WASHOE COUNTY
HEALTH DISTRICT

ENHANCING QUALITY OF LIFE

2010-19 Washoe County, Nevada Air Quality Trends Report

July 1, 2020

Public Health
Prevent. Promote. Protect.

WASHOE COUNTY
HEALTH DISTRICT
ENHANCING QUALITY OF LIFE

Public Health
Prevent. Promote. Protect.

VISION

A healthy community

MISSION

To protect and enhance the well-being and quality of life for all in Washoe County.

Table of Contents

Introduction 1
Pollutants 2
  Ozone (O_3) 2
  Particulate Matter (PM_{10}, $PM_{2.5}$ and PM_{coarse}) 2
  Carbon Monoxide (CO) 3
  Nitrogen Dioxide (NO_y and NO_2) 4
  Sulfur Dioxide (SO_2) 5
  Lead (Pb) 5
National Ambient Air Quality Standards 7
Current Design Values and Attainment Status 8
Ambient Air Monitoring Network 9
  Monitoring Stations in Operation and Pollutants Monitored in 2019 11
  Monitoring Stations in Operation and Pollutants Monitored Prior to 2019 11
A Review of 2019 12
2019 Air Quality Index Summaries 14
Ten-Year Air Quality Trend 18
  Air Quality Index 18
  Burn Code Season 19
  Design Values 20
  O_3 (8-hour) Design Values 21
  $PM_{2.5}$ (24-hour) Design Values 22
  $PM_{2.5}$ (Annual) Design Values 23
  PM_{10} (24-hour) First Highs 24
  CO (8-hour) Design Values 25
  CO (1-hour) Design Values 26
  NO_2 (1-hour) Design Values 27
  NO_2 (Annual) Design Values 28
  SO_2 (1-hour) Design Values 29

Tables iii
Figures iii
Acronyms and Abbreviations iv

Appendices

Appendix A – Detailed Summary of Ambient Air Monitoring Data
Appendix B – Monitoring Stations in Operation From 1963 to 2019

Tables

1. National Ambient Air Quality Standards (as of December 31, 2019) 7
2. Design Values and Attainment Status (as of December 31, 2019)........................8
3. Monitoring Stations in Operation and Pollutants Monitored in 2019 11
4. 2019 NAAQS Exceedances Summary 13

Figures

1. Washoe County, Nevada...1
2. Washoe County Ambient Air Monitoring Sites (2010-2019) 10
3. Thunderstorm outflow sends dust to Reno on May 9...12
4. Prescribed fires around Lake Tahoe on December 2 12
5. Monthly AQI Summary for All Pollutants (2019)...14
6. Monthly AQI Summary of O_3 (2019)..15
7. Monthly AQI Summary of $PM_{2.5}$ (2019) 15
8. Monthly AQI Summary of PM_{10} (2019)..16
9. Monthly AQI Summary of CO (2019)..16
10. Monthly AQI Summary of NO_2 (2019) 17
11. Monthly AQI Summary of SO_2 (2019) 17
12. AQI Trend (2010-2019)...18
13. Burn Code Seasons (2010/11 - 2019/20) 19
14. O_3 (8-hour) Design Values 21
15. $PM_{2.5}$ (24-hour) Design Values..22
16. $PM_{2.5}$ (Annual) Design Values 23
17. PM_{10} (24-hour) First Highs 24
18. CO (8-hour) Design Values 25
19. CO (1-hour) Design Values 26
20. NO_2 (1-hour) Design Values..27
21. NO_2 (Annual) Design Values 28
22. SO_2 (1-hour) Design Values 29

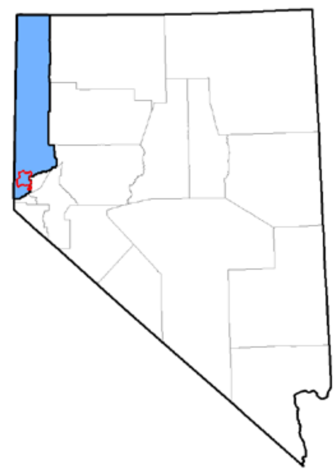
Acronyms and Abbreviations

AQI	Air Quality Index
AQMD	Washoe County Health District - Air Quality Management Division
AQS	Air Quality System
BAM	Beta Attenuation Monitor
CFR	Code of Federal Regulations
CBSA	Core-Based Statistical Area
CO	Carbon Monoxide
EPA	U.S. Environmental Protection Agency
GAL	Galletti
HA 87	Hydrographic Area 87
HC	Hydrocarbons
HNO_2	Nitrous Acid
HNO_3	Nitric Acid
INC	Incline
LEM	Lemmon Valley
$\mu g/m^3$	Micrograms per cubic meter
NAAQS	National Ambient Air Quality Standards
NCore	National Core Multi-Pollutant Monitoring Station
N_2O_5	Nitrogen Pentoxide
NO	Nitric Acid
NO_2	Nitrogen Dioxide
NO_3	Nitrate
NO_x	Oxides of Nitrogen
NO_y	Reactive Oxides of Nitrogen
O_3	Ozone
PAN	Peroxyacetyl nitrate, or $CH_3COO_2NO_2$
PLM	Plumb-Kit
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter less than or equal to 2.5 microns in aerodynamic diameter
PM_{10}	Particulate Matter less than or equal to 10 microns in aerodynamic diameter
PM_{coarse}	PM_{10} minus $PM_{2.5}$
ppb	Parts per billion
ppm	Parts per million
RNO	Reno3
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
SO_x	Oxides of Sulfur
SPK	Sparks
SPM	Special Purpose Monitoring
SPS	Spanish Springs
SRN	South Reno
STN	Speciation Trends Network
TOL	Toll
USG	Unhealthy for Sensitive Groups
VOC	Volatile Organic Compounds

Introduction

Washoe County is located in the northwest portion of Nevada and bounded by California, Oregon, and the Nevada counties of Humboldt, Pershing, Storey, Churchill, Lyon, and Carson City (Figure 1). The Truckee Meadows is approximately 200 square miles in size and situated in the southern portion of Washoe County. It's geographically identified as Hydrographic Area 87 (HA 87) as defined by the State of Nevada Division of Water Resources. Most of Washoe County's urban population lives in the Truckee Meadows. Anthropogenic activities, such as automobile use and residential wood combustion, are also concentrated here.

Figure 1
Washoe County, Nevada



The U.S. Environmental Protection Agency (EPA) has set health and welfare based National Ambient Air Quality Standards (NAAQS) for the following pollutants: ozone (O_3), particulate matter less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$), particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb).

The mission of the Washoe County Health District, Air Quality Management Division (AQMD) Monitoring Program is "To monitor and assure the scientific accuracy of the ambient air quality data collected for the determination of compliance with the National Ambient Air Quality Standards (NAAQS) as defined by the EPA". The AQMD has established a monitoring network throughout the Health District to collect ambient air data. The network is reviewed annually to ensure it reflects the actual air quality of the county and that it is measuring for the pollutants of highest concern.

This document summarizes the ambient air data collected between 2010 and 2019 from the AQMD's monitoring network. These data were submitted to the EPA's Air Quality System (AQS) and are available for public review on EPA's AirData website. Long-term monitoring data can reveal trends in ambient air pollution and the subsequent need for control strategies.

Pollutants

The following describes the six NAAQS criteria pollutants, their primary sources, and associated health effects.

Ozone (O_3)

Ozone is a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but, at ground-level, it is created by a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. Ozone has the same chemical structure whether it occurs miles above the earth or at ground-level and can be “good” or “bad”, depending on its location in the atmosphere. “Good” O_3 occurs naturally in the stratosphere approximately 10 to 30 miles above the earth and forms a layer that protects life on earth from the sun’s harmful rays.

In the lower atmosphere, ground-level O_3 is considered “bad”. Breathing ground-level O_3 can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. Ground-level O_3 can also reduce lung function and inflame the linings of the lungs. Repeated exposure may permanently scar lung tissue. People with lung disease, children, older adults, and physically active people may be affected when O_3 levels are unhealthy. Numerous scientific studies have linked ground-level O_3 exposure to a variety of problems including: airway irritation, coughing, and pain when taking a deep breath; wheezing and breathing difficulties during exercise or outdoor activities; inflammation, which is much like a sunburn on the skin; aggravation of asthma and increased susceptibility to respiratory illnesses like pneumonia and bronchitis; and permanent lung damage with repeated exposures.

Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NO_x and VOC that help form O_3. Ground-level O_3 is the primary constituent of smog. Sunlight and hot weather cause ground-level O_3 to form in harmful concentrations. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of “bad” O_3, but even rural areas are also subject to increased O_3 levels because wind carries O_3 and pollutants that form it hundreds of miles away from their original sources.

Particulate Matter (PM_{10}, $PM_{2.5}$, and PM_{coarse})

Particulate matter, also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of several components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. Of concern are particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- “Inhalable coarse particles” (PM_{10} and PM_{coarse}), such as those found near roadways and dusty industries, are between 2.5 and 10 micrometers in diameter.
- “Fine particles” ($PM_{2.5}$), such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries, and automobiles react in the air.

Particle pollution, especially fine particles, contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including: increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing, for example; decreased lung function; aggravated asthma; development of chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease.

People with heart or lung diseases, children and older adults are the most likely to be affected by particle pollution exposure. However, even healthy people may experience temporary symptoms from exposure to elevated levels of particle pollution.

Carbon Monoxide (CO)

Carbon monoxide is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, which contributes about 56% of all CO emissions nationwide. Other non-road engines and vehicles (such as construction equipment and boats) contribute about 22% of CO emissions nationwide. Higher concentrations generally occur in areas with heavy traffic congestion. Other sources include industrial processes (i.e., metals processing and chemical manufacturing), residential wood burning, and natural sources such as forest fires. The highest ambient levels of CO typically occur during the colder months of the year when temperature inversions are more frequent. The air pollution becomes trapped near the ground beneath a layer of warm air.

