspection and comment period per 40 CFR 58.10(a)(1). This plan was posted on DAQ's website, made available at the DAQ front counter, and noticed in the Las Vegas Review Journal. DES received no comments on this plan.

The annual network plan outlines all notices of proposed changes, in compliance with 40 CFR 58.10. If DAQ needs to change the location of a $PM_{2.5}$ monitor that records exceedances of the NAAQS, DAQ will notify EPA Region 9 of the exceedance, and DAQ will formulate a plan for moving the site. DAQ will post all such notices and relevant documents for public review on its website, and the public will have at least a 30-day comment period. DAQ will then submit formal notification to EPA. DAQ intends to discuss and obtain EPA approval prior to making any changes to its $PM_{2.5}$ network, whether the changes affect monitors that records a NAAQS exceedance or not; however, unforeseen circumstances (e.g., unexpected loss of site access) may preclude this process.

6.4 O_3 Monitoring Waiver

Due to the 2015 revised O_3 NAAQS, EPA has revoked all previous seasonal O_3 waivers. If agencies desire an O_3 waiver approval, they must reevaluate O_3 data and resubmit waiver requests. Based on this direction, DAQ submitted an O_3 waiver request for the Apex and Indian Springs sites on February 22, 2023. EPA pproval is pending.

6.5 Near-Road Monitoring

The Rancho & Teddy site (Near-Road Site 1) was approved by EPA as part of the 2014 Annual Network Plan response, and DAQ began operations in August 2015. The Casino Center (Near-Road Site 2) was approved by EPA as part of the 2014 Annual Network Plan response, and operations commenced in July 2016. 40 CFR Part 58 requires one CO monitor and one $PM_{2.5}$ monitor to be placed at a near-road NO_2 monitoring site. DAQ deployed both monitors at the Rancho & Teddy site (Near-Road Site 1) beginning January 2017, as required.

6.6 Special Purpose Studies

DAQ plans to contribute to the goals of the Clean Air Act and the evolving science of air quality. DAQ's objectives include research of pollutants and precursor transport, identification of stratospheric intrusions and mixing heights, pollution impacts, and model validation. Many of these efforts will be focused on the O_3 season, and related studies are being projected over the next several years. DAQ will continue to deploy trace CO monitors, which provide an inverse O_3-CO correlation during O_3 intrusions and direct correlation during smoke events, and these initiatives contribute to DAQ modeling efforts. None of the upper-elevation O_3 or CO research monitors that are a part of these studies will be a part of the SLAMS or regulatory monitoring network.

DAQ will continue filter-based chemical speciation sampling during special events, such as New Year's Eve and Fourth of July, when $PM_{2.5}$ can reach exceedance levels and where impacts from fireworks can

be documented. DAQ may also sample for markers of levoglucosan, which can assist development of O_3 exceptional event demonstration packages when smoke from wildfires may be a significant factor.

In anticipation of potential $PM_{2.5}$ NAAQS reductions, DAQ embarked on a $PM_{2.5}$ fingerprint study. DAQ ran $PM_{2.5}$ special purpose samples, using 24-hour filter runs and routine sampling procedures. This took place at the Walnut and Green Valley sites, on a 1-in-3 day frequency, through February 2022. The objective of this short-term study was to better ascertain $PM_{2.5}$ composition, which will assist with developing future control strategies and permitting. DAQ may consider changes to the $PM_{2.5}$ network to better characterize emission sources. Spatial coverage in low-income areas is also being considered to meet environmental justice goals.

DAQ operates visibility cameras at the M Resort located at 12300 South Las Vegas Blvd. Henderson, Nevada. This location is at the south end of the Las Vegas Valley. These visibility cameras assist in documenting dust and transport events in the Las Vegas Valley.

6.7 Future Needs

DAQ will continue exploring the possibility of gaseous, particulate, and meteorological monitoring in unrepresented/underrepresented areas and work to achieve environmental justice throughout the jurisdiction. Any special study sites will likely be started as SPM sites.