Environmental
Protection
Agency

Ohio Air Quality 2024

39-095-0026, Lucas County

Ohio EPA
Division of Air Pollution Control
December 2025

STATE OF OHIO
AIR QUALITY
CALENDAR YEAR 2024

PREPARED BY
DIVISION OF AIR POLLUTION CONTROL
OHIO ENVIRONMENTAL PROTECTION AGENCY

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Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

AMNP	Annual Monitoring Network Plan
AQI	Air Quality Index (replaced Pollutant Standard Index, PSI)
AQS	Air Quality System
ATMP	Air Toxics Monitoring Program
CAA	Clean Air Act
CASTNET	Clean Air Status and Trends Network
CBSA	Core-Based Statistical Area
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DES	Division of Environmental Services
DNS	Did Not Sample
FEM	Federal Equivalent Method
FRM	Federal Reference Method
FR	Federal Register
GC	Gas Chromatograph or Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
ICP/MS	Inductively Coupled Plasma/ Mass Spectrometry
ICP/OES	Inductively Coupled Plasma/Optical Emissions Spectroscopy
MDL	Method Detection Limit
$\mu g/m^3$	micrograms per cubic meter
mg/m^3	milligrams per cubic meter
MSA	Metropolitan Statistical Area
ng/m^3	nanograms per cubic meter
NAAQS	National Ambient Air Quality Standards
NAMS	National Ambient Monitoring Stations
NCore	National Core Monitoring Network
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_3	Ozone
OASN	Ohio Air Sampling Network
Obs	Observations
Ohio EPA	Ohio Environmental Protection Agency
Pb	Lead
PAMS	Photochemical Assessment Monitoring Stations
POC	Parameter Occurrence Code
ppb	parts per billion
ppm	parts per million
ppbv	parts per billion by volume
PQAO	Primary Quality Assurance Organization
PM_{10}	Particulate matter having an aerodynamic diameter ≤10 microns
$PM_{2.5}$	Particulate matter having an aerodynamic diameter ≤2.5 microns
PSI	Pollutant Standard Index (replaced by Air Quality Index, AQI)
RADS	Remote Ambient-Air Data System
RL	Reporting Limit
SIP	State Implementation Plans
SLAMS	State/Local Ambient Monitoring Stations
SO_2	Sulfur Dioxide

Acronyms and Abbreviations

TO-15	Toxics Organics – 15 (U.S. EPA Air Method for VOC Analysis)
TSP	Total Suspended Particulate
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

Executive Summary

A. General Review

Air quality data for calendar year 2024 are summarized for seven criteria pollutants: particulate matter with aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with aerodynamic diameter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone, and lead. Data are also summarized for total suspended particulates (TSP). Also included is a section discussing toxics monitoring projects conducted and trend analysis results for the criteria pollutants: PM_{10}, $PM_{2.5}$, ozone, NO_2, SO_2, CO, and lead.

B. Discussion of National Ambient Air Quality Standards, Exceedances and Violations

The United States Environmental Protection Agency (U.S. EPA) sets National Ambient Air Quality Standards (NAAQS) for each of the criteria pollutants. In setting the NAAQS, U.S. EPA indicated a level (e.g., 0.070 ppm), an averaging time (e.g., eight-hours) and a form (e.g., annual fourth-highest daily maximum eight-hour concentration, averaged over three years) (see Table 1). A monitor is in violation of the NAAQS when it exceeds the level, over the averaging time, for a given form.

Table 1. U.S. EPA and Ohio EPA Ambient Air Quality Standards

			Level	
Pollutant	**Averaging time**	**Form**	**Primary***	**Secondary***
PM_{10}	24-hour	Not to be exceeded more than once per year on average over 3 years	150 µg/m^3	150 µg/m^3
$PM_{2.5}$	1-year	Annual mean, averaged over 3 years	9.0 µg/m$^{3\wedge}$	15.0 µg/m^3
	24-hour	98th percentile, averaged over 3 years	35 µg/m^3	35 µg/m^3
Ozone	8-hour	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	0.070 ppm	0.070 ppm
NO_2	1-hour	98th percentile of 1-hour daily maximum concentrations, average over 3 years	100 ppb	none
	1-year	Annual mean	53 ppb	53 ppb
SO_2	1-hour	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	75 ppb	none
	1-year	Annual mean, averaged over 3 years	none	10 ppb$^{\sim}$
CO	8-hour	Not to be exceeded more than once per year	9 ppm	none
	1-hour	Not to be exceeded more than once per year	35 ppm	none
Lead	Rolling 3-month average	Not to be exceeded	0.15 µg/m^3	0.15 µg/m^3

*Primary NAAQS are established for protection of public health; secondary NAAQS are established for protection of public welfare.

^ Primary NAAQS was revised in March 2024 from 12.0 µg/m^3 to 9.0 µg/m^3.

~Secondary NAAQS was revised in December 2024 from 0.5 ppm not to be exceeded more than once per year to the level and form listed above.

In some cases, NAAQS are separated into two parts: primary and secondary. A primary standard sets the level of air pollution where human health is protected. A secondary standard sets the level where the welfare of citizens is protected due to air pollution damage to crops, animals, vegetation and materials.

A monitor could show an exceedance of the level for a given averaging time, without triggering a violation of the NAAQS. For example, in 2024, an ozone monitor could have an annual fourth-highest daily maximum eight-hour concentration exceed the 0.070 ppm level but be below the NAAQS when averaged over three years. In that case we would denote that an exceedance occurred on an annual basis in 2024 but not a violation. Exceedances and violations are discussed in more detail in the observations and conclusions section.

Table 2 provides a summary of violations by county that occurred in 2024. There were no violations of the PM_{10}, 24-hour $PM_{2.5}$, NO_2, SO_2, lead or CO NAAQS during 2024.

Table 2. Violation of National Ambient Air Quality Standards (NAAQS) by County 2022-2024

Pollutant	Standard	Counties
$PM_{2.5}$	Annual (9.0 $\mu g/m^3$)	Butler, Cuyahoga, Franklin and Hamilton
Ozone	8-hour (0.070 ppm)	Cuyahoga, Hamilton, Lake, Lucas and Warren

C. Observations and Conclusions

Particulate matter having an aerodynamic diameter ≤10 microns (PM_{10})

There were 30 PM_{10} monitoring sites with a total of 32 monitors to collect ambient and quality assurance data.

There is a 24-hour NAAQS for PM_{10}, not to be exceeded more than once per year on average over 3 years. There were no exceedances or violations of the PM_{10} NAAQS in 2024. The last exceedance and violation occurred in 2023.

Particulate matter having an aerodynamic diameter ≤2.5 microns ($PM_{2.5}$)

There were 44 $PM_{2.5}$ monitoring sites with 97 monitors to collect both ambient and quality assurance data. Most are filter-based instruments collecting individual 24-hour average concentrations on a schedule of either every three-days or every six-days, and the remaining are continuous instruments collecting hourly concentrations each day in addition to 9 chemical speciation monitors that operate on an every three- or six-day schedule with filters analyzed for chemical composition of $PM_{2.5}$ matter.

There is both an annual and 24-hour $PM_{2.5}$ NAAQS. In 2024, there were three counties with an exceedance for at least one 24-hour period for the 24-hour $PM_{2.5}$ NAAQS: Butler, Cuyahoga and Franklin. These three counties (Butler, Cuyahoga and Franklin), also exceeded the value of the annual $PM_{2.5}$ NAAQS in 2024. Due to the form of both standards being averaged over three years, one year with exceedances does not constitute a violation of the annual or 24-hour NAAQS. There were no violations of the 24-hour NAAQS in 2024. Butler, Cuyahoga, Franklin, and Hamilton Counties had at least one site violating the annual NAAQS in 2024. Please note that Hamilton

County is in violation of the newly revised annual $PM_{2.5}$ NAAQS but did not experience an annual exceedance in 2024. This is due to the annual NAAQS being averaged over three years coupled with the level of the standard being revised in 2024 from 12.0 µg/m^3 to 9.0 µg/m^3.

Ozone (O_3)

There were 50 ozone continuous monitoring sites collecting ambient hourly data, two of which were operated by U.S. EPA as part of their CASTNET monitoring network.

There was at least one monitor in each of twenty counties with exceedances of the eight-hour NAAQS during at least one eight-hour period in 2024. However, seven counties exceeded the eight-hour NAAQS during the fourth highest eight-hour period in 2024: Clinton, Cuyahoga, Hamilton, Lake, Lucas, Montgomery, and Warren Counties. The three-year, eight-hour ozone NAAQS was in violation in Cuyahoga, Hamilton, Lake, Lucas and Warren Counties for the most recent three-year period.

Nitrogen Dioxide (NO_2)

There were seven NO_2 continuous monitoring sites collecting ambient hourly data.

There is both a one-hour and annual NO_2 NAAQS. There were no exceedances or violations of either of the NO_2 NAAQS in 2024. There have been no violations of the three-year, one-hour or annual NO_2 NAAQS since 1997.

Sulfur Dioxide (SO_2)

There were 26[1] SO_2 continuous monitoring sites collecting ambient hourly data.

There is both a one-hour and annual SO_2 NAAQS. The annual SO_2 NAAQS is only a secondary NAAQS. There were three monitors with an exceedance of the one-hour NAAQS during at least one one-hour period in 2024. These exceedances occurred in Gallia, Lake and Mason (West Virginia) Counties. There were no violations of the most recent three-year period for the one-hour SO_2 NAAQS.

The secondary annual NAAQS was promulgated in December of 2024 and there were no exceedances statewide in 2024.

Carbon Monoxide (CO)

There were seven CO continuous monitoring sites collecting ambient hourly data.

There is both a one-hour and eight-hour CO NAAQS. There were no exceedances or violations of either of the CO NAAQS in 2024. There have been no violations of the one-hour or eight-hour CO NAAQS since 1990 and 1993, respectively.

[1] One monitor is located in West Virginia to monitor a SO_2 source located in Ohio.

Lead (Pb)

There were 11 lead monitoring sites with a total of 16 monitors collecting ambient and quality assurance data.

In 2024, there were no exceedances or violations of the lead NAAQS. The last violation of the three-month rolling average lead NAAQS occurred in 2021.

D. Monitoring Network

There were 113 monitoring sites reporting data from 45 counties; a list of every Ohio monitoring site in operation during 2024 along with the pollutants monitored at each site can be found in Table [2] of this report. Each year, Ohio EPA is required to submit an annual Air Monitoring Network Plan (AMNP) to U.S. EPA which describes the state's ambient monitoring network in detail. The most recent Ohio AMNP is available for viewing on our agency website at:

https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/air-monitoring

Site location information is included in the Monitoring Site Description appendix of Ohio's AMNP. This information includes a map depicting the general location within the state boundaries along with an aerial and ground level view of each site.

[2] Table 36, as well as the site and county counts include one monitoring site located in West Virginia which is operated by Ohio EPA.

I. INTRODUCTION

A. General

A variety of substances are generated and released into the atmosphere by a multitude of man-made and natural sources. Those substances that may affect public health and welfare are regarded as "air pollutants." U.S. EPA has established NAAQS to safeguard public health and welfare from these air pollutants. Ambient air is generally defined as air that is accessible to the general public. The air within fenced-in, guarded or limited access areas of facility property is not considered ambient air.

Pollutants for which NAAQS have been promulgated are particulate matter having an aerodynamic diameter ≤10 microns (PM_{10}), particulate matter having an aerodynamic diameter ≤2.5 microns ($PM_{2.5}$), ozone, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO) and lead. The NAAQS are concentrations expressed in micrograms per cubic meter ($\mu g/m^3$), parts per million (ppm) or parts per billion (ppb) per sampling averaging times. The concentrations, averaging times and the form for each standard in effect as of 2024 are provided in Table 1 above.

This report presents summaries of Ohio EPA's measurements of the NAAQS criteria and toxic air pollutants during calendar year 2024. Also presented are selected statistics and trend analyses for Ohio. Each pollutant section provides a brief description of the pollutant, sources from which it originates, potential adverse health effects, and monitoring methods used.