Carbon monoxide can cause harmful health effects by reducing oxygen delivery to the body’s organs (i.e., heart and brain) and tissues. The health threat from lower levels of CO is most serious for those who suffer from heart disease, like angina, clogged arteries, or congestive heart failure. For a person with heart disease, a single exposure to low levels of CO may cause chest pain and a reduced ability to exercise. Repeated exposures may contribute to other cardiovascular effects. Even healthy people can be affected by high levels of CO. Exposure to high levels can result in vision problems, reduced ability to work or learn, reduced manual dexterity, and difficulty performing complex tasks. At extremely high levels, CO is poisonous and can cause death.

Nitrogen Dioxide (NO_y and NO_2)

NO_y (total reactive nitrogen) is defined as the sum of NO_x plus the compounds produced from the oxidation of NO_x that include nitric acid. NO_y component species include NO (nitric oxide), NO_2 (nitrogen dioxide), NO_3 (nitrate), HNO_3 (nitric acid), N_2O_5 (nitrogen pentoxide), $CH_3COO_2NO_2$ (Peroxyacetyl nitrate, or PAN), and particulate nitrate.

Nitrogen dioxide is one of a group of highly reactive gasses known as "oxides of nitrogen", or "nitrogen oxides (NO_x)". Other nitrogen oxides include nitrous acid (HNO_2) and nitric acid (HNO_3). While EPA's NAAQS covers this entire group of NO_x, NO_2 is the component of greatest interest and the indicator for the larger group of NO_x. Nitrogen dioxide forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level O_3 and fine particle pollution, NO_2 is linked with several adverse effects on the respiratory system.

Current scientific evidence links short-term NO_2 exposures, ranging from 30 minutes to 24 hours, with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Also, studies show a connection between breathing elevated short-term NO_2 concentrations, and increased visits to emergency rooms and hospital admissions for respiratory issues, especially asthma.

NO_2 concentrations in vehicles and near roadways are appreciably higher than those measured at monitors in the current network. In fact, in-vehicle concentrations can be 2 to 3 times higher than measured at nearby area-wide monitors. Near-roadway (within about 50 meters) concentrations of NO_2 have been measured to be approximately 30 to 100% higher than concentrations away from roadways.

Individuals who spend time on or near major roadways can experience short-term NO_2 exposures considerably higher than measured by the current network. Approximately 16% of US housing units (approximately 48 million people) are located within 300 feet of a major highway, railroad, or airport. NO_2 exposure concentrations near roadways are of particular concern for susceptible individuals, including people with asthma, children, and the elderly.

NO_x reacts with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. Ozone is formed when NO_x and VOC react in the presence of heat and sunlight. Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outdoors are at risk for adverse effects from O_3. These include reduction in lung function and increased respiratory symptoms as well as respiratory-related emergency room visits, hospital admissions, and possibly premature deaths.

Emissions that lead to the formation of NO_2 generally also lead to the formation of other NO_x. Emissions control measures leading to reductions in NO_2 can generally be expected to reduce population exposures to all gaseous NO_x. This may have the important co-benefit of reducing the formation of O_3 and fine particles, both of which pose significant public health threats.

Sulfur Dioxide (SO_2)

Sulfur dioxide is one of a group of highly reactive gasses known as "oxides of sulfur". The largest sources of SO_2 emissions are from fossil fuel combustion at power plants (66%) and other industrial facilities (29%). Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur-containing fuels by locomotives, large ships, and non-road equipment. SO_2 is linked with a number of adverse effects on the respiratory system.

Current scientific evidence links short-term exposures to SO_2, ranging from 5 minutes to 24 hours, with an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms. These effects are particularly important for asthmatics at elevated ventilation rates (i.e., while exercising or playing.). Studies also show a connection between short-term exposure and increased visits to emergency rooms and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.

EPA's SO_2 NAAQS is designed to protect against exposure to the entire group of sulfur oxides (SO_x). SO_2 is the component of greatest concern and is used as the indicator for the larger group of SO_x. Other gaseous sulfur oxides (i.e., sulfur trioxide (SO_3)) are found in the atmosphere at concentrations much lower than SO_2.

Emissions leading to high concentrations of SO_2 generally also lead to the formation of other SO_x. Control measures that reduce SO_2 can generally be expected to reduce people's exposures to all gaseous SO_x. This may have the important co-benefit of reducing the formation of fine sulfate particles, which pose significant public health threats.

SO_x can react with other compounds in the atmosphere to form small particles. These particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. EPA's PM NAAQS are designed to provide protection against these health effects.

Lead (Pb)

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of Pb emissions have historically been motor vehicles (such as cars and trucks) and industrial sources. As a result of EPA's efforts to remove Pb from gasoline, ambient Pb levels decreased 99% between 1980 and 2017. Today, elevated levels of Pb in air are usually found near lead smelters, waste incinerators, utilities, lead-acid battery manufacturers, and can be found in emissions of non-road mobile sources such as piston-propelled aircraft.

In addition to exposure to Pb in air, other major exposure pathways include ingestion of Pb in drinking water and lead-contaminated food as well as incidental ingestion of lead-contaminated soil and dust. Lead-based paint remains a major exposure pathway in older homes.

Once taken into the body, Pb distributes throughout the body in the blood and is accumulated in the bones. Depending on the level of exposure, Pb can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system. Lead exposure also affects the oxygen carrying capacity of the blood. The effects most commonly encountered in current populations are neurological effects in children and cardiovascular effects (i.e., high blood pressure and heart disease) in adults. Infants and young children are especially sensitive to even low levels of Pb, which may contribute to behavioral problems, learning deficits, and lowered IQ.

National Ambient Air Quality Standards

The Clean Air Act requires the EPA to establish NAAQS for pollutants considered harmful to public health and the environment. Two types of NAAQS have been established; primary and secondary standards. Primary standards set limits to protect public health, especially that of sensitive populations such as asthmatics, children, and seniors. Secondary standards set limits to protect public welfare, including protections against decreased visibility, damage to animals, crops, and buildings.

The EPA has set NAAQS for seven principal pollutants, which are called "criteria" pollutants. They are listed in Title 40 of the Code of Federal Regulations (CFR) Part 50 and summarized in Table 1 below. The units of measure for the standards are parts per million (ppm), part per billion (ppb), or micrograms per cubic meter of air (μg/m^3).

Table 1
National Ambient Air Quality Standards (as of December 31, 2019)

Pollutant	Primary Standard		Secondary Standard		Form
	Averaging Time	Level	Averaging Time	Level	
O_3	8-hour	0.070 ppm	Same as primary		Fourth highest daily maximum concentration, averaged over 3 years
$PM_{2.5}$	24-hour	35 μg/m^3	Same as primary		98th percentile of daily max, averaged over 3 years
	Annual	12.0 μg/m^3	Annual	15.0 μg/m^3	Annual mean, averaged over 3 years
PM_{10}	24-hour	150 μg/m^3	Same as primary		Not to be exceeded more than once per year on average over 3 years
CO	1-hour	35 ppm	None		Not to be exceeded more than once per year
	8-hour	9 ppm	None		
NO_2	1-hour	100 ppb	None		98th percentile, averaged over 3 years
	Annual	53 ppb	Same as primary		Annual Mean
SO_2	1-hour	75 ppb	3-hour	0.5 ppm	1˚: 99th percentile of daily maximum concentration, averaged over 3 years 2˚: not to be exceeded more than once per year
Pb	Rolling 3-month average	0.15 μg/m^3	Same as primary		Not to be exceeded

Current Design Values and Attainment Status

Table 2 summarizes Washoe County's current design values. Design values are the statistic used to compare ambient air monitoring data against the NAAQS to determine designations for each NAAQS. Designations are also codified in 40 CFR 81.329.

Table 2
Design Values and Attainment Status (as of December 31, 2019)

NAAQS		Design Value	Designations	
Pollutant (Averaging Time)	Level		Unclassifiable/ Attainment, or Maintenance	Non-Attainment (classification)
O_3 (8-hour)	0.070 ppm	0.070 ppm	All HA's	---
$PM_{2.5}$ (24-hour)	35 µg/m^3	24 µg/m^3	All HA's	---
$PM_{2.5}$ (Annual)	12.0 µg/m^3	7.3 µg/m^3	All HA's	---
PM_{10} (24-hour)	150 µg/m^3	0.0 Expected Exceedances	All HA's	---
CO (1-hour)	35 ppm	2.2 ppm	All HA's	---
CO (8-hour)	9 ppm	1.6 ppm	All HA's	---
NO_2 (1-hour)	100 ppb	48 ppb	All HA's	---
NO_2 (Annual Mean)	53 ppb	11 ppb	All HA's	---
SO_2 (1-hour)	75 ppb	4 ppb	All HA's	---
Pb (Rolling 3-month average)	0.15 µg/m^3	n/a	All HA's	---

Ambient Air Monitoring Network

The AQMD began monitoring ambient air quality in Washoe County in the 1960's, and the monitoring network has grown and evolved since that time. This trends report provides a summary of data collected from ambient air monitoring sites in Washoe County that the AQMD operated and maintained between 2010 and 2019 to measure O_3, $PM_{2.5}$, PM_{10}, CO, NO_2, and SO_2. Due to the Reno, NV Core-Based Statistical Area (CBSA) population being under 500,000 as required by 40 CFR 58, Appendix D, Section 3(b) and not exceeding airport and non-airport emissions limits in 40 CFR 58, Appendix D, Section 4.5(a), there was no Pb monitoring in Washoe County.

Each monitoring site is classified into one of two major categories - SLAMS (State and Local Air Monitoring Station) and SPM (Special Purpose Monitoring). SLAMS consist of a network of monitoring stations, the size and distribution of which is largely determined by the monitoring requirements for NAAQS comparison. SLAMS in the AQMD's network can be further classified as NCore (National Core monitoring network) or STN (Speciation Trends Network).

The AQMD's monitoring stations are sited in accordance with 40 CFR 58 and utilize equipment designated as reference or equivalent methods.[1] In addition, the network is reviewed annually[2] to ensure it meets the monitoring objectives defined in 40 CFR 58, Appendix D. Ambient air monitoring data are collected, quality assured,[3] and recorded in AQS. Appendix A of this document provides a detailed summary of the ambient air monitoring data for 2019. All data summarized in Appendix A has been provided by reports retrieved from AQS. The data provided by AQS reports were certified on April 28, 2020 as "complete to the best of our knowledge and ability". Figure 2 displays the ambient air monitoring sites operated between 2010 and 2019. For specific details regarding the ambient air monitoring network, refer to the AQMD's "2020 Ambient Air Monitoring Network Plan" and "2020 Ambient Air Monitoring Network Assessment".

[1] 40 CFR 53.
[2] 40 CFR 58.10.
[3] 40 CFR 58.

Figure 2
Washoe County Ambient Air Monitoring Sites (2010-2019)

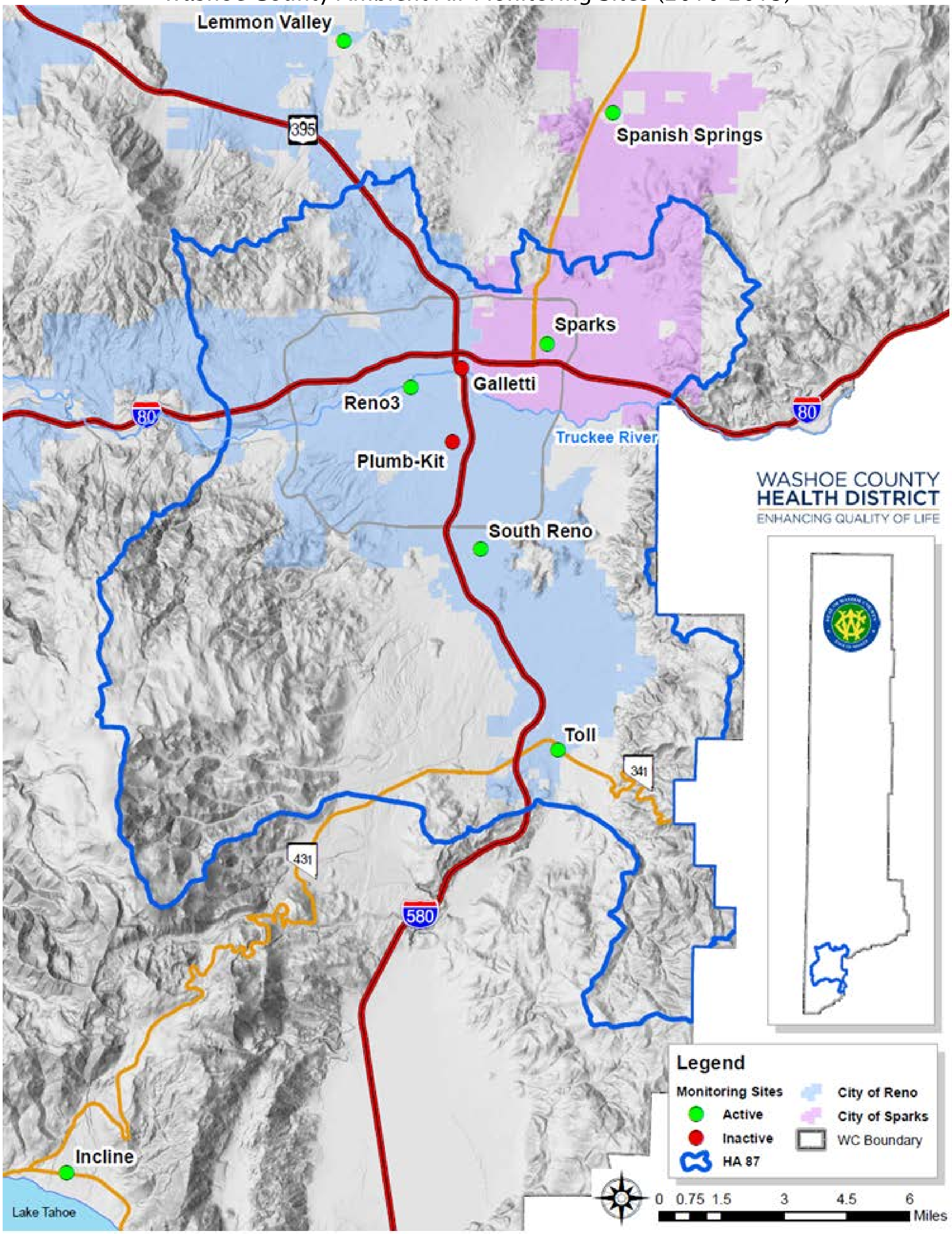


Table 3 Monitoring Stations in Operation and Pollutants Monitored in 2019

Network Type / Site	O_3	CO	Trace CO	Trace NO	NO_2	NO_x	Trace NOy	Trace SO_2	PM_{10} (manual)	PM_{10} (continuous)	$PM_{2.5}$ (manual)	$PM_{2.5}$ (continuous)	PM_{coarse} (manual)	PM_{coarse} (continuous)	$PM_{2.5}$ Speciation	Meteorology
SLAMS																
Incline	✓															
Lemmon Valley	✓															
South Reno	✓															✓
Spanish Springs	✓									✓		✓		✓		✓
Sparks	✓	✓								✓		✓		✓		
Toll	✓									✓						✓
NCore																
Reno3	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Speciation Trends																
Reno3															✓	
SPM																
Spanish Springs																✓
Toll												✓		✓		

Monitoring Stations in Operation and Pollutants Monitored Prior to 2019

Ambient air monitoring data have been collected in Washoe County since the 1963. A complete historical list of monitoring stations and pollutants monitored is included in Appendix B, "Monitoring Stations in Operation From 1963 to 2019."

A Review of 2019

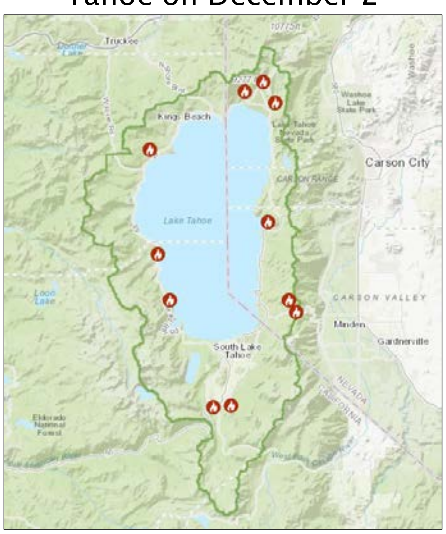
January and February continued the green burn code streak. The 2018-19 burn code season ended with 120 green burn codes. This is the only season in the 32 year history of the wood stove program in which we only issued green burn codes. A very active January and February included blizzard warnings in both months and above average precipitation. The highest 24-hour average for $PM_{2.5}$ during the burn code season was 18.8 μg/m³ on January 26 at Sparks.

Figure 3
Thunderstorm outflow sends dust to Reno on May 9

The active weather continued through much of the spring. March was notable because it was unusually cooler than average. It was only the third time that March didn't reach 70˚F in Reno in the last 30 years. Inversely, April was the second warmest on record. Thunderstorms arrived in May and, on May 9, a thunderstorm outflow sent dust from the Fallon sink into Reno/Sparks. The highest 24-hour average for PM_{10} on that day was 51 μg/m³ at Toll.

The summer months began cooler than usual. Despite the cooler weather, ozone peaked during the beginning of June with the highest 8-hour average for ozone of 0.069 ppm on June 1 at Reno3. The Walker Fire in Plumas County, California sent smoke to central Washoe County prompting the National Weather Service to issue a dense smoke advisory for areas near Hallelujah Junction on September 8. Smoke drifted southeasterly the following day and impacted Spanish Springs. The highest 24-hour average for $PM_{2.5}$ during the summer was 17.7 μg/m³ on September 9 at Spanish Springs.

Figure 4
Prescribed fires around Lake Tahoe on December 2



November was active but had brief cold air inversions. Conditions were favorable for prescribed fires into December. The highest 24-hour average for $PM_{2.5}$ for the fall and winter was 21.4 μg/m³ on November 24 at Sparks. December was mild and dry with weak cold air inversions toward the end of the month. The green burn code streak from the previous season continued through the end of the year. The year ended without recording an exceedance of any NAAQS pollutant.

Table 4 summarizes NAAQS exceedances in 2019 by pollutant, averaging period, and dates.