Throughout this report data may be flagged with a footnote as "does not meet the data completeness criteria" or "insufficient data for valid statistical averages." A monitor must operate a minimum amount of time based on operating schedules and monitoring frequency set by U.S. EPA. In order to have a valid statistical average for comparison to the NAAQS with three-year averaging times, a monitor must have all three years of data meeting U.S. EPA's completeness criteria.

In the majority of cases, data sets are incomplete/insufficient due to the startup, shut down, or relocation of a site or monitor. When monitors start, stop, or are relocated, they often cannot meet the minimum operating requirements for that year simply because of the timing of the start up or shut down. Therefore, it can take up to three years for a newly established monitor to have a valid statistical average. Monitors that have shut down but were still active within three years of 2024 are included in tables presenting three-year averages but also do not represent valid statistical averages since the monitor ceased collecting data within that three-year period. In other, more rare cases, data sets may be incomplete/insufficient due to other circumstances, such as a prolonged malfunction. More information about the operation of Ohio EPA's air monitoring network, including approvals to start or shut down a site or monitor can be found as part of Ohio AMNP referenced in the Monitoring Network section above.

From approximately June through August 2023 Ohio observed impacts from wildfire smoke that can be observed across different pollutants. These 2023 wildfire smoke influences may have impacted the concentrations seen in tables below presenting three-year averages for both the ozone and particulate matter NAAQS. For more information regarding wildfire smoke and 2023 air quality data please see Ohio EPA's 2023 Air Quality Report.

B. Development of the Ohio Air Monitoring System

Society's concern about air pollution resulted in the Clean Air Act (CAA) of 1955. The CAA and its subsequent amendments first encouraged, then authorized, grants to help finance the establishment of state and local air pollution control programs. In 1963, Ohio established the Ohio Air Sampling Network (OASN) with 21 monitoring sites, measuring total suspended particulates (TSP) throughout the state. The CAA Amendments of 1970 mandated the promulgation of NAAQS. The U.S. EPA was formed in 1970 and began developing air monitoring regulations requiring states to establish a network of monitors to measure air quality in all major urban areas.

39-035-0060, Cuyahoga County

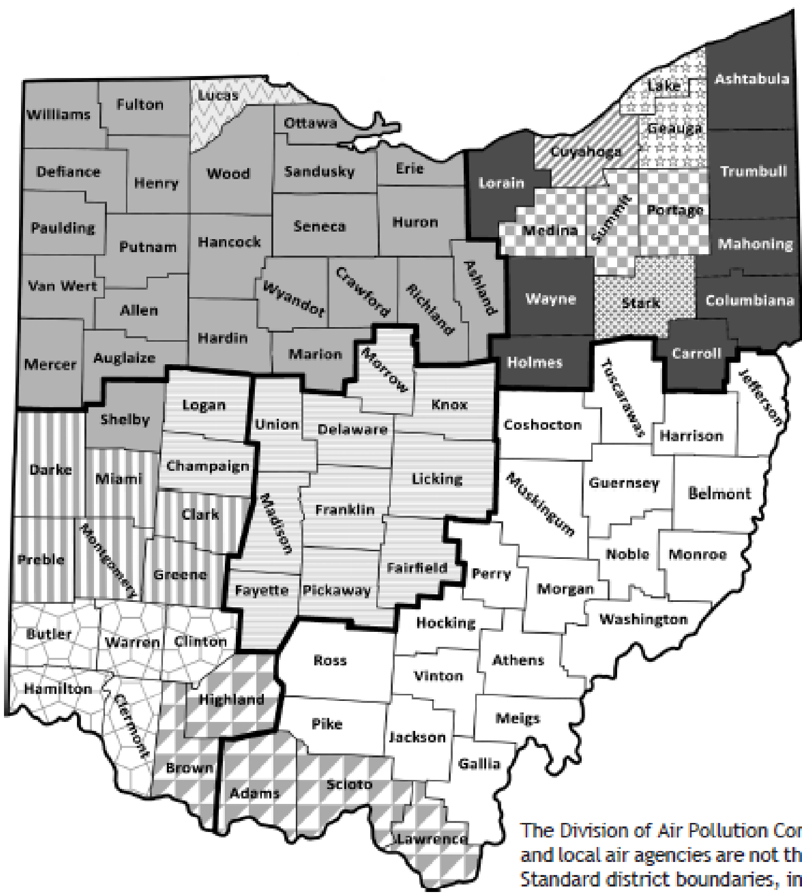
The air monitoring program began under the Ohio Department of Health and started with regulations for TSP, SO_2, NO_2, CO, and photochemical oxidants. In October of 1972, Ohio EPA was formed and became responsible for CAA compliance. In 1978, U.S. EPA promulgated the NAAQS for lead. In 1979, the NAAQS for ozone replaced photochemical oxidants. Over time, U.S. EPA progressed to monitoring smaller particulate matter. In July of 1987, a NAAQS for PM_{10} was established followed by a NAAQS for $PM_{2.5}$ in July of 1997. These NAAQS replaced TSP. Throughout that time, Ohio's air quality monitoring network significantly expanded.

Ohio has four District Offices and eight Local Air Agencies supporting Ohio's air monitoring program. Figure 1 provides details regarding geographic coverage and contact information for all District Offices and Local Air Agencies.

The goals of the ambient monitoring program are to determine compliance with the NAAQS; to provide real-time monitoring of air pollution episodes; to provide data for trend analyses, regulation evaluation and planning; and to provide daily information to the public concerning air quality in high population areas, near major emission sources and in rural areas.

Figure 1. Ohio EPA District Offices & Local Air Agencies Jurisdictional Boundaries

Division of Air Pollution Control
District Office and Local Air Agency Jurisdiction



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The Division of Air Pollution Control's jurisdictional boundaries for district offices and local air agencies are not the same as Ohio EPA's standard district boundaries. Standard district boundaries, indicated by the dark lines, are for reference only.

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In 1980, U.S. EPA and Ohio EPA established and designated certain portions of Ohio's ambient air monitoring network to be a part of the National Air Monitoring Station (NAMS) network, created for tracking national trends. This required that all sites produce data of adequate quality and quantity to meet monitoring objectives and statistical analysis.

The first annual PM_{10} NAAQS was set at 50 µg/m^3 and became effective July 1987. In 1997 the first $PM_{2.5}$ NAAQS became effective and included both an annual (15.0 µg/m^3) and 24-hour (65 µg/m^3) NAAQS. Filter-based $PM_{2.5}$ monitors began collecting data in 1999. Monitors to determine chemical makeup of the particulate matter were added in 2000. In 2001, monitors that could continuously measure $PM_{2.5}$ became a programmatic requirement. The 24-hour $PM_{2.5}$ NAAQS was revised in 2006 to 35 µg/m^3. The annual $PM_{2.5}$ NAAQS was revised in 2012 to 12.0 µg/m^3 and then again in 2024 to 9.0 µg/m^3.

The one-hour ozone NAAQS of 0.12 ppm established in 1979 was supplanted with an eight-hour standard in 1997. The eight-hour NAAQS is the three-year average of each site's annual 4th high eight-hour average, which was set at 0.08 ppm. The one-hour ozone NAAQS was revoked in 2006. In 2008, the eight-hour NAAQS was revised to 0.075 ppm before it was lowered again in 2015 to 0.070 ppm.

In 2010, the primary NAAQS for SO_2 was established as a one-hour NAAQS set at a level of 75 ppb based on the three-year average of the annual 99th percentile of one-hour daily maximum concentrations. During this time, a secondary three-hour 0.5 ppm NAAQS was in place (not to be exceeded more than once per year). This secondary NAAQS was retained until December 11, 2024, when it was revised to an annual average of 10 ppb to be averaged over three consecutive years.

In 2008, the NAAQS for lead was revised to 0.15 µg/m^3 as a three-month rolling average, replacing the 1.5 µg/m^3 calendar quarter average NAAQS established in 1978. New monitors near known or presumed sources were required to be operational on the first sampling day of 2010.

On January 1, 2011, U.S. EPA made changes to the designations of NAMS sites. The NAMS designation, used for national trends in concentrations was eliminated in favor of National Core Monitoring Network (NCore) sites, a much smaller network of sites with many more parameters per site monitored. There are three NCore sites in Ohio, which are located in Cincinnati, Cleveland, and Preble County.

In October 2015, U.S. EPA promulgated a more stringent air quality standard for ozone. As a result, Photochemical Assessment Monitoring Stations (PAMS) stations were to be established at all NCore sites located in CBSAs whose population is greater than or equal to one million people. In Ohio there are three NCore sites: Cleveland (MSA population greater than one million), Cincinnati (MSA population greater than one million), and Preble County (not in a CBSA). Therefore, the new rule required Cleveland and Cincinnati NCore sites to have a PAMS operational by the monitoring deadline of June 1, 2019. On January 8, 2020, U.S. EPA issued final rulemaking to delay the start date for PAMS monitoring until June 1, 2021 (85 FR 834). Ohio EPA fully implemented PAMS monitoring by June 1, 2021 in accordance with U.S. EPA's rulemaking extension. The PAMS monitoring season occurs each year from June 1st through August 31st.

Currently, air monitoring sites for criteria pollutants are established using criteria set by U.S. EPA for their location and operation. The monitoring stations in this network are called the State and Local Air Monitoring Stations (SLAMS). There are other types of monitors besides SLAMS monitors, which are established with different criteria set by U.S. EPA. For example, some monitors may be categorized as Special Purpose or Industrial. Regardless of whether a monitor is designated as SLAMS, Special Purpose or Industrial, all ambient air monitoring data from all sites is included in this report.

Details on Ohio's ambient air monitoring network, and how it meets the criteria established by U.S. EPA, are provided annually in the AMNP. The AMNP is a CAA requirement, annually addressing the state's network as it existed on July 1 of the reporting year and as it was expected or anticipated to be modified in the year ahead. Appendix A of the AMNP is the Complete Network Plan Description, listing each monitoring site within the Local Air Agencies and District Offices in Ohio. The AMNP is available at https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/air-monitoring.

C. Data Acquisition

Beginning in 1986, the Remote Ambient-Air Data System (RADS) provided for the automatic acquisition of data from Ohio EPA's remote monitors to a central computer. Data is retrieved from each District Office and Local Air Agency's continuous monitoring sites on an hourly basis. RADS has since been upgraded for improved remote access to data by digital cellular wireless technology. Beginning in 2015, RADS began using Agilaire's AirVision software to poll, process and assemble all hourly data collected in Ohio.

D. Data Availability on the Internet

Air monitoring data is available on Ohio EPA's AirOhio website at https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/airohio-air-monitoring-data.

Ohio EPA also provides ozone and $PM_{2.5}$ data updates hourly to U.S. EPA's AirNow website. Current data and data forecasts are presented in the form of tables and maps and can be viewed at http://www.airnow.gov.

Historical ambient air quality data can also be found at https://www.epa.gov/outdoor-air-quality-data. This site is a gateway to maps, reports and user-selected data residing in U.S. EPA's Air Quality System (AQS) database.

II. PARTICULATE MATTER ≤10μM (PM_{10})

A. Overview

In 1987, U.S. EPA promulgated a primary NAAQS for particulate matter that included only those particles with an aerodynamic diameter smaller than or equal to 10 micrometers (PM_{10}, particulate matter ≤10 micrometers). From 1987 to 2006, the annual NAAQS was 50 µg/m^3 annual arithmetic mean (averaged over three years) and the 24-hour NAAQS was 150 µg/m^3 (not to be exceeded more than once per year, averaged over three years).

In 2006, the 24-hour PM_{10} NAAQS of 150 µg/m^3 was retained, but the annual PM_{10} NAAQS was revoked.