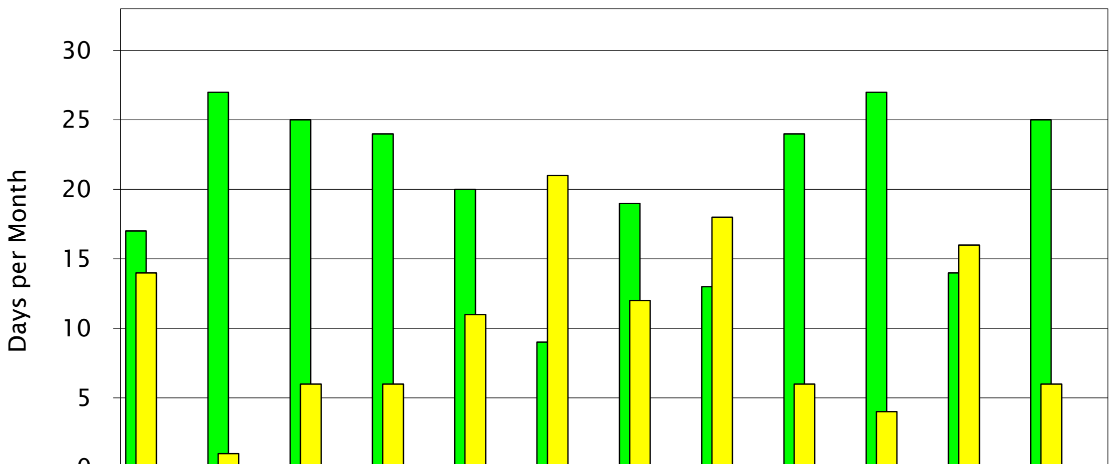
Table 4
2019 NAAQS Exceedances Summary

Pollutant	Averaging Period	Exceedance Dates
O_3	8-hour	None
$PM_{2.5}$	24-hour	None
PM_{10}	24-hour	None
CO	1-hour	None
	8-hour	None
NO_2	1-hour	None
SO_2	1-hour	None
	3-hour	None
Pb	Rolling 3-month	Not required to monitor based on population size and lack of significant Pb sources.

2019 Air Quality Index Summaries

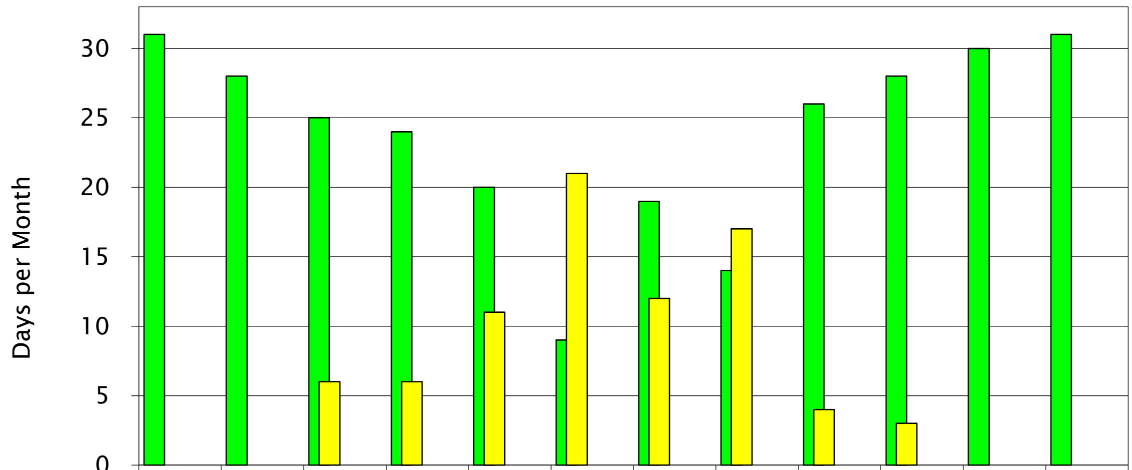
The Air Quality Index (AQI) is an index for reporting daily air quality that has been established by the EPA. It informs the public how clean or polluted the air is, and what associated health effects might be a concern. The AQI is reported to the public via EnviroFlash, social media (Facebook and Twitter), AirNow.gov, and the AQMD's air quality hotline ((775) 785-4110). The email, social media, and hotline are updated daily, and more often during air pollution episodes. The next six figures are pollutant-specific and summarize Washoe County's air quality for the previous year by pollutant, month, and AQI categories. The highest NAAQS average pollutant throughout our network is the AQI for that day. Months with less AQIs than days for NO_2 and SO_2 are due to not meeting data capture requirements for the AQI averaging time due to invalid data.

Figure 5
Monthly AQI Summary for All Pollutants (2019)



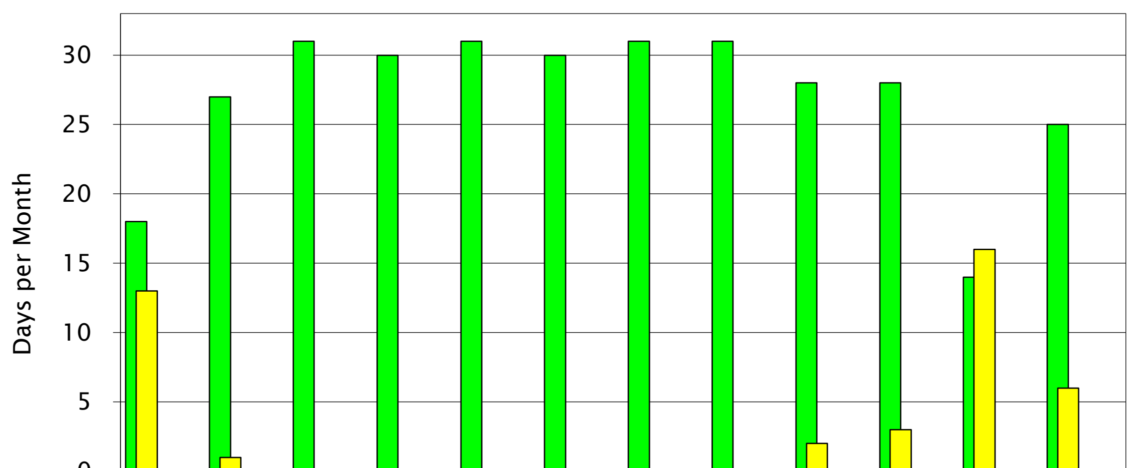
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Good	17	27	25	24	20	9	19	13	24	27	14	25
Moderate	14	1	6	6	11	21	12	18	6	4	16	6
USG	-	-	-	-	-	-	-	-	-	-	-	-
Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-	-	-

Figure 6
Monthly AQI Summary of O_3 (2019)



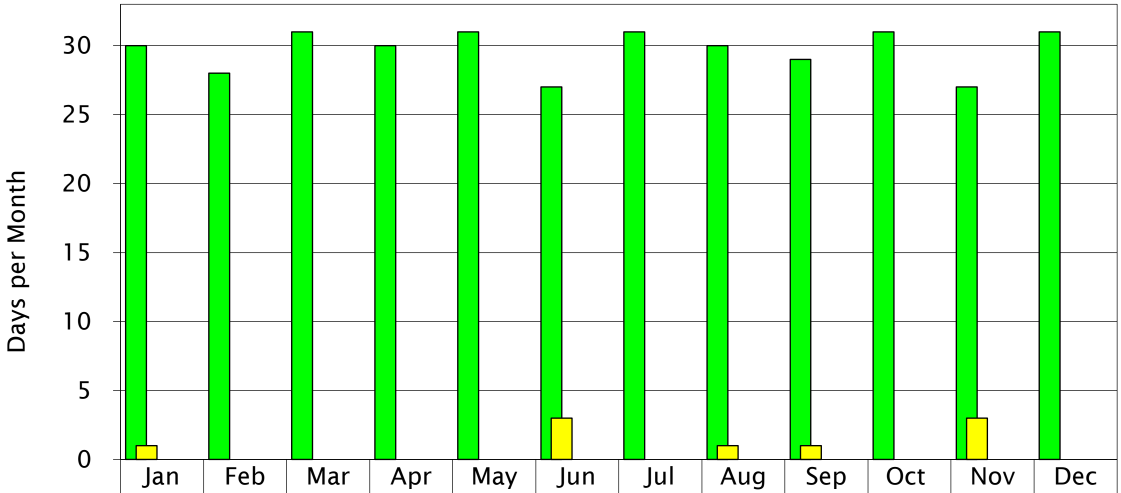
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Good	31	28	25	24	20	9	19	14	26	28	30	31
Moderate	-	-	6	6	11	21	12	17	4	3	-	-
USG	-	-	-	-	-	-	-	-	-	-	-	-
Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-	-	-

Figure 7
Monthly AQI Summary of $PM_{2.5}$ (2019)



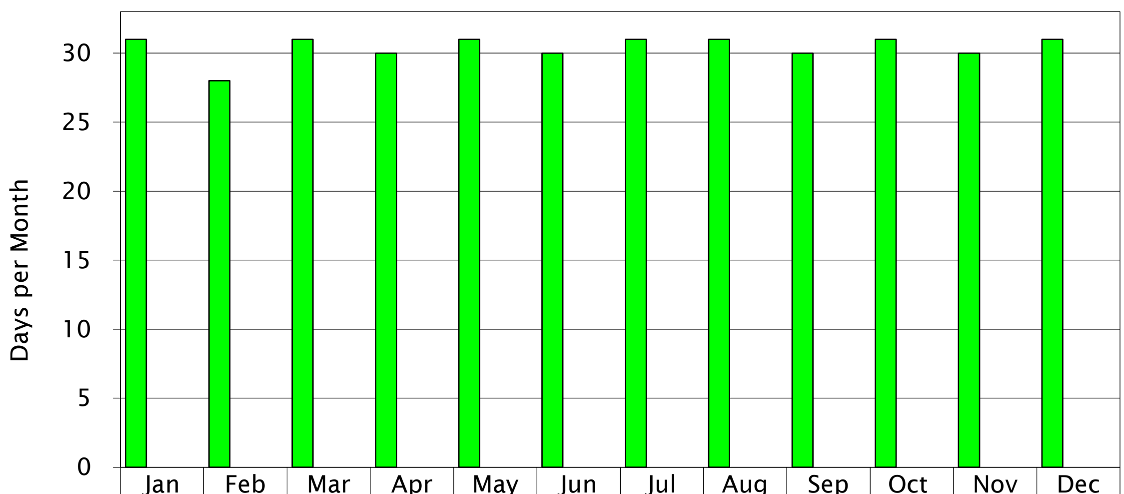
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Good	18	27	31	30	31	30	31	31	28	28	14	25
Moderate	13	1	-	-	-	-	-	-	2	3	16	6
USG	-	-	-	-	-	-	-	-	-	-	-	-
Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-	-	-

Figure 8
Monthly AQI Summary of PM_{10} (2019)



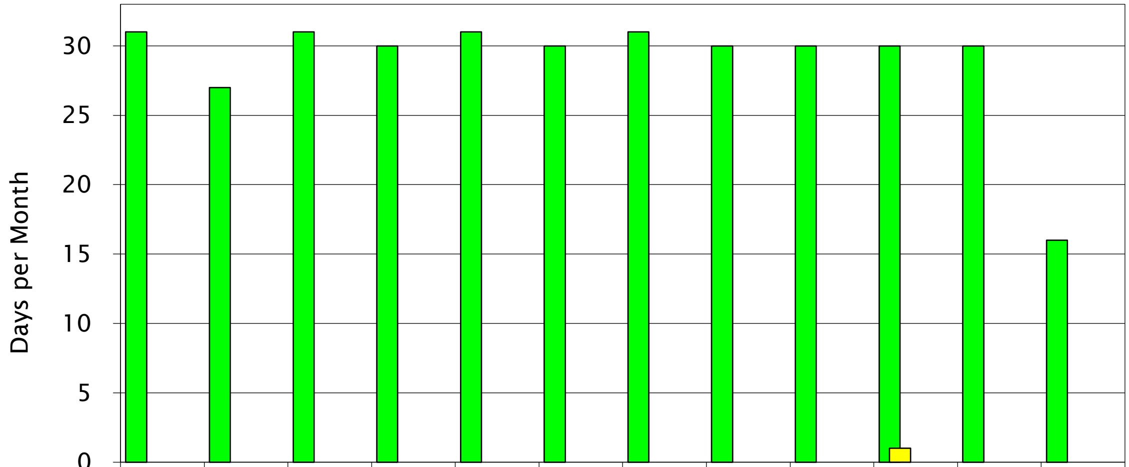
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Good	30	28	31	30	31	27	31	30	29	31	27	31
Moderate	1	-	-	-	-	3	-	1	1	-	3	-
USG	-	-	-	-	-	-	-	-	-	-	-	-
Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-	-	-

Figure 9
Monthly AQI Summary of CO (2019)



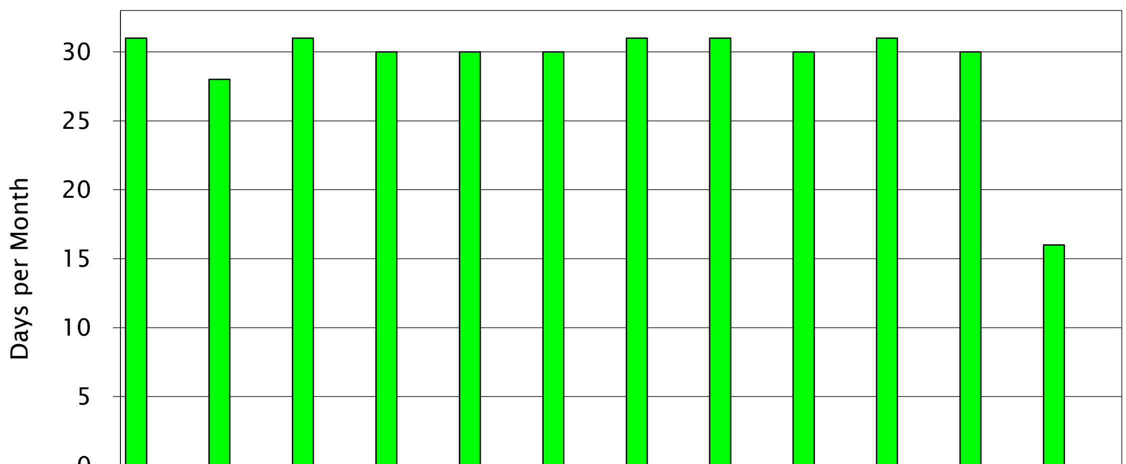
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Good	31	28	31	30	31	30	31	31	30	31	30	31
Moderate	-	-	-	-	-	-	-	-	-	-	-	-
USG	-	-	-	-	-	-	-	-	-	-	-	-
Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-	-	-

Figure 10
Monthly AQI Summary of NO_2 (2019)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Good	31	27	31	30	31	30	31	30	30	30	30	16
Moderate	-	-	-	-	-	-	-	-	-	1	-	-
USG	-	-	-	-	-	-	-	-	-	-	-	-
Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-	-	-

Figure 11
Monthly AQI Summary of SO_2 (2019)



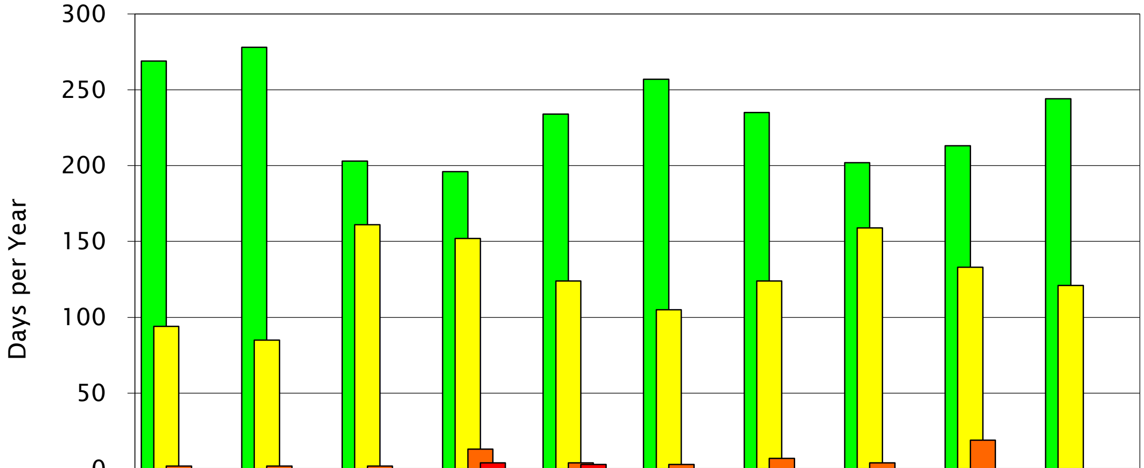
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Good	31	28	31	30	30	30	31	31	30	31	30	16
Moderate	-	-	-	-	-	-	-	-	-	-	-	-
USG	-	-	-	-	-	-	-	-	-	-	-	-
Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-	-	-

Ten-Year Air Quality Trend

Air Quality Index

Figure 12 summarizes the ten-year trend in AQI between 2010 and 2019. NAAQS revisions in 2012 and 2015 resulted in changes to AQI category ranges and the number of days per year within those ranges.

Figure 12
AQI Trend (2010-2019)



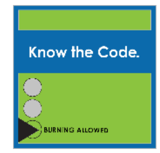
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Good	269	278	203	196	234	257	235	202	213	244
Moderate	94	85	161	152	124	105	124	159	133	121
USG*	2	2	2	13	4	3	7	4	19	-
Unhealthy	-	-	-	4	3	-	-	-	-	-
Very Unhealthy	-	-	-	-	-	-	-	-	-	-
Hazardous	-	-	-	-	-	-	-	-	-	-

* Unhealthy for Sensitive Groups

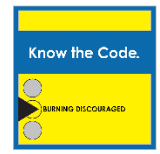
Notes
2012: Annual $PM_{2.5}$ NAAQS strengthened from 15.0 to 12.0 µg/m^3.
2015: 8-hour O_3 NAAQS strengthened from 0.075 to 0.070 ppm.

Burn Code Season

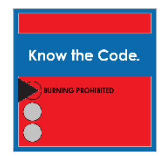
The Burn Code program has been in place since 1987. It begins November 1 and ends on the last day of February. During this wintertime period, the burn code curtails PM_{10}, $PM_{2.5}$, and CO emissions from residential and commercial solid fuel burning devices such as wood stoves, pellet stoves, fireplaces, and residential open burning.



Green: Issued when $PM_{2.5}$ levels are low and are not expected to be approaching the 24-hour $PM_{2.5}$ NAAQS. It is legal for residents and businesses to use their solid fuel burning device.