39-155-0006, Trumbull County

Ohio's air monitoring network was expanded to include 21 PM_{10} sites in 1986, 45 in 1988, and a high of 91 sites in 1997. Since 1997, the PM_{10} network has been substantially reduced, as monitoring of particulates has been focused to sampling of $PM_{2.5}$ fine particulates. In 2024, there were 30PM_{10} sites with 32 total monitors. There are two types of monitors in operation. Filter-based Federal Reference Method (FRM) instruments collect 24-hour average concentrations either every three-days or every six-days. Other monitors collect hourly concentrations throughout the year (continuous). Continuous instruments are referred to as Federal Equivalent Method (FEM) PM_{10} monitors. All of Ohio's continuous PM_{10} monitors are used for comparison to the NAAQS or for supplementing data for FRM monitors. Continuous monitoring data from FEM monitors are comparable to the PM_{10} NAAQS when it is located at a site without an FRM monitor or when it is collocated at a site with an FRM and is used to fill data gaps when the intermittent FRM monitor is not operational.

B. Sampling Method

PM_{10} is measured by the filtered air sampler method for non-continuous instruments. These instruments are refined beyond the traditional TSP sampler to limit the size of particle collected on the filter. Measured volumes of air are similarly drawn through a filter for 24 hours. PM_{10} matter trapped on the filter is weighed to determine the mass collected per volume of air. Continuous instruments collect real-time PM_{10} concentrations by various other measurement techniques.

C. Air Quality Data

Table 3 presents PM_{10} data Ohio EPA uses to evaluate air quality for the state. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met per instrument type (FRM filter based vs FEM continuous). Data reported below will also refer to a POC (parameter occurrence code) followed by a number. For PM_{10}, instruments are a combination of filterable FRM instruments and continuous FEM instruments either dedicated for comparison to the NAAQS (where applicable) or designated for quality assurance purposes. Sites utilizing continuous FEM instruments are marked with a caret (^) in the table below. During 2023, Ohio EPA transitioned several PM_{10} instruments from filterable to continuous resulting in the appearance of more sites than usual not meeting data completeness criteria. However, this is not an indication of whether Ohio EPA PM_{10} data meets the true completeness requirement, which is by site, and considers combining the FRM and FEM data. Unfortunately, U.S. EPA's AQS reports for PM_{10} data do not provide combined site completeness information. This is exacerbated for 2023 because during 2023 alone, Ohio EPA replaced ten FRM monitors with FEM monitors during the year. While PM_{10} monitoring continued at these sites throughout the entire year, the individual instruments appear to have not met completeness requirements. In addition, during 2023, several PM_{10} sites were discontinued as they were no longer necessary. The FEM replacements and FRM shutdowns are evident in Table 4 where you see multiple years of data represented. Years without any data collection by instrument type (FRM versus FEM) indicate the machine was not operating during that period.

The 24-hour PM_{10} NAAQS is 150 $\mu g/m^3$ and should be compared against the column labeled "2nd Max" because the form of the NAAQS is not to be exceeded more than once per year. Because the form of the NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2024. Results are reported as $\mu g/m^3$.

Over the course of the summer months, approximately June through August 2023, Ohio's air quality data shows effects from smoke caused by wildfires that occurred outside the state. These effects can be seen in the 2023 data located in Table 4 below.

Where applicable, Ohio EPA documented and is working to submit exceptional event demonstrations to U.S. EPA to exclude these 2023 values for regulatory purposes. Not all days influenced by wildfire smoke will qualify for an exceptional event demonstration. However, as part of the yearly data certification process Ohio EPA has "flagged" PM values influenced by wildfire smoke to provide a more complete understanding of PM concentrations in Ohio for 2023. These qualifier flags do not appear in the table below but are part of the yearly data certification sent to U.S. EPA.

Table 3. PM_{10} 24-Hour Air Monitoring Statistics from Intermittent FRM and Continuous FEM Instruments (µg/m³)

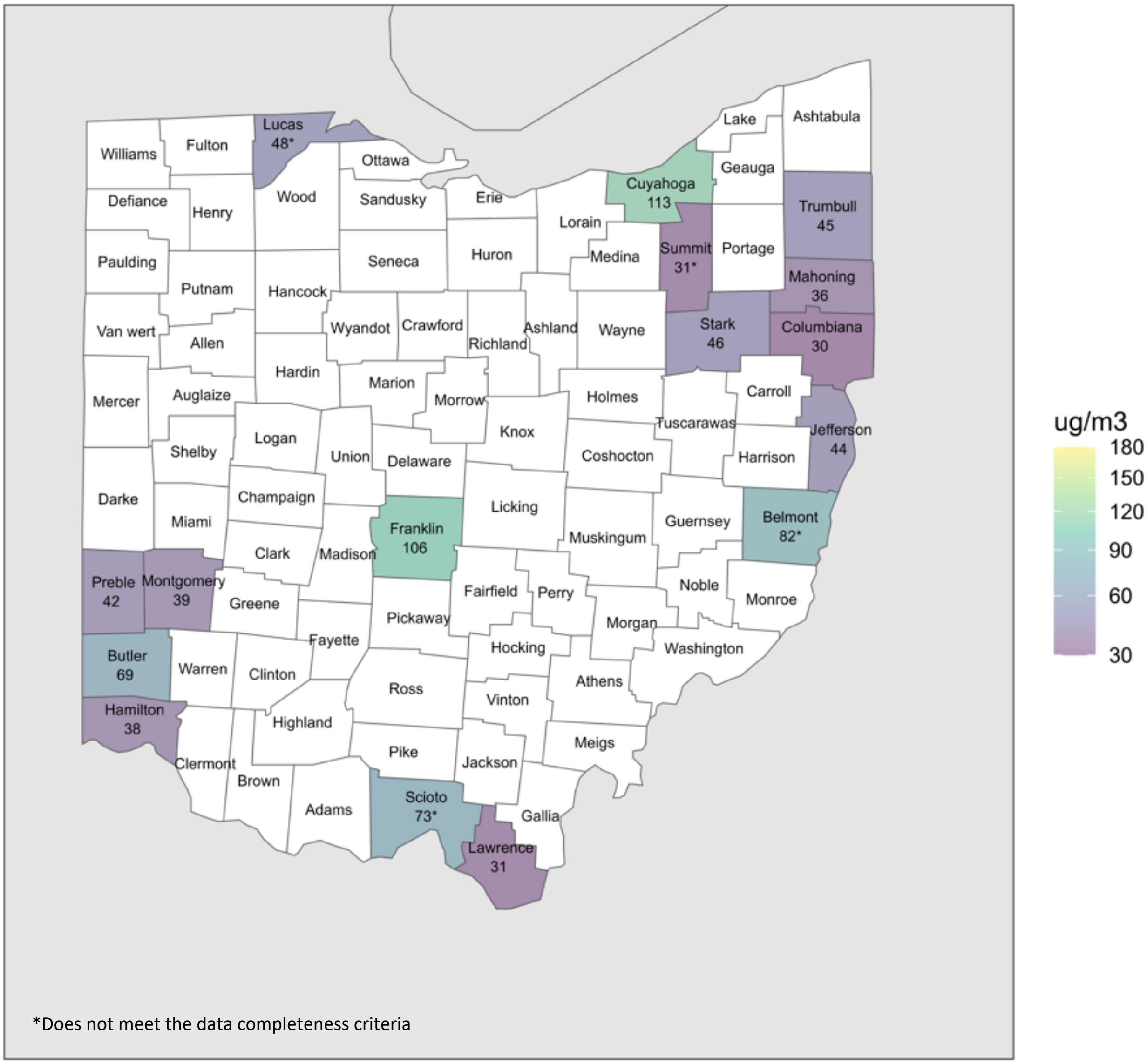
County	Site ID	POC	City	Valid Days	Obs	% Obs	Obs Req	1st Max	2nd Max	3rd Max	4th Max	Days > NAAQS	Max > NAAQS	Mean	
Belmont	39-013-0006^	3	Shadyside	238	238	65	366	90	82	73	73	0	0	21.5	*
Butler	39-017-0015^	9	Middletown	366	366	100	366	51	51	49	47	0	0	19.3	
Butler	39-017-0019^	3	Middletown	352	352	96	366	42	39	35	34	0	0	15.8	
Butler	39-017-0020^	3	Middletown	361	361	99	366	108	69	64	60	0	0	25.4	
Columbiana	39-029-0020	1	East Liverpool	61	61	100	61	21	20	19	18	0	0	10.5	
Columbiana	39-029-0023	1	East Liverpool	60	60	98	61	37	30	26	21	0	0	12.5	
Columbiana	39-029-0023	2	East Liverpool	61	61	100	61	29	28	26	19	0	0	11.9	
Cuyahoga	39-035-0038^	3	Cleveland	364	364	99	366	84	65	63	62	0	0	22.6	
Cuyahoga	39-035-0045^	3	Cleveland	356	356	97	366	52	51	49	41	0	0	18.8	
Cuyahoga	39-035-0060^	3	Cleveland	364	364	99	366	127	113	98	97	0	0	27.7	
Cuyahoga	39-035-0065^	3	Newburgh Heights	363	363	99	366	100	95	81	76	0	0	27.5	
Franklin	39-049-0034^	3	Columbus	365	365	100	366	109	102	93	81	0	0	21.4	
Franklin	39-049-0040^	3	Columbus	364	364	99	366	129	106	101	101	0	0	30.7	
Franklin	39-049-0081^	3	Columbus	334	334	91	366	66	64	41	39	0	0	17.2	*
Hamilton	39-061-0040^	9	Cincinnati	366	366	100	366	43	38	36	34	0	0	16.1	
Jefferson	39-081-0017^	3	Steubenville	350	350	96	366	47	44	41	40	0	0	17.3	
Lawrence	39-087-0012	1	Ironton	58	58	95	61	57	31	30	26	0	0	13.3	
Lawrence	39-087-0012	2	Ironton	59	59	97	61	52	29	29	25	0	0	12.4	
Lucas	39-095-0024^	3	Toledo	284	284	78	366	54	48	47	47	0	0	17.4	*
Mahoning	39-099-0015^	3	Youngstown	359	359	98	366	38	36	36	35	0	0	15.9	
Montgomery	39-113-0038^	9	Dayton	362	362	99	366	43	39	38	36	0	0	15.3	
Preble	39-135-1001^	3	New Paris	355	355	97	366	45	42	40	38	0	0	14.3	
Scioto	39-145-0013^	3	Portsmouth	291	291	80	366	113	73	46	43	0	0	18.1	*
Scioto	39-145-0015^	3	Portsmouth	341	341	93	366	48	45	43	42	0	0	16.6	*
Scioto	39-145-0020^	1	Franklin Furnace	361	361	99	366	39	35	31	30	0	0	10.9	
Scioto	39-145-0021^	1	Franklin Furnace	361	361	99	366	44	41	39	38	0	0	16.4	
Scioto	39-145-0022^	1	Franklin Furnace	350	350	96	366	30	28	26	25	0	0	13.2	
Stark	39-151-0017^	3	Canton	360	360	98	366	49	46	44	43	0	0	18.5	

County	Site ID	POC	City	Valid Days	Obs	% Obs	Obs Req	1st Max	2nd Max	3rd Max	4th Max	Days > NAAQS	Max > NAAQS	Mean	
Summit	39-153-0017^	3	Akron	328	328	90	366	39	31	31	30	0	0	14.4	*
Trumbull	39-155-0006	1	Warren	61	61	100	61	32	28	26	26	0	0	12.2	
Trumbull	39-155-0014^	3	Warren	366	366	100	366	57	45	42	41	0	0	16.4	
Trumbull	39-155-0015	1	Girard	61	61	100	61	39	26	25	20	0	0	11.2	

* Does not meet the data completeness criteria. ^Continuous FEM instruments.