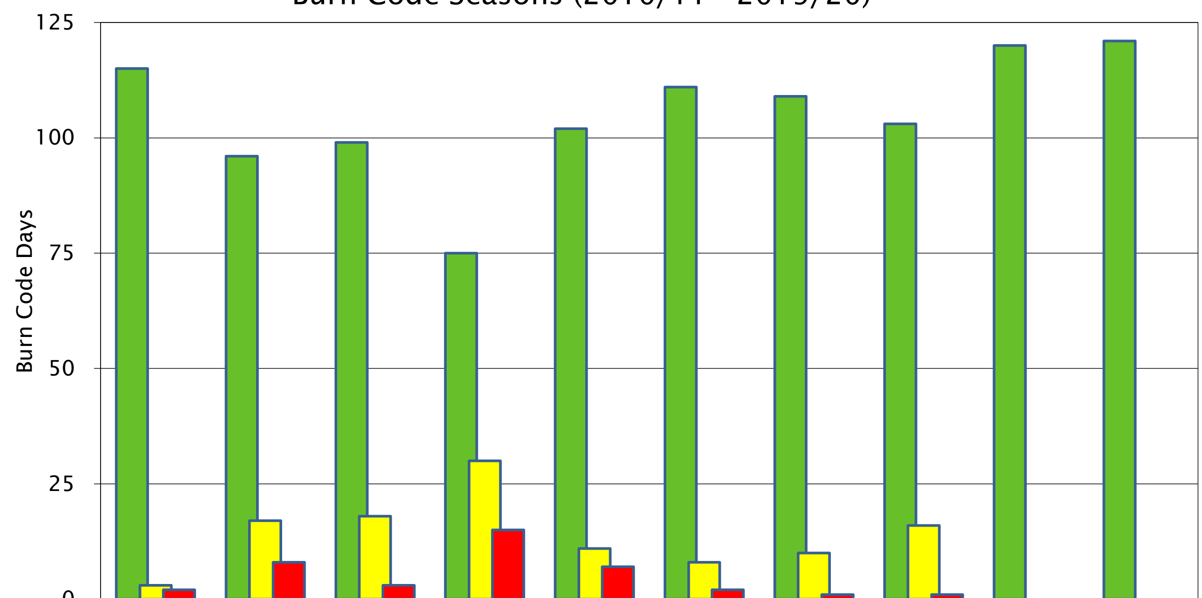


Yellow: Issued when $PM_{2.5}$ levels are approaching the 24-hour $PM_{2.5}$ NAAQS. It is legal for residents and businesses to use their solid fuel burning device, but it is encouraged to reduce or stop burning.



Red: Issued when $PM_{2.5}$ levels are above or expected to be above the $PM_{2.5}$ NAAQS. It is illegal for residents to use their solid fuel burning device except residents that have a sole source exemption. It is also illegal for businesses to burn solid fuel at a 24-hour average of 55 µg/m^3 for $PM_{2.5}$.

Figure 13
Burn Code Seasons (2010/11 - 2019/20)



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Green	115	96	99	75	102	111	109	103	120	121
Yellow	3	17	18	30	11	8	10	16	-	-
Red	2	8	3	15	7	2	1	1	-	-

Design Values

Data in the following section contains data that the AQMD has flagged as "exceptional" due to events such as wildfires, high winds, and transport. The design values will include these "exceptional" data until EPA determines concurrence with AQMD's exceptional events demonstrations submitted to EPA for Reno3 O_3 in 2008 and for Reno3 $PM_{2.5}$ in 2008, 2013, and 2014. Ozone exceptional events for the Reno3 monitoring station in 2015 and 2016 were concurred by EPA Region 9 on May 30, 2017.[4]

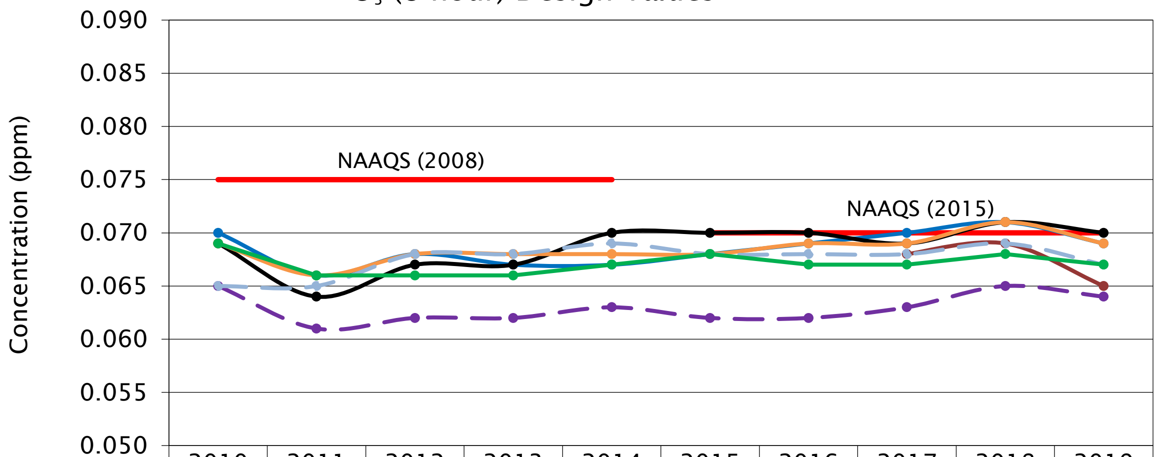
[4] "Exceptional Events Document Ozone - Washoe, NV." (**www.epa.gov/air-quality-analysis/exceptional-events-documents-ozone-washoe-nv**), EPA.gov. United States Environmental Protection Agency, 9 June 2017. Web. 20 May 2020

O_3 (8-hour) Design Values

NAAQS Level: 0.070 ppm
Design Value (2017-19): 0.070 ppm (REN)
Current Designation: Attainment/Unclassifiable (Entire County)

2019 Exceedances: 0
2019 First High: 0.069 ppm (Jun 01 - REN)
2019 Fourth High: 0.066 ppm (Jun 18 - REN)

Figure 14
O_3 (8-hour) Design Values



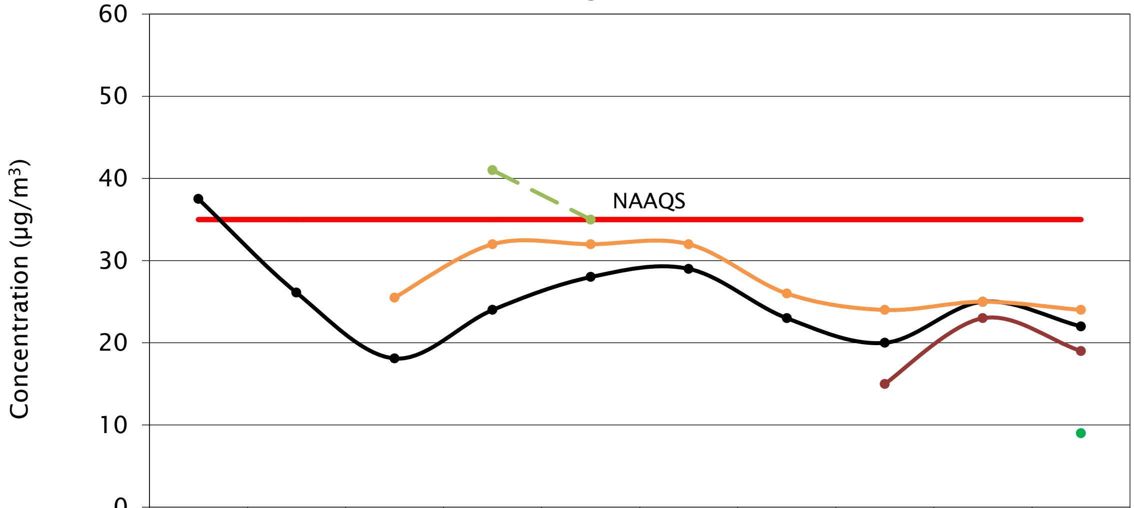
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	0.075	0.075	0.075	0.075	0.075	0.070	0.070	0.070	0.070	0.070
INC (2002)	0.065	0.061	0.062	0.062	0.063	0.062	0.062	0.063	0.065	0.064
LEM (2009)	0.070	0.066	0.068	0.067	0.067	0.068	0.069	0.070	0.071	0.069
RNO (0016)	0.069	0.064	0.067	0.067	0.070	0.070	0.070	0.069	0.071	0.070
SPK (1005)	0.069	0.066	0.068	0.068	0.068	0.068	0.069	0.069	0.071	0.069
SPS (1007)								0.068	0.069	0.065
SRN (0020)	0.065	0.065	0.068	0.068	0.069	0.068	0.068	0.068	0.069	0.067
TOL (0025)	0.069	0.066	0.066	0.066	0.067	0.068	0.067	0.067	0.068	0.067

$PM_{2.5}$ (24-hour) Design Values

<u>NAAQS Level</u>: 35 µg/m^3
<u>Design Value (2017-19)</u>: 24 µg/m^3 (SPK)
<u>Current Designation</u>: Attainment/Unclassifiable (Entire County)

<u>2019 Exceedances</u>: 0
<u>2019 First High</u>: 21.4 µg/m^3 (Nov 24 - SPK)
<u>2019 98th Percentile</u>: 15.8 µg/m^3 (Jan 11 - SPK)

Figure 15
$PM_{2.5}$ (24-hour) Design Values



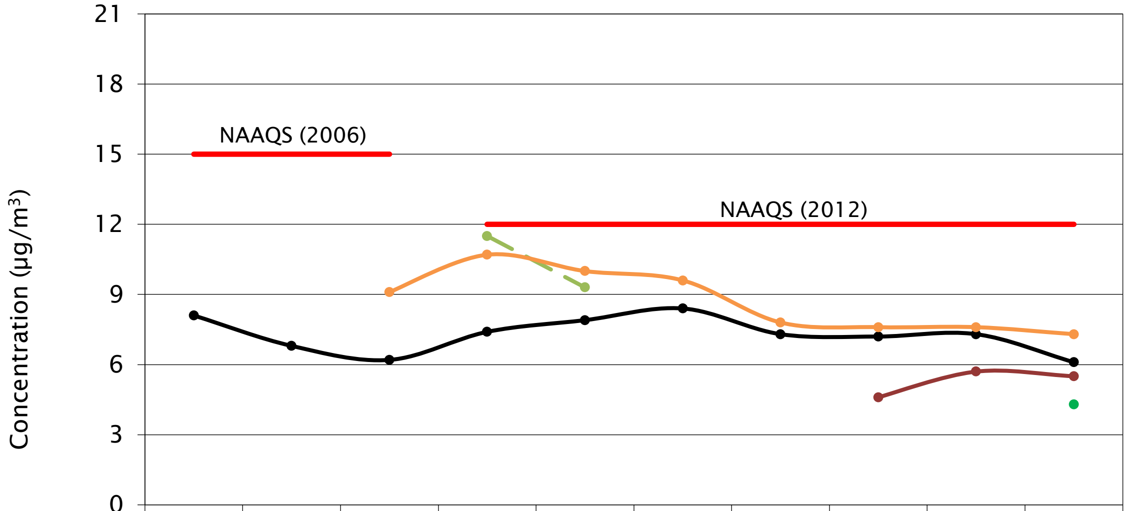
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	35	35	35	35	35	35	35	35	35	35
GAL (0022)				41	35					
RNO (0016)	38	26	18	24	28	29	23	20	25	22
SPK (1005)			26	32	32	32	26	24	25	24
SPS (1007)								15	23	19
TOL (0025)										9

$PM_{2.5}$ (Annual) Design Values

<u>NAAQS Level</u>: 12.0 µg/m³
<u>Design Value (2017-19)</u>: 7.3 µg/m³ (SPK)
<u>Current Designation</u>: Attainment/Unclassifiable (Entire County)

<u>2019 Annual Weighted Mean</u>: 6.0 µg/m³ (SPK)

Figure 16
$PM_{2.5}$ (Annual) Design Values



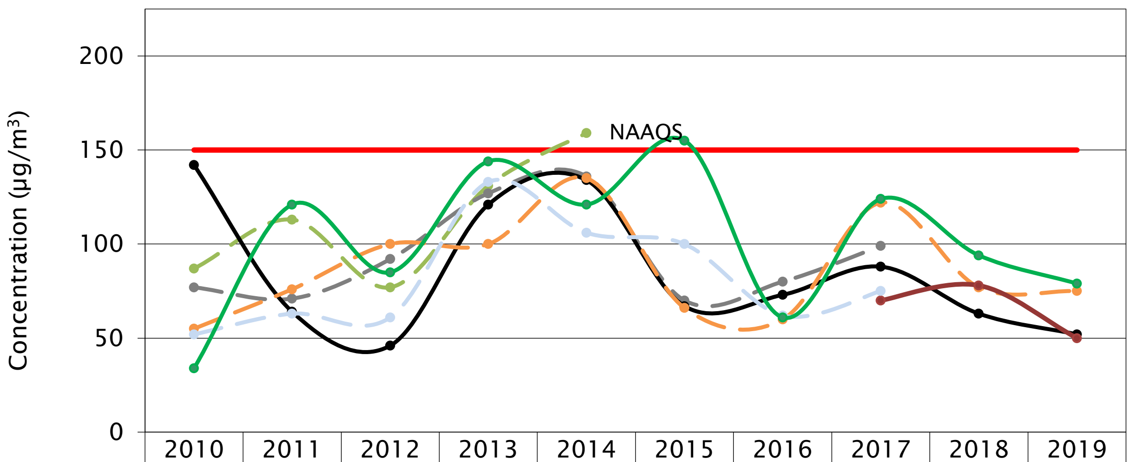
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	15.0	15.0	15.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
GAL (0022)				11.5	9.3					
RNO (0016)	8.1	6.8	6.2	7.4	7.9	8.4	7.3	7.2	7.3	6.1
SPK (1005)			9.1	10.7	10.0	9.6	7.8	7.6	7.6	7.3
SPS (1007)								4.6	5.7	5.5
TOL (0025)										4.3

PM_{10} (24-hour) First Highs

NAAQS Level: 150 µg/m^3
Design Value (2017-19): 0 expected exceedances
Current Designation: Attainment (HA 87); Attainment/Unclassifiable (Remainder of County)

2019 Exceedances: 0
2019 Expected Exceedances: 0
2019 First High: 79 µg/m^3 (Aug 26 - TOL)

Figure 17
PM_{10} (24-hour) First Highs



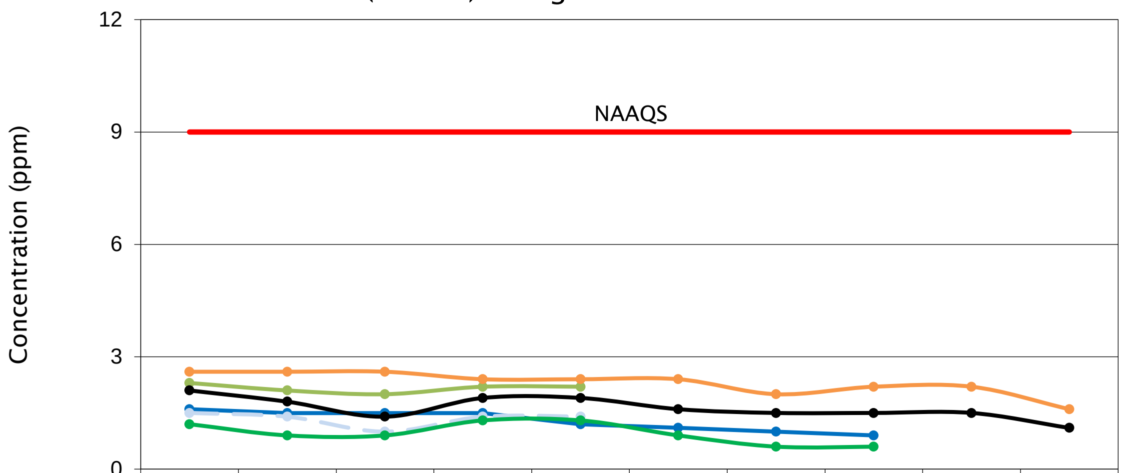
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	150	150	150	150	150	150	150	150	150	150
GAL (0022)	87	113	77	131	159					
PLM (0030)	77	71	92	127	136	70	80	99		
RNO (0016)	142	64	46	121	134	67	73	88	63	52
SPK (1005)	55	76	100	100	135	66	60	122	77	75
SPS (1007)								70	78	50
SRN (0020)	52	63	61	133	106	100	62	75		
TOL (0025)	34	121	85	144	121	155	61	124	94	79

CO (8-hour) Design Values

<u>NAAQS Level</u>: 9 ppm
<u>Design Value (2018-19)</u>: 1.6 ppm (SPK)
<u>Current Designation</u>: Attainment (HA 87); Attainment/Unclassifiable (Remainder of County)

<u>2019 Exceedances</u>: 0
<u>2019 First High</u>: 1.6 ppm (Nov 13 - SPK)
<u>2019 Second High</u>: 1.5 ppm (Jan 11 - SPK)

Figure 18
CO (8-hour) Design Values



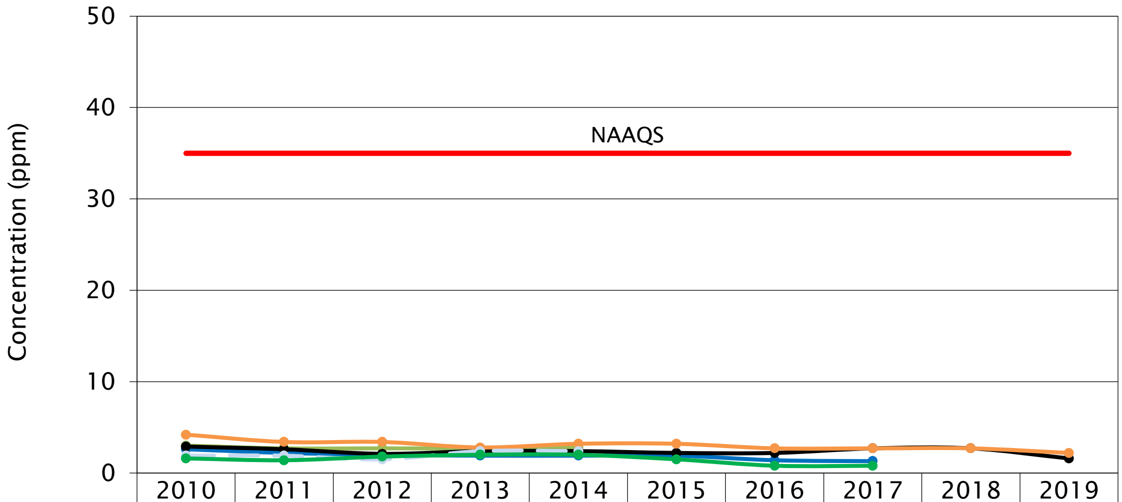
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	9	9	9	9	9	9	9	9	9	9
GAL (0022)	2.3	2.1	2.0	2.2	2.2					
LEM (2009)	1.6	1.5	1.5	1.5	1.2	1.1	1.0	0.9		
RNO (0016)	2.1	1.8	1.4	1.9	1.9	1.6	1.5	1.5	1.5	1.1
SPK (1005)	2.6	2.6	2.6	2.4	2.4	2.4	2.0	2.2	2.2	1.6
SRN (0020)	1.5	1.4	1.0	1.4	1.4					
TOL (0025)	1.2	0.9	0.9	1.3	1.3	0.9	0.6	0.6		

CO (1-hour) Design Values

<u>NAAQS Level</u>: 35 ppm
<u>Design Value (2018-19)</u>: 2.2 ppm (SPK)
<u>Current Designation</u>: Attainment/Unclassifiable (Entire County)

<u>2019 Exceedances</u>: 0
<u>2019 First High</u>: 2.6 ppm (Oct 28 - REN)
<u>2019 Second High</u>: 2.0 ppm (Jan 03 - SPK)