Figure 2 presents the 2nd highest 24-hour maximum concentrations for every county with a PM_{10} monitor in 2024. For counties with more than one PM_{10} monitor, the highest concentration for the county was used. The values in the figures below in some cases will not match the "2nd Max" column in Table 3. For some sites, with multiple POC numbers, the 2nd maximum is calculated from a combination of primary monitors, collocated monitors, and in some cases continuous monitors that make up a single official data stream for the site. For some counties, the 2nd highest value presented in Figure 2 and Figure 3 are calculated from the combinations of monitors. The information presented in Table 3 above offers individual data for all PM_{10} monitors to provide a complete picture of data collection and air quality in the state.

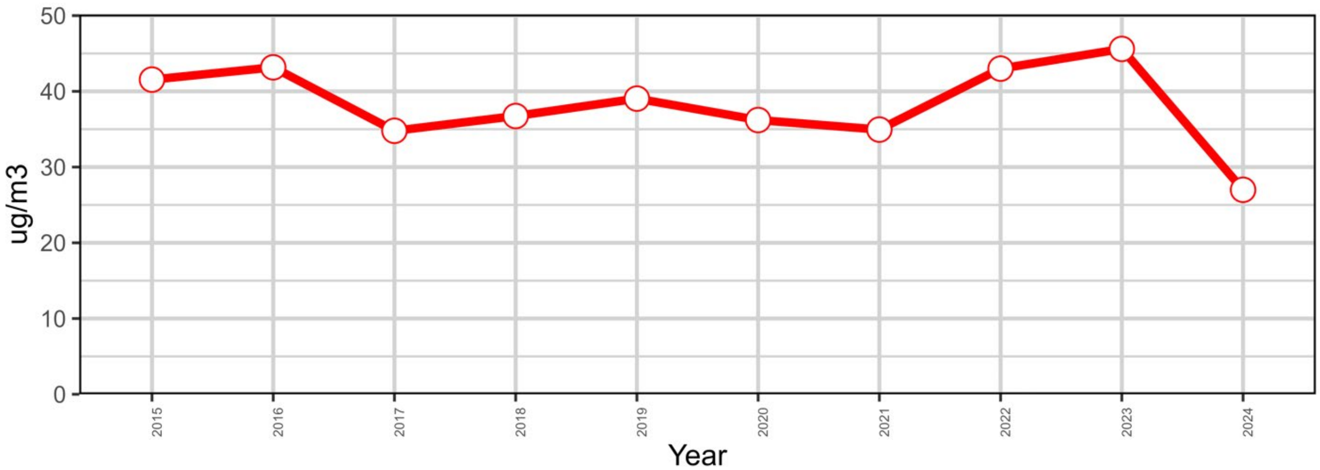
Figure 2. 2024 PM_{10} 2nd High 24-Hour Concentrations



D. Ten Year Air Quality Trends

Figure 3 presents the average of each year's 2nd highest yearly maximum concentration for all monitoring sites for years 2015 through 2024. Overall PM_{10} concentrations in the state are consistently low and well below the NAAQS. The upward movement in 2023 was likely due to wildfire events.

Figure 3. PM_{10} Trend: Average 2nd High Concentrations for all Sites



E. Attainment Status

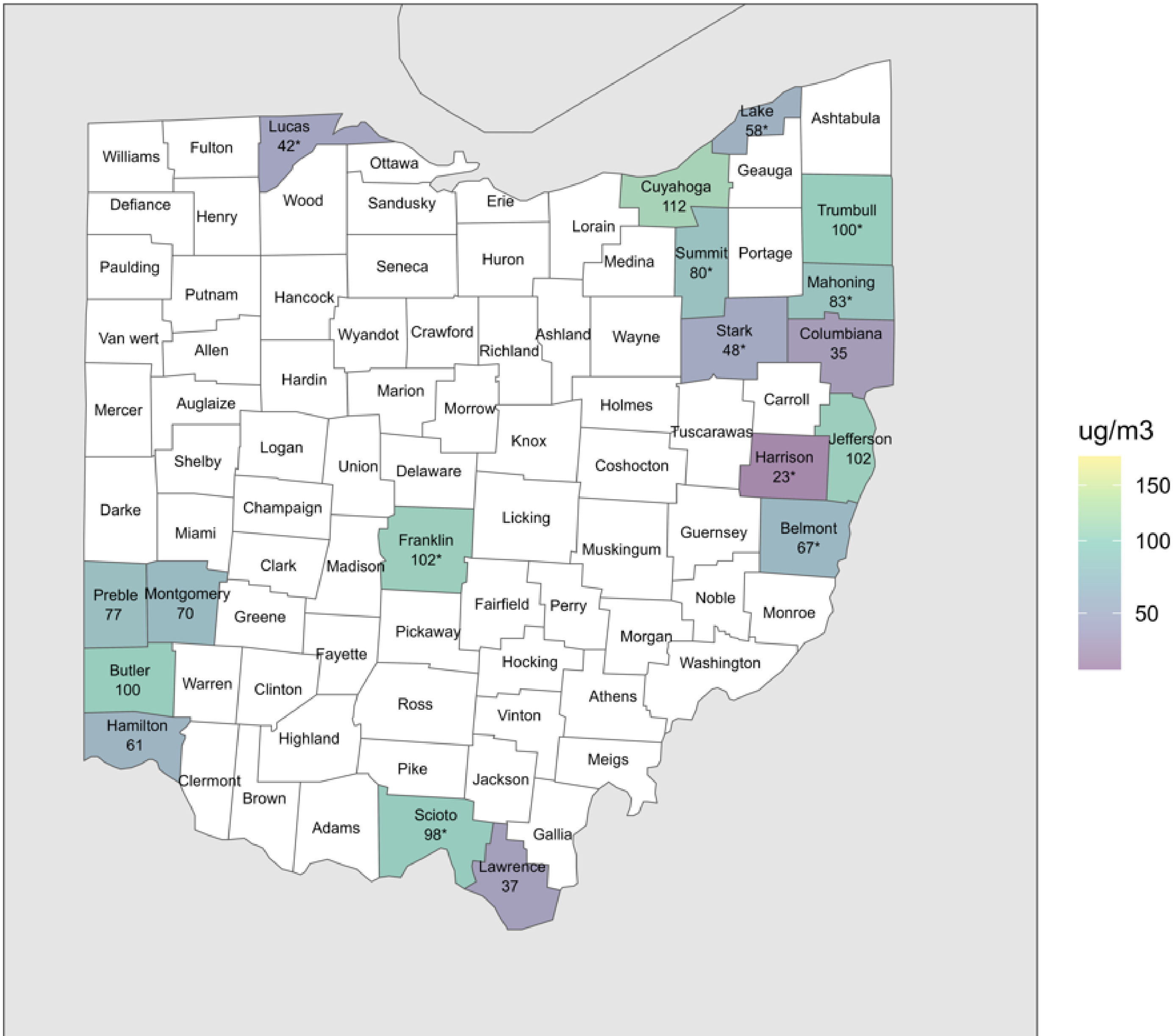
All of Ohio has been designated as in attainment for the 24-hour PM_{10} NAAQS since 2001[3]. The maps and data tables below present the design value[4] for the NAAQS for years 2022 through 2024 and only include data from monitoring sites used for comparison to the NAAQS. Counties that do not show data do not contain monitors and the value shown is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values and are highlighted green in Table 4. As noted above, because FRM and FEM data are not combined, the completeness metric presented in these tables are not considered a true representation of the completeness for the entire site.

Often, design value is a term used to identify the value that is compared to the NAAQS. However, for the 24-hour PM_{10} NAAQS this is not the case due to the form of the standard. Nonetheless, it is a useful metric for comparing values across the state and is presented in the figures and tables below. Figure 4 presents the 2nd highest 24-hour maximum concentrations averaged over three years (design value). Table 4 presents the 2nd daily maximum concentration for each year and the three-year averages used to determine the design value for each county.

[3] Violations do not always lead to an area being officially designated as nonattainment by U.S. EPA. This section of this report identifies information related to official designations and historic and/or current attainment status.

[4] A "design value" represents the highest reading monitor in a county for that NAAQS when more than one monitor resides in a county. In most cases, that value is a three-year average. However, for some pollutants the value is an annual metric. Each section will specify if the design value presented is a three-year average or an annual metric.

Figure 4.2022-2024 PM_{10} 24-Hour Design Values



*Does not meet the data completeness criteria

Table 4. PM_{10} 2nd High 24-Hour Concentrations and Three-Year Averages (µg/m³)

Site ID	County	City	2022	2023	2024	Design Value 2022-2024
39-013-0006	Belmont	Shadyside	49	85*	---*	67
39-013-0006^		Shadyside	---*	45*	82*	64
39-017-0015	Butler	Middletown	86	32*	---*	59
39-017-0015^		Middletown	---*	101*	51	76
39-017-0019		Middletown	45*	---*	---*	67
39-017-0019^		Middletown	54*	98	39	64
39-017-0020^		Middletown	119	111	69	100
39-029-0020	Columbiana	East Liverpool	33	47	20	33
39-029-0023		East Liverpool	30	46	30	35
39-035-0038	Cuyahoga	Cleveland	59	23*	---*	41
39-035-0038^		Cleveland	71	141	65	92
39-035-0045		Cleveland	46	27*	---*	37
39-035-0045^		Cleveland	---*	39*	51	45
39-035-0060^		Cleveland	77	147	113	112
39-035-0065		Newburgh Heights	72	65*	---*	69
39-035-0065^		Newburgh Heights	---*	71*	95	83
39-035-1002		Brook Park	27	---*	---*	27
39-049-0034	Franklin	Columbus	54	88*	---*	71
39-049-0034^		Columbus	---*	48*	102	75
39-049-0040^		Columbus	---*	97*	106	102
39-049-0081^		Columbus	---*	58*	64*	61
39-061-0014	Hamilton	Cincinnati	32	---*	---*	32
39-061-0040^		Cincinnati	58	88	38	61
39-067-0005	Harrison	Hopedale	23*	---*	---*	23
39-081-0001	Jefferson	Brilliant	29	---*	---*	29
39-081-0017^		Steubenville	54	207	44	102
39-085-0008	Lake	Fairport Harbor	68	49*	---*	58
39-087-0012	Lawrence	Ironton	38	41	31	37
39-095-0024^	Lucas	Toledo	---*	37*	48*	42
39-099-0015^	Mahoning	Youngstown	51*	162	36	83
39-113-0038^	Montgomery	Dayton	66	105	39	70
39-135-1001^	Preble	New Paris	54	136	42	77
39-145-0013	Scioto	Portsmouth	27	16*	---*	22
39-145-0013^		Portsmouth	---*	122*	73*	98
39-145-0015^		Haverhill	---*	112*	45*	79
39-145-0019		Portsmouth	25	39	---*	32
39-145-0020^		Franklin Furnace	42	59	35	45
39-145-0021^		Franklin Furnace	41	63	41	48
39-145-0022^		Franklin Furnace	43	64	28	45
39-151-0017^	Stark	Canton	---*	72*	46	48
39-153-0017	Summit	Akron	---*	128*	31*	80
39-155-0006	Trumbull	Warren	39	56	28	41
39-155-0014		Warren	35	10*	---*	23
39-155-0014^		Warren	---*	154*	45	100
39-155-0015		Girard	---*	60*	26	43

(green shading) Insufficient data for valid statistical average.

^Continuous instruments. * Does not meet the data completeness criteria.

III. PARTICULATE MATTER ≤2.5µM ($PM_{2.5}$)

A. Overview

In 1997, U.S. EPA promulgated revisions to the NAAQS for particulate matter to focus on those particles with an aerodynamic diameter smaller than or equal to 2.5 micrometers ($PM_{2.5}$).

In 1997, the annual $PM_{2.5}$ NAAQS was set at 15.0 µg/m^3 as an annual mean, averaged over three years. In 2013, the annual NAAQS was revised from 15.0 µg/m^3 to 12.0 µg/m^3. The annual $PM_{2.5}$ NAAQS was revised once again in 2024 from 12.0 µg/m^3 to 9.0 µg/m^3, remaining as an annual mean, averaged over three years.