Figure 19
CO (1-hour) Design Values



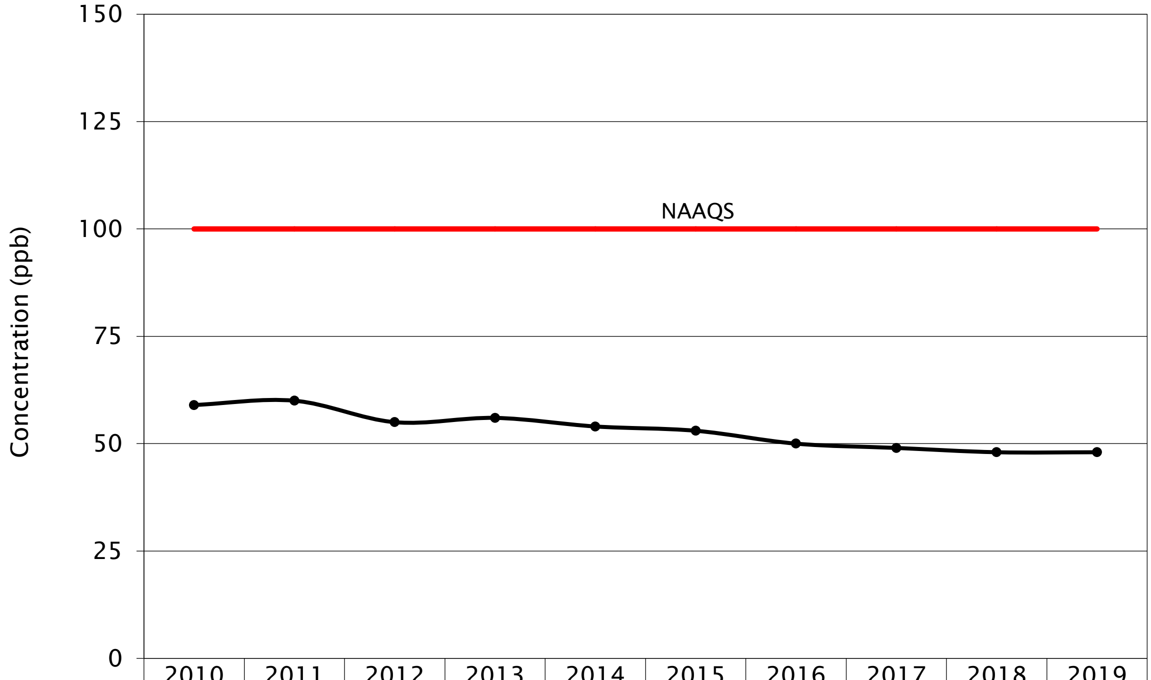
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	35	35	35	35	35	35	35	35	35	35
GAL (0022)	3.0	2.7	2.7	2.7	2.8					
LEM (2009)	2.6	2.2	2.0	1.9	1.9	1.9	1.4	1.3		
RNO (0016)	2.9	2.6	2.1	2.4	2.4	2.2	2.2	2.7	2.7	1.6
SPK (1005)	4.2	3.4	3.4	2.8	3.2	3.2	2.7	2.7	2.7	2.2
SRN (0020)	1.9	1.9	1.5	2.4	2.4					
TOL (0025)	1.6	1.4	1.8	2.0	2.0	1.5	0.8	0.8		

NO_2 (1-hour) Design Values

<u>NAAQS Level</u>: 100 ppb
<u>Design Value (2017-19)</u>: 48 ppb (RNO)
<u>Current Designation</u>: Attainment/Unclassifiable (Entire County)

<u>2019 Exceedances</u>: 0
<u>2019 First High</u>: 60.0 (Oct 16 - RNO)
<u>2019 98th Percentile</u>: 45.6 ppb (Mar 28 - RNO)

Figure 20
NO_2 (1-hour) Design Values



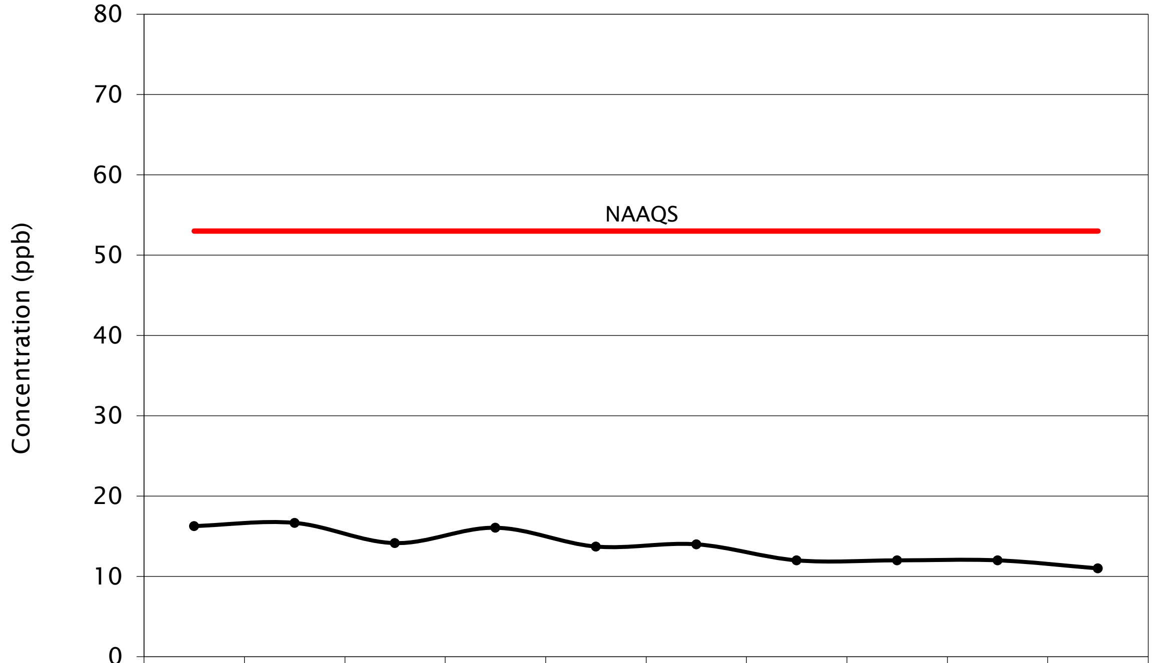
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	100	100	100	100	100	100	100	100	100	100
RNO (0016)	59	60	55	56	54	53	50	49	48	48

NO_2 (Annual) Design Values

NAAQS Level: 53 ppb
Design Value (2019): 11 ppb (RNO)
Current Designation: Attainment/Unclassifiable (Entire County)

2019 Annual Mean: 11 ppb (RNO)

Figure 21
NO_2 (Annual) Design Values



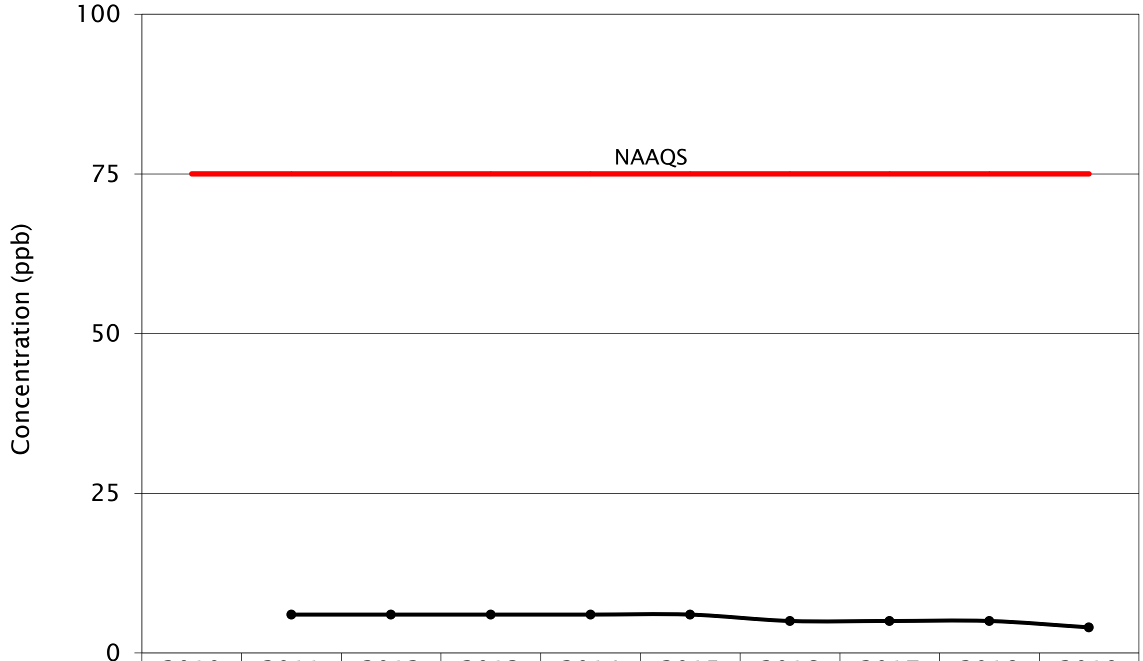
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	53	53	53	53	53	53	53	53	53	53
RNO (0016)	16	17	14	16	14	14	12	12	12	11

SO_2 (1-hour) Design Values

NAAQS Level: 75 ppb
Design Value (2019): 4 ppb (RNO)
Current Designations: Attainment/Unclassifiable (Entire County)

2019 First High: 3.9 ppb (Jan 11 - RNO)
2019 99th Percentile: 2.7 ppb (Jan 17 - RNO)

Figure 22
SO_2 (1-hour) Design Values



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NAAQS	75	75	75	75	75	75	75	75	75	75
RNO (0016)		6	6	6	6	6	5	5	5	4