In 1997, the 24-hour $PM_{2.5}$ NAAQS was set at 65 µg/m^3 and then revised to 35 µg/m^3 in 2006. The 24-hour NAAQS is met when the 98th percentile concentration, averaged over three years, is less than or equal to 35 µg/m^3.

Ohio had a peak of 66 $PM_{2.5}$ monitoring sites in 2008. In 2024, there were 44 $PM_{2.5}$ sites with 97 total monitors. Most are filter-based Federal Reference Method (FRM) instruments collecting 24-hour average concentrations either every three-days or every six-days. Additionally, there are 9 chemical speciation monitors operating on an every three- or six-day schedule with filters analyzed for chemical composition of $PM_{2.5}$ matter. Additional $PM_{2.5}$ monitors collect hourly concentrations throughout the year (continuous). Continuous instruments are referred to as Federal Equivalent Method (FEM) $PM_{2.5}$ monitors or may be designated for the purpose of air quality index (AQI) reporting only. Ohio's continuous $PM_{2.5}$ monitors are used for three proposes: AQI reporting only, comparison to the NAAQS, and for supplementing data for FRM monitors. Except in rare circumstances, all continuous $PM_{2.5}$ monitors serve the purpose of AQI reporting and some may be designated as AQI reporting only monitors and are therefore, not comparable to the NAAQS. AQI only monitors are not considered FEM monitors. Continuous monitoring data from an FEM monitor is comparable to the $PM_{2.5}$ NAAQS when it is located at a site without an FRM monitor or when it is collocated at a site with an FRM and used to fill data gaps when the intermittent FRM monitor is not operational. Speciation monitors are used to determine the composition of the particulates.

39-017-0022, Butler County

B. Sampling Method

$PM_{2.5}$ is measured by the filtered air sampler method for non-continuous instruments. These instruments are refined beyond the TSP and PM_{10} sampler to further limit the size of particle collected on the filter. Measured volumes of air are similarly drawn through a filter for 24 hours. $PM_{2.5}$ matter trapped on the filter is weighed to determine the mass collected per volume of air.

Continuous instruments collect real-time $PM_{2.5}$ concentrations by various other measurement techniques. Ohio EPA's continuous network include instruments that use beta attenuation, broadband spectroscopy, and gravimetric methods to measure $PM_{2.5}$ concentrations continuously. Beta attenuation uses beta rays to analysis particles absorbed on a filter over a given time period. Broadband spectroscopy is an innovative technology that combines advanced LED technology with well-understood light scattering theory. Gravimetric units pull in a constant rate of air over a glass tube with a filter that is then continuously weighted to determine the particulate matter concentration.

C. Air Quality Data

Table 5 presents 24-hour 98th percentile $PM_{2.5}$ data from intermittent FRM and all continuous instruments[5] Ohio EPA uses to evaluate air quality for the state. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. The 24-hour NAAQS is 35 $\mu g/m^3$ and compared against the column labeled "98th Percentile" while the annual NAAQS is 9.0 $\mu g/m^3$ and compared against the column labeled "24-Hr Mean". Because the form of both NAAQS is to be averaged over three years, this is not a direct comparison to each NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2024.

Results are reported as $\mu g/m^3$. Data reported below will also refer to a POC followed by a number. For $PM_{2.5}$, POC1, POC2 and POC4 instruments are filterable FRM instruments either dedicated to comparing to the NAAQS (where applicable) or designated for quality assurance purposes. For $PM_{2.5}$, POC3 and POC7 are continuous instruments. No single POC can give a true representation of $PM_{2.5}$ air quality at a site due to the form of the NAAQS. However, looking at individual POCs can be insightful information which is why individual POCs are displayed in Tables 5 and 6. For a NAAQS comparable value for each site please see Tables 7 and 8.

As discussed above, AQI-only continuous instruments are not comparable to the NAAQS. These instruments are identified in the table below with a caret (^). FEM continuous instruments are comparable to the NAAQS as described above.

[5] The statistical database from which data for this report is generated does not include 98th percentile concentrations for AQI-only continuous instruments; therefore N/A will be found in Table 5 for this statistic and Figure 5 will not display this data.

Table 5. $PM_{2.5}$ 24-Hour Air Monitoring Statistics from Intermittent FRM and Continuous Instruments (µg/m^3)

County	Site ID	POC	City	Valid Days	1st Max	2nd Max	3rd Max	4th Max	98th Percentile	24-Hr Mean	
Allen	39-003-0009	1	Lima	58	22.3	16.3	14.3	13.8	16.3	6.8	
Allen	39-003-0009	3	Lima	338	22.8	21.0	17.3	16.8	14.1	5.8	
Athens	39-009-0003	1	Sharpsburg	115	12.7	11.6	11.0	10.5	11.0	5.1	
Athens	39-009-0003	3	Sharpsburg	362	16.2	15.0	14.8	14.0	12.0	5.4	
Belmont	39-013-0006	1	Shadyside	109	18.1	16.8	14.3	13.1	14.3	6.8	
Belmont	39-013-0006	3	Shadyside	238	22.8	16.0	15.6	15.1	14.1	7.0	*
Butler	39-017-0015	1	Middletown	61	16.2	15.2	14.4	14.3	15.2	7.7	
Butler	39-017-0015	3	Middletown	366	23.1	20.3	20.2	19.9	18.9	8.4	
Butler	39-017-0015	4	Middletown	61	15.0	14.4	13.2	13.1	14.4	7.7	
Butler	39-017-0019	1	Middletown	56	19.4	17.1	15.3	14.0	17.1	8.2	*
Butler	39-017-0019	3	Middletown	352	24.5	19.8	18.6	17.8	16.9	7.9	
Butler	39-017-0019	4	Middletown	61	17.3	17.0	16.9	13.6	17.0	8.5	
Butler	39-017-0020	1	Middletown	61	18.8	17.1	15.1	14.2	17.1	9.4	
Butler	39-017-0020^	3	Middletown	8690	83.4	78.1	51.0	50.4	17.0	9.0	
Butler	39-017-0020	4	Middletown	51	18.5	17.2	16.8	15.8	17.2	9.5	*
Butler	39-017-0022	1	Middletown	61	17.7	17.2	16.2	15.8	17.2	9.0	
Butler	39-017-0022	3	Middletown	366	36.5	27.1	25.6	22.9	19.6	9.5	
Butler	39-017-0022	4	Middletown	59	17.8	16.6	15.7	15.6	16.6	8.7	
Clark	39-023-0005	1	Springfield	107	17.0	15.9	15.7	14.6	15.7	6.7	*
Clark	39-023-0005	3	Springfield	361	20.7	20.2	18.5	18.0	17.1	7.7	
Clermont	39-025-0022^	3	Batavia	341	15.4	14.4	13.8	12.7	N/A	4.5	
Cuyahoga	39-035-0034	1	Cleveland	120	16.9	15.3	14.1	14.1	14.1	6.6	
Cuyahoga	39-035-0034	3	Cleveland	366	18.5	17.4	17.2	16.6	16.1	6.4	
Cuyahoga	39-035-0038	1	Cleveland	118	21.4	20.2	19.0	18.9	19.0	8.5	
Cuyahoga	39-035-0038	2	Cleveland	120	21.5	20.7	19.5	19.2	19.5	8.6	
Cuyahoga	39-035-0038	3	Cleveland	364	22.9	22.2	21.9	21.6	19.5	9.0	
Cuyahoga	39-035-0045	1	Cleveland	113	25.4	18.4	16.3	16.1	16.3	7.6	
Cuyahoga	39-035-0045	3	Cleveland	356	27.3	20.8	20.7	19.4	18.4	8.2	
Cuyahoga	39-035-0060	1	Cleveland	117	20.1	17.7	15.7	15.6	15.7	8.4	
Cuyahoga	39-035-0060	3	Cleveland	364	28.7	28.7	28.3	27.1	22.8	9.8	
Cuyahoga	39-035-0065	1	Newburgh	121	43.3	30.8	27.6	26.7	27.6	11.5	
Cuyahoga	39-035-0065	3	Newburgh	363	28.5	21.9	21.6	19.3	18.2	8.9	

County	Site ID	POC	City	Valid Days	1st Max	2nd Max	3rd Max	4th Max	98th Percentile	24-Hr Mean	
Cuyahoga	39-035-0073	1	Warrensville	121	15.5	14.5	13.3	12.9	13.3	6.2	
Cuyahoga	39-035-0073	3	Warrensville	364	19.0	17.7	16.4	15.6	14.7	6.5	
Franklin	39-049-0029^	3	New Albany	328	15.3	15.0	14.2	13.7	N/A	5.2	
Franklin	39-049-0034	1	Columbus	120	20.4	17.0	15.2	14.6	15.2	7.2	
Franklin	39-049-0034	2	Columbus	60	16.0	15.2	14.0	13.7	15.2	7.4	
Franklin	39-049-0034	3	Columbus	365	42.6	41.9	35.0	32.7	22.8	9.6	
Franklin	39-049-0038	1	Columbus	121	17.0	15.4	15.4	14.0	15.4	7.6	
Franklin	39-049-0038	3	Columbus	358	24.0	23.1	23.1	22.2	20.0	8.2	
Franklin	39-049-0040	1	Columbus	114	19.7	18.4	18.2	16.0	18.2	7.8	
Franklin	39-049-0040	3	Columbus	364	27.8	24.7	24.6	23.7	21.3	9.5	
Franklin	39-049-0081	1	Columbus	120	15.9	14.7	14.0	13.9	14.0	6.9	
Franklin	39-049-0081	3	Columbus	334	23.1	22.1	21.7	21.4	20.1	8.5	*
Hamilton	39-061-0010^	3	Cleves	356	17.5	16.2	15.6	15.5	N/A	7.2	
Hamilton	39-061-0006	3	Blue Ash	348	17.5	16.2	16.1	15.9	15.4	6.2	
Hamilton	39-061-0014	1	Cincinnati	59	16.0	14.6	14.2	13.9	14.6	8.0	
Hamilton	39-061-0014	2	Cincinnati	59	14.8	14.4	14.0	13.2	14.4	7.8	
Hamilton	39-061-0014	3	Cincinnati	366	21.9	20.6	19.9	19.5	18.2	8.5	
Hamilton	39-061-0014	4	Cincinnati	61	16.3	15.9	13.6	13.0	15.9	8.1	
Hamilton	39-061-0040	1	Cincinnati	61	15.6	12.4	12.3	12.2	12.4	6.8	
Hamilton	39-061-0040	3	Cincinnati	366	23.3	23.2	23.1	21.6	20.1	8.4	
Hamilton	39-061-0040	4	Cincinnati	60	16.2	13.8	11.1	10.8	13.8	6.8	
Hamilton	39-061-0042	1	Cincinnati	60	15.2	13.6	13.2	13.0	13.6	7.3	
Hamilton	39-061-0042	3	Cincinnati	366	21.3	20.4	20.0	19.8	18.4	7.9	
Hamilton	39-061-0042	4	Cincinnati	60	17.6	14.3	12.1	11.9	14.3	7.4	
Hamilton	39-061-0048	2	Cincinnati	60	15.7	15.4	14.1	13.9	15.4	8.5	
Hamilton	39-061-0048	3	Cincinnati	356	18.5	18.2	17.7	17.5	16.6	8.4	
Jefferson	39-081-0017	1	Steubenville	89	15.6	15.3	14.7	13.5	15.3	7.1	*
Jefferson	39-081-0017	2	Steubenville	55	15.3	14.1	13.6	13.0	14.1	7.5	
Jefferson	39-081-0017	3	Steubenville	350	24.8	22.4	20.0	17.0	16.4	7.9	
Lake	39-085-0007	1	Painesville	121	14.4	13.0	12.7	12.6	12.7	5.8	
Lake	39-085-0007^	3	Painesville	304	17.7	15.2	14.6	14.3	12.9	5.8	*
Lawrence	39-087-0012	1	Ironton	115	13.9	13.0	12.1	12.1	12.1	6.2	
Lawrence	39-087-0012	3	Ironton	365	34.8	18.2	18.0	16.6	14.7	6.9	

County	Site ID	POC	City	Valid Days	1st Max	2nd Max	3rd Max	4th Max	98th Percentile	24-Hr Mean	
Lucas	39-095-0024	1	Toledo	120	28.1	20.2	14.3	14.3	14.3	7.0	
Lucas	39-095-0024^	3	Toledo	284	33.9	26.9	25.2	22.8	21.1	8.8	*
Lucas	39-095-0026	1	Toledo	114	24.0	19.6	13.9	13.8	13.9	6.7	
Lucas	39-095-0026	3	Toledo	294	22.3	21.9	19.1	18.4	16.6	8.0	*
Lucas	39-095-1003	1	Toledo	111	22.4	21.7	20.6	19.8	20.6	8.5	
Lucas	39-095-1003	3	Toledo	295	24.2	23.2	21.7	21.0	20.3	9.6	*
Mahoning	39-099-0015	1	Youngstown	59	15.3	13.9	13.6	12.8	13.9	7.5	
Mahoning	39-099-0015	3	Youngstown	359	18.4	18.1	17.6	16.9	15.2	7.1	
Mahoning	39-099-0015	4	Youngstown	61	16.9	16.2	13.0	12.5	16.2	7.4	
Medina	39-103-0004	1	Westfield	122	15.8	15.6	15.6	12.5	15.6	6.5	
Medina	39-103-0004	3	Westfield	364	21.4	17.6	17.0	16.4	15.5	7.0	
Montgomer	39-113-0038	1	Dayton	117	15.1	14.8	14.7	14.3	14.7	7.0	
Montgomer	39-113-0038	2	Dayton	58	14.5	13.9	13.5	12.7	13.9	6.8	
Montgomer	39-113-0038	7	Dayton	362	22.5	18.3	18.2	18.0	17.1	7.7	
Preble	39-135-1001	1	New Paris	109	14.9	12.0	11.8	11.5	11.8	6.0	
Preble	39-135-1001	3	New Paris	358	23.3	16.7	16.0	15.8	14.9	7.2	
Scioto	39-145-0013	1	Portsmouth	117	20.0	15.1	13.2	13.1	13.2	6.2	
Scioto	39-145-0013	3	Portsmouth	291	19.4	18.9	18.5	18.1	17.2	7.4	*
Scioto	39-145-0015	1	Portsmouth	59	13.3	12.5	12.1	11.3	12.5	6.5	
Scioto	39-145-0015	3	Portsmouth	341	24.1	20.6	20.6	20.3	19.2	7.8	*
Stark	39-151-0017	1	Canton	120	20.7	20.0	16.5	16.4	16.5	8.2	
Stark	39-151-0017	2	Canton	60	19.3	15.8	14.6	14.5	15.8	8.1	
Stark	39-151-0017	3	Canton	360	23.0	22.9	22.9	22.2	21.6	9.1	
Stark	39-151-0020	1	Canton	120	16.8	15.7	15.6	14.7	15.6	7.3	
Stark	39-151-0020	3	Canton	337	20.0	18.8	18.7	18.5	17.8	8.0	*
Summit	39-153-0017	1	Akron	121	18.5	16.0	14.8	14.4	14.8	7.2	
Summit	39-153-0017	2	Akron	59	15.1	14.2	13.3	12.9	14.2	7.3	
Summit	39-153-0017	3	Akron	328	19.8	19.5	19.4	18.5	16.0	7.3	*
Trumbull	39-155-0014	1	Warren	61	14.0	13.8	13.7	13.4	13.8	7.5	
Trumbull	39-155-0014	3	Warren	366	20.0	19.9	18.9	18.3	17.3	7.8	
Trumbull	39-155-0014	4	Warren	61	17.5	17.1	13.8	12.8	17.1	7.5	
Warren	39-165-0007^	3	Lebanon	349	17.9	13.2	12.9	12.7	N/A	5.9	

* Does not meet the data completeness criteria. ^ Monitor used for AQI purposes only.

Figure 5 presents the 98th percentile 24-hour concentrations and Figure 6 presents the annual average concentrations for every county with a $PM_{2.5}$ monitor[6] in 2024. The values in the figures below in some cases will not match the "98th Percentile" or "24-Hr Mean" column in Table 5. For some sites, with multiple POC numbers, the 98th percentile and mean are calculated from a combination of primary monitors, collocated monitors, and in some cases continuous monitors that make up a single official data stream for the site. For some counties, the highest value presented in Figure 5 and Figure 6 are calculated from the combinations of monitors. These calculated values will match the "2024" column in Table 7, for 24-hour concentrations and Table 8, for annual average concentrations. The information presented in Table 5 above offers individual data for all $PM_{2.5}$ monitors to provide a complete picture of data collection and air quality in the state. For counties with more than one $PM_{2.5}$ monitor, the highest concentration for the county was used. All concentrations are reported as µg/m^3.

[6]Figure 6 includes data from the AQI-only continuous monitors located in Clermont and Warren Counties. These values are not official values because 98th percentile values and design values are not calculated for AQI-only monitors. However, in Figure 6 the annual average values have been included for the two counties to provide a more complete picture of $PM_{2.5}$ data in the state for 2023. Since official design values are not calculated for AQI-only monitors, the two counties therefore do not appear on the maps or tables in the Attainment Status section.

Figure 5. 2024 $PM_{2.5}$ 24-Hour 98th Percentile Concentrations

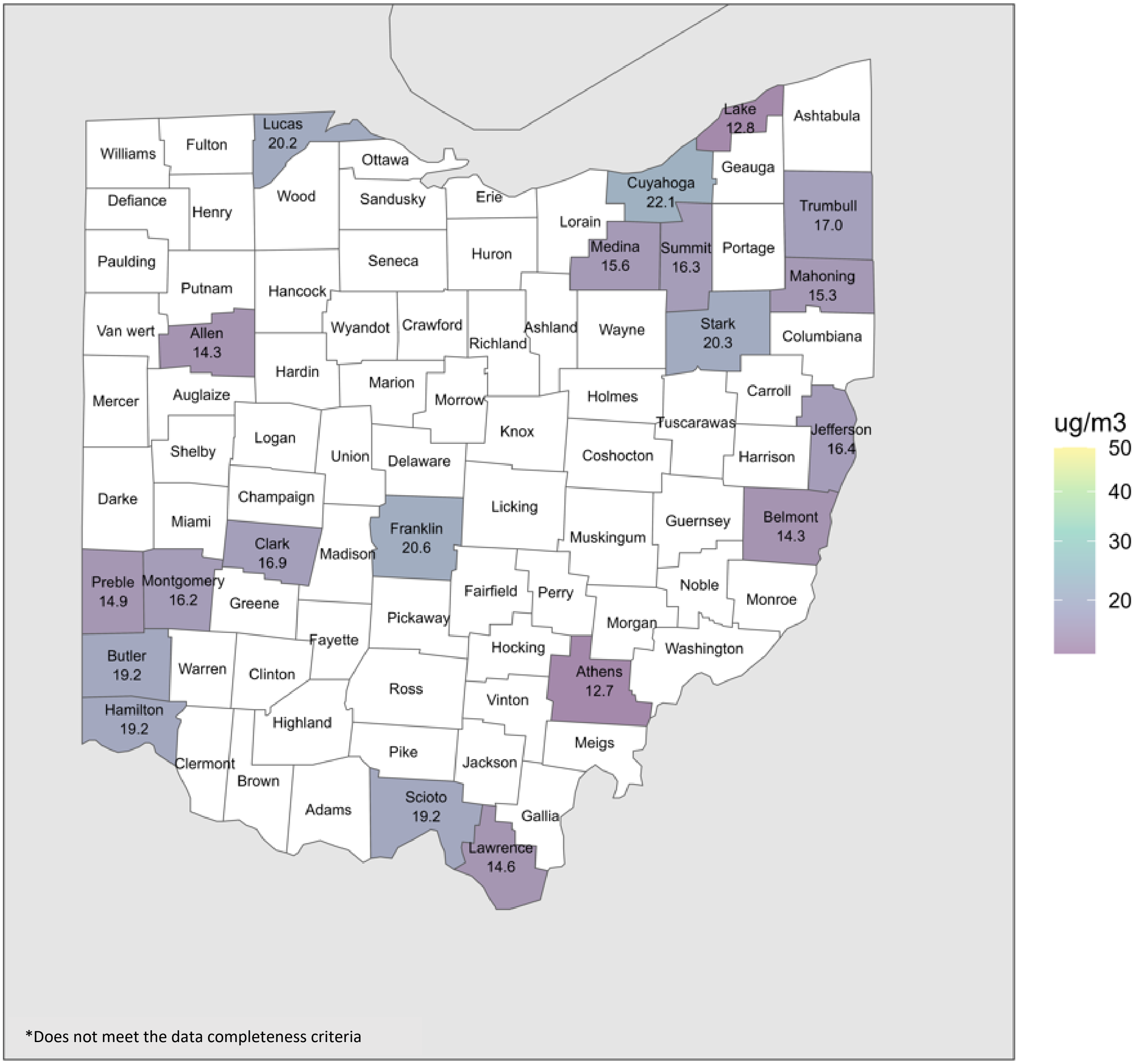


Figure 6. 2024 $PM_{2.5}$ Annual Average Concentrations

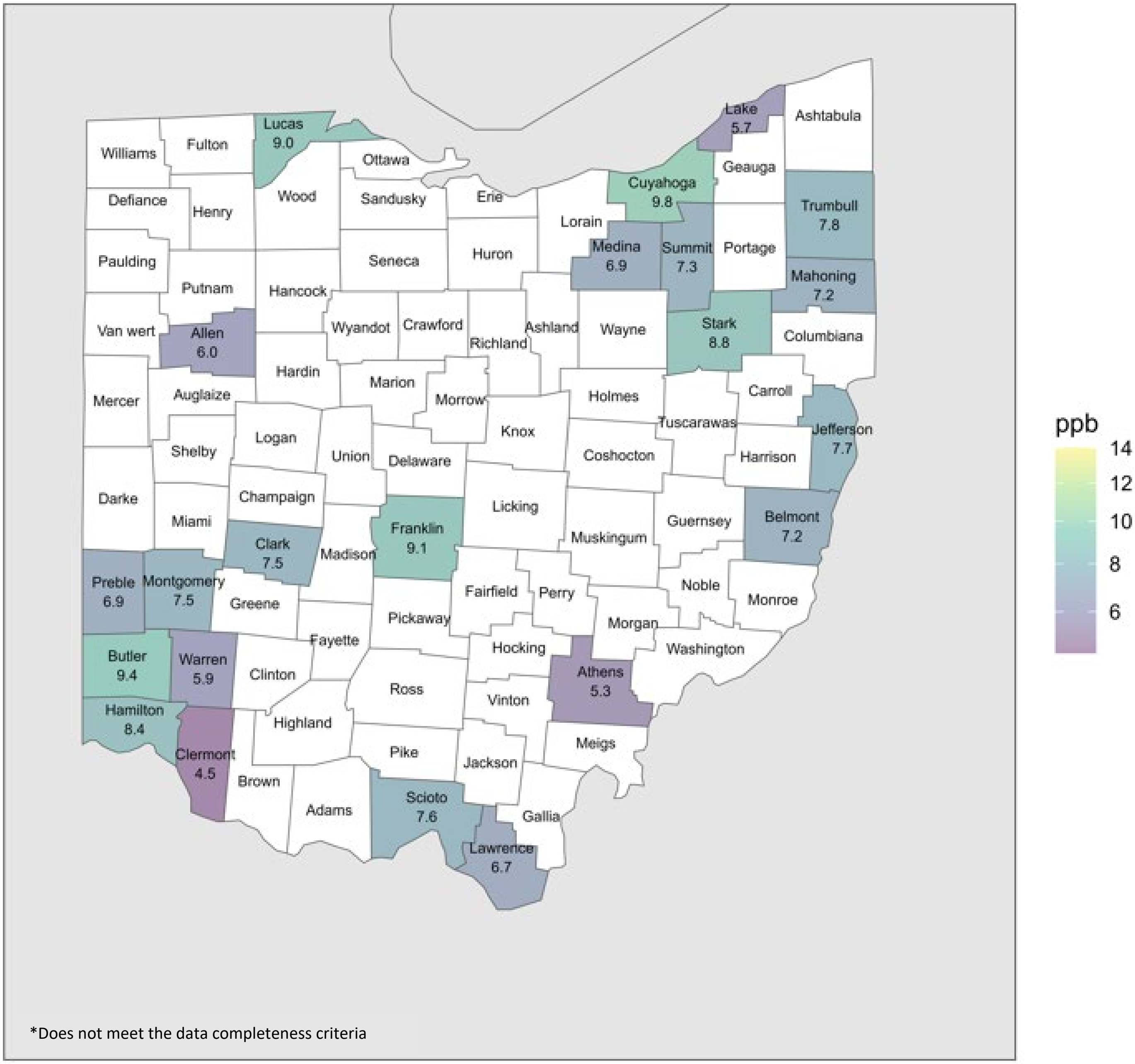


Table 6 presents one-hour $PM_{2.5}$ data from continuous instruments. It is important to note that many of these monitors have a single maximum hour reading above the 24-hour $PM_{2.5}$ NAAQS of 35 µg/m^3. $PM_{2.5}$ concentrations can change quickly due to factors such as meteorological conditions and activity at nearby sources of $PM_{2.5}$ and high hourly values are not uncommon. Continuous monitors provide valuable, detailed information about the variations in concentrations and can record short-term events of high concentrations. That is why these monitors are well-suited for reporting to the AQI. It is because of these variables that the data presented in Table 6 is not used in comparison with the NAAQS.

Table 6. $PM_{2.5}$ One-Hour Air Monitoring Statistics from Continuous Instruments (µg/m³)

County	Site ID	POC	City	Obs	1st Max	2nd Max	3rd Max	4th Max	1-Hr Mean
Allen	39-003-0009	3	Lima	8142	94.7	93.8	67.9	55.4	5.94
Athens	39-009-0003	3	Sharpsburg	8730	38.0	34.9	33.8	31.2	5.43
Belmont	39-013-0006	3	Shadyside	5731	63.9	46.7	40.5	38.8	7.04*
Butler	39-017-0015	3	Middletown	8760	64.4	56.7	48.5	41.7	8.46
	39-017-0019	3	Middletown	8462	123.7	113.2	85.5	77.3	7.93
	39-017-0020	3	Middletown	8690	83.4	78.1	51.0	50.4	9.00
	39-017-0022	3	Middletown	8754	222.1	199.8	183.1	166.3	9.53
Clark	39-023-0005	3	Springfield	8706	93.5	59.1	58.6	47.9	7.76
Clermont	39-025-0022	3	Batavia	8235	37.0	33.1	32.1	30.4	4.57
Cuyahoga	39-035-0034	3	Cleveland	8756	92.9	68.3	60.3	53.5	6.42
	39-035-0038	3	Cleveland	8730	74.1	73.5	71.5	60.6	9.02
	39-035-0045	3	Cleveland	8615	153.8	139.5	127.2	95.8	8.25
	39-035-0060	3	Cleveland	8692	85.7	71.1	63.3	59.6	9.89
	39-035-0065	3	Newburgh Heights	8711	153.7	145.2	132.3	118.9	9.00
	39-035-0073	3	Warrensville Heights	8725	49.0	33.0	32.1	32.0	6.52
Franklin	39-049-0029	3	New Albany	7992	74.6	43.7	39.2	37.0	5.23
	39-049-0034	3	Columbus	8753	106.1	92.9	89.8	89.7	9.64
	39-049-0038	3	Columbus	8628	76.6	71.8	58.5	57.0	8.28
	39-049-0040	3	Columbus	8752	97.8	77.7	57.4	56.8	9.51
	39-049-0081	3	Columbus	8048	51.6	44.0	43.9	40.3	8.60
Hamilton	39-061-0006	3	Blue Ash	8485	48.2	41.9	32.3	32.0	6.19
	39-061-0010	3	Cleves	8560	34.5	32.1	30.9	30.4	7.26
	39-061-0014	3	Cincinnati	8768	85.5	46.1	45.1	44.3	8.54
	39-061-0040	3	Cincinnati	8767	57.2	46.0	37.0	35.7	8.41
	39-061-0042	3	Cincinnati	8768	198.4	65.5	61.1	49.3	7.91

County	Site ID	POC	City	Obs	1st Max	2nd Max	3rd Max	4th Max	1-Hr Mean
Hamilton	39-061-0048	3	Cincinnati	8563	94.0	53.3	43.6	42.6	8.45
Jefferson	39-081-0017	3	Steubenville	8404	52.3	52.0	38.9	38.2	7.87
Lake	39-085-0007	3	Painesville	7237	54.4	44.5	27.5	26.1	5.86
	39-085-0007	3	Painesville	1425	19.7	19.4	18.8	18.1	5.48
Lawrence	39-087-0012	3	Ironton	8748	143.3	128.9	116.9	94.6	6.95
Lucas	39-095-0024	3	Toledo	6837	121.8	105.9	80.1	77.0	8.97
	39-095-0026	3	Toledo	7042	115.6	98.1	89.9	80.6	7.99
	39-095-1003	3	Toledo	7042	71.5	70.7	61.7	59.2	9.59
Mahoning	39-099-0015	3	Youngstown	8631	80.2	71.7	45.6	39.0	7.11
Medina	39-103-0004	3	Westfield	8722	44.3	42.7	36.5	34.8	7.07
Montgomery	39-113-0038	7	Dayton	8691	74.8	32.7	30.4	30.2	7.80
Preble	39-135-1001	3	New Paris	8637	34.7	32.9	31.7	31.2	7.21
Scioto	39-145-0013	3	Portsmouth	7079	44.9	44.2	43.2	40.6	7.60
	39-145-0015	3	Portsmouth	8184	86.2	81.1	69.4	62.7	7.90
Stark	39-151-0017	3	Canton	8654	95.7	70.9	69.9	63.8	9.16
	39-151-0020	3	Canton	8094	78.1	64.6	45.0	44.2	8.02
Summit	39-153-0017	3	Akron	7857	47.5	46.1	45.0	43.6	7.32
Trumbull	39-155-0014	3	Warren	8768	140.3	108.1	61.7	44.9	7.89
Warren	39-165-0007	3	Lebanon	8414	40.2	39.7	32.2	26.9	5.93

* Does not meet the data completeness criteria.

D. Ten Year Air Quality Trends

Figure 7 presents the average of each year's 24-hour 98th percentile concentration for all monitoring sites for years 2015 through 2024. Overall, 24-hour 98th percentile $PM_{2.5}$ concentrations have remained fairly consistent with only a slight increase in 2023 influenced by wildfire smoke. Excluding 2023, concentrations have remained approximately 15 µg/m^3 or more below the NAAQS throughout the last decade.

Figure 7. $PM_{2.5}$ Trend: Average 24-Hour 98th Percentile Concentrations for all Sites

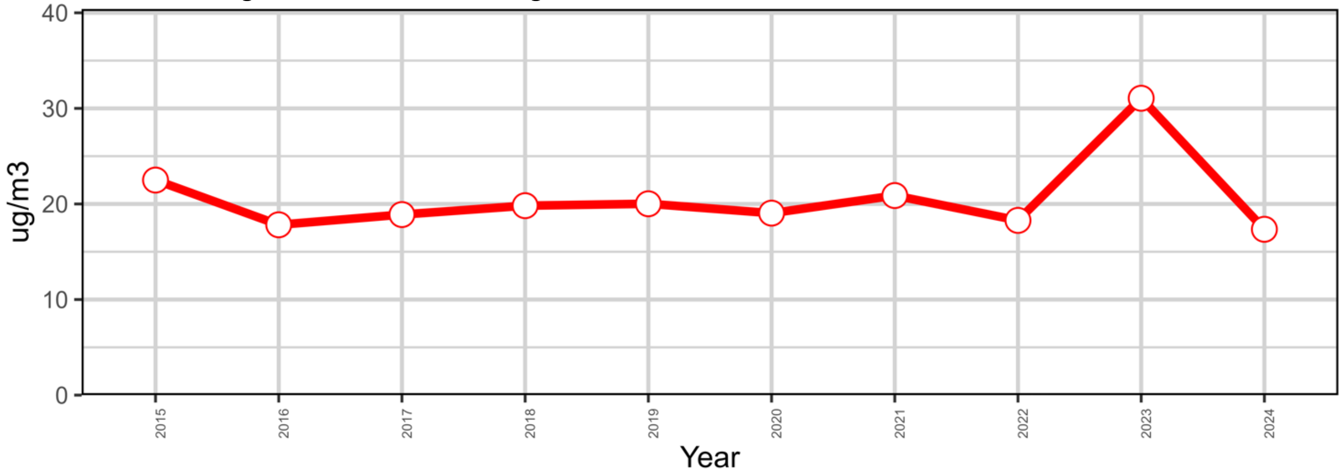


Figure 8 presents the average of each year's annual averages for all monitoring sites for years 2015 through 2024. Annual average $PM_{2.5}$ concentrations have remained below the NAAQS and apart from 2023 have been fairly consistent over the last decade. The 2023 increase was influenced by wildfire smoke and concentrations have since returned to the expected trend in 2024, which is trending slightly downwards.

Figure 8. $PM_{2.5}$ Trend: Average Annual Average Concentrations for all Sites

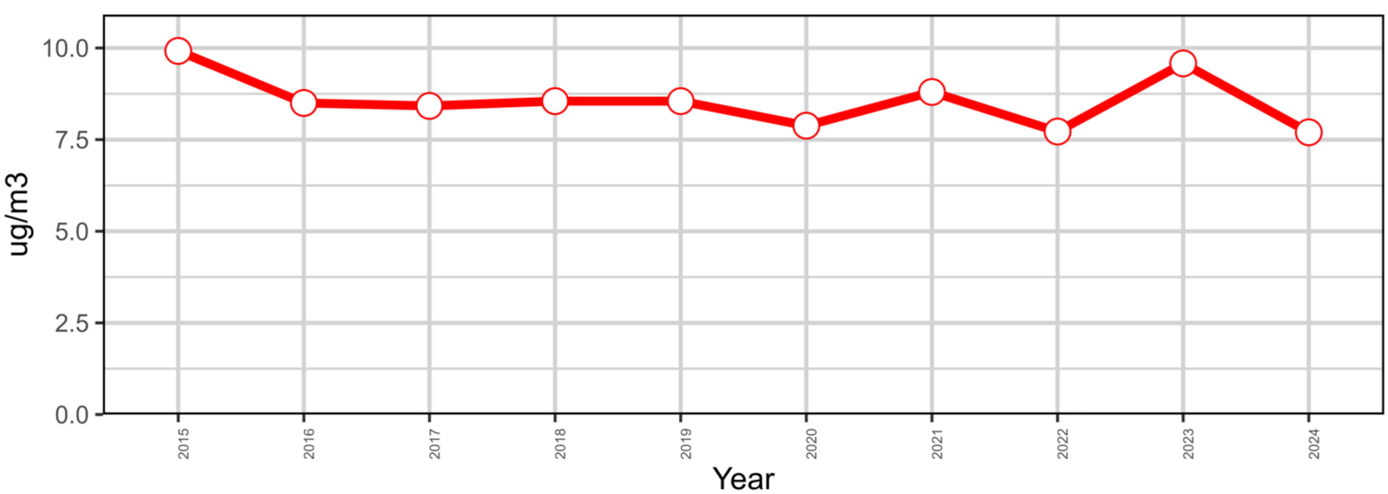
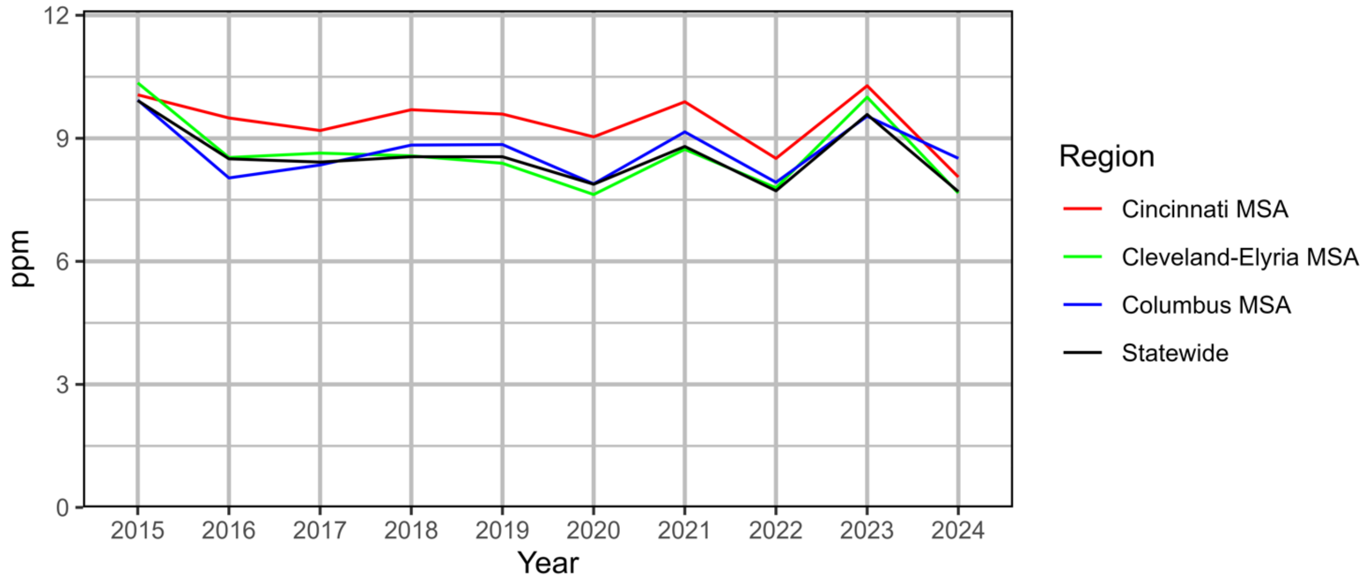


Figure 9 presents the statewide average of each year's annual averages from Figure 8 in comparison to the average of each year's annual averages for the three largest metropolitan-statistical areas (MSA) in Ohio. Particulate pollution has been on a fairly consistent trend in the state for most of the past decade, except in 2023 due to wildfire smoke.

Figure 9. $PM_{2.5}$ Trend: Average Annual Average Concentrations for all Sites Statewide and Within MSAs



E. Attainment Status

The entire state has been designated as in attainment for the 24-hour (35 µg/m^3) $PM_{2.5}$ NAAQS since 2013. Ohio EPA has recommended to U.S. EPA nonattainment areas for the recently revised annual $PM_{2.5}$ NAAQS (9.0 µg/m^3) and is awaiting U.S. EPA's response on the matter. On February 4, 2025, with a supplemental submittal on April 9, 2025, Ohio EPA recommended three counties for nonattainment status: Butler, Cuyahoga and Hamilton counties. Franklin County has a monitor (39 -049-0040) with a 2022-2024 annual $PM_{2.5}$ design value of 9.3 µg/m^3 but was not recommended for nonattainment designation. This site did not begin operating until May 2022 therefore the first two quarters of calendar year 2022 have data incompleteness causing an invalid design value for this site. Details regarding the nonattainment recommendations can be found on our website (https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans).

The maps and data tables below present the design values for both NAAQS for years 2022 through 2024 and only include data from monitoring sites used for comparison to the NAAQS. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values for comparison to the NAAQS and are highlighted in green in Table 7 and Table 8.

Figure 10 presents the 24-hour design value calculated by the three-year average of 98th percentile concentrations and Table 7 shows each year's individual 98th percentile concentration and the three-year averages used to determine the 24-hour design value for each county.

Figure 10. 2022-2024 24-Hour $PM_{2.5}$ Design Values

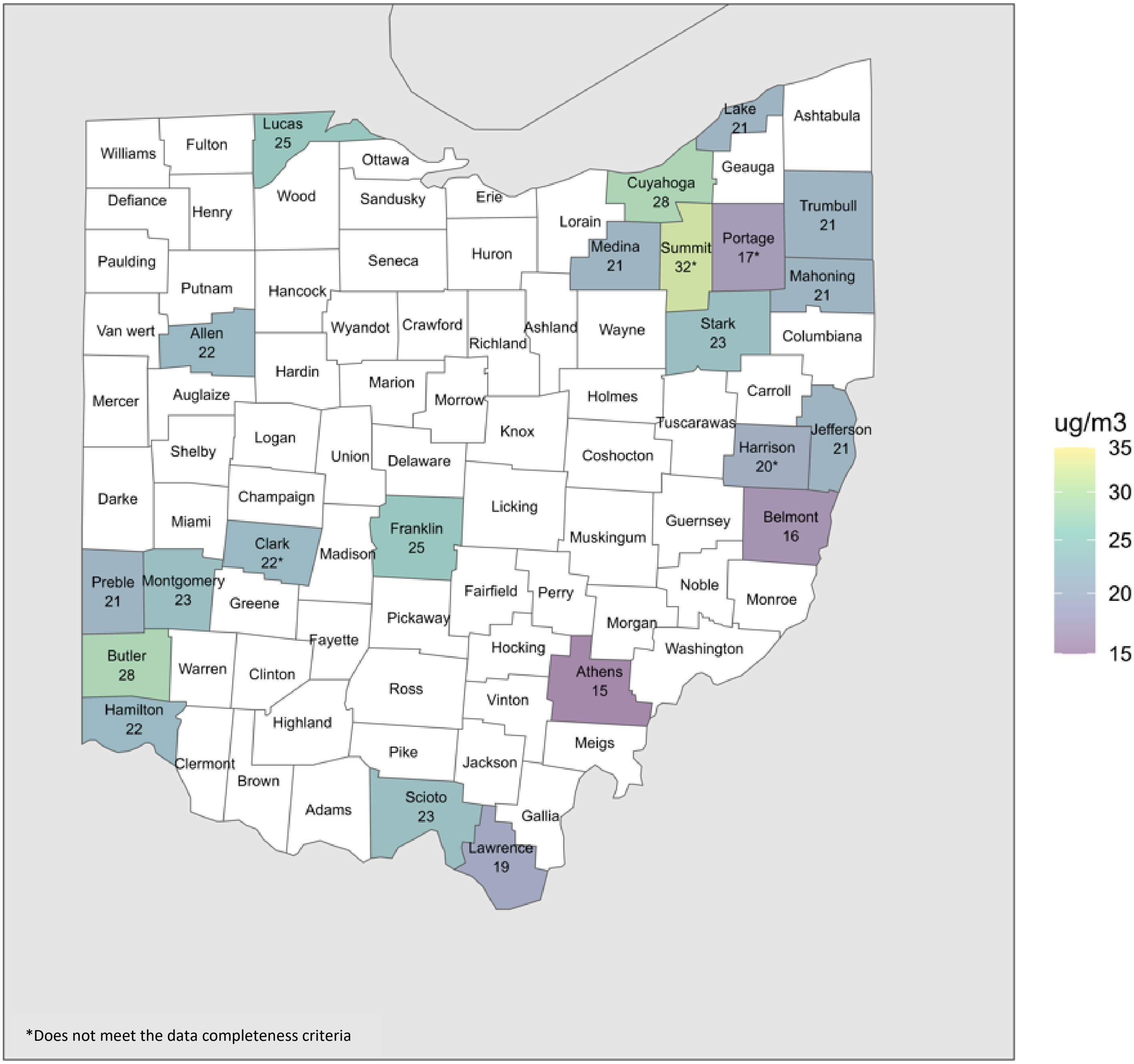


Table 7. $PM_{2.5}$ 24-hour 98th Percentile Concentrations and 24-Hour Design Values (µg/m³)

Site	County	City	Year 2022	2023	2024	Design Value 2022-2024
39-003-0009	Allen	Lima	16.5	35.0	14.3	22
39-009-0003	Athens	Sharpsburg	12.5	18.8	12.7	15
39-013-0006	Belmont	Shadyside	14.6	19.5	14.3	16
39-017-0015	Butler	Middletown	19.0	38.6	17.9	25
39-017-0016	Butler	Fairfield	19.9	---*	---*	20
39-017-0019	Butler	Middletown	19.1	30.5	17.3	22
39-017-0022	Butler	Middletown	20.5	43.7	19.2	28
39-023-0005	Clark	Springfield	16.2*	32.6	16.9	22
39-035-0034	Cuyahoga	Cleveland	15.2	19.9	15.3	17
39-035-0038	Cuyahoga	Cleveland	23.1	34.0	19.5	26
39-035-0045	Cuyahoga	Cleveland	17.6	17.7*	17.7	18
39-035-0060	Cuyahoga	Cleveland	23.4	39.7	21.4	28
39-035-0065	Cuyahoga	Newburgh Heights	27.4	35.0	22.1	28
39-035-0073	Cuyahoga	Warrensville Heights	19.2	35.8	14.5	23
39-035-1002	Cuyahoga	Brook Park	15.5	---*	---*	16
39-049-0034	Franklin	Columbus	17.3	29.1	20.4	22
39-049-0038	Franklin	Columbus	19.9	35.0	18.8	25
39-049-0040	Franklin	Columbus	18.6*	24.6	20.6	21
39-049-0081	Franklin	Columbus	17.4	29.1	19.2	22
39-061-0006	Hamilton	Blue Ash	18.2	28.6	15.4	21
39-061-0014	Hamilton	Cincinnati	18.8	30.8	17.7	22
39-061-0040	Hamilton	Cincinnati	17.4	27.3	19.2	21
39-061-0042	Hamilton	Cincinnati	18.5	30.4	18.4	22
39-061-0048	Hamilton	Cincinnati	19.8	30.6	16.6	22
39-067-0005	Harrison	Hopedale	19.9*	---*	---*	20
39-081-0017	Jefferson	Steubenville	20.7	25.3	16.4	21
39-085-0007	Lake	Painesville	15.1	36.1	12.8	21
39-087-0012	Lawrence	Ironton	14.8	27.9	14.6	19
39-095-0024	Lucas	Toledo	16.5*	31.6	20.2	23
39-095-0026	Lucas	Toledo	18.3	31.0	16.6	22
39-095-1003	Lucas	Toledo	23.5	32.9	19.8	25
39-099-0015	Mahoning	Youngstown	17.1	30.2	15.3	21
39-103-0004	Medina	Westfield	17.7	29.6	15.6	21
39-113-0038	Montgomery	Dayton	18.1	33.4	16.2	23
39-133-0002	Portage	Ravenna	16.6	---*	---*	17
39-135-1001	Preble	New Paris	15.8	31.5	14.9	21
39-145-0013	Scioto	Portsmouth	16.7	31.7	17.2	22
39-145-0015	Scioto	Portsmouth	15.3	33.2	19.2	23
39-151-0017	Stark	Canton	19.5	29.5	20.3	23
39-151-0020	Stark	Canton	21.1	31.1	17.6	23
39-153-0017	Summit	Akron	18.8	27.4	16.3	21
39-153-0023	Summit	Akron	15.5	49.4*	---*	32
39-155-0014	Trumbull	Warren	16.6	30.0	17.0	21

(Green shading) Insufficient data for valid statistical average. * Does not meet the data completeness criteria.

Figure 11 presents the annual design value calculated by the three-year average of the mean concentrations and Table 8 shows each year's annual averages and the three-year averages used to determine the annual design value for each county.

Figure 11. 2022-2024 Annual $PM_{2.5}$ Design Values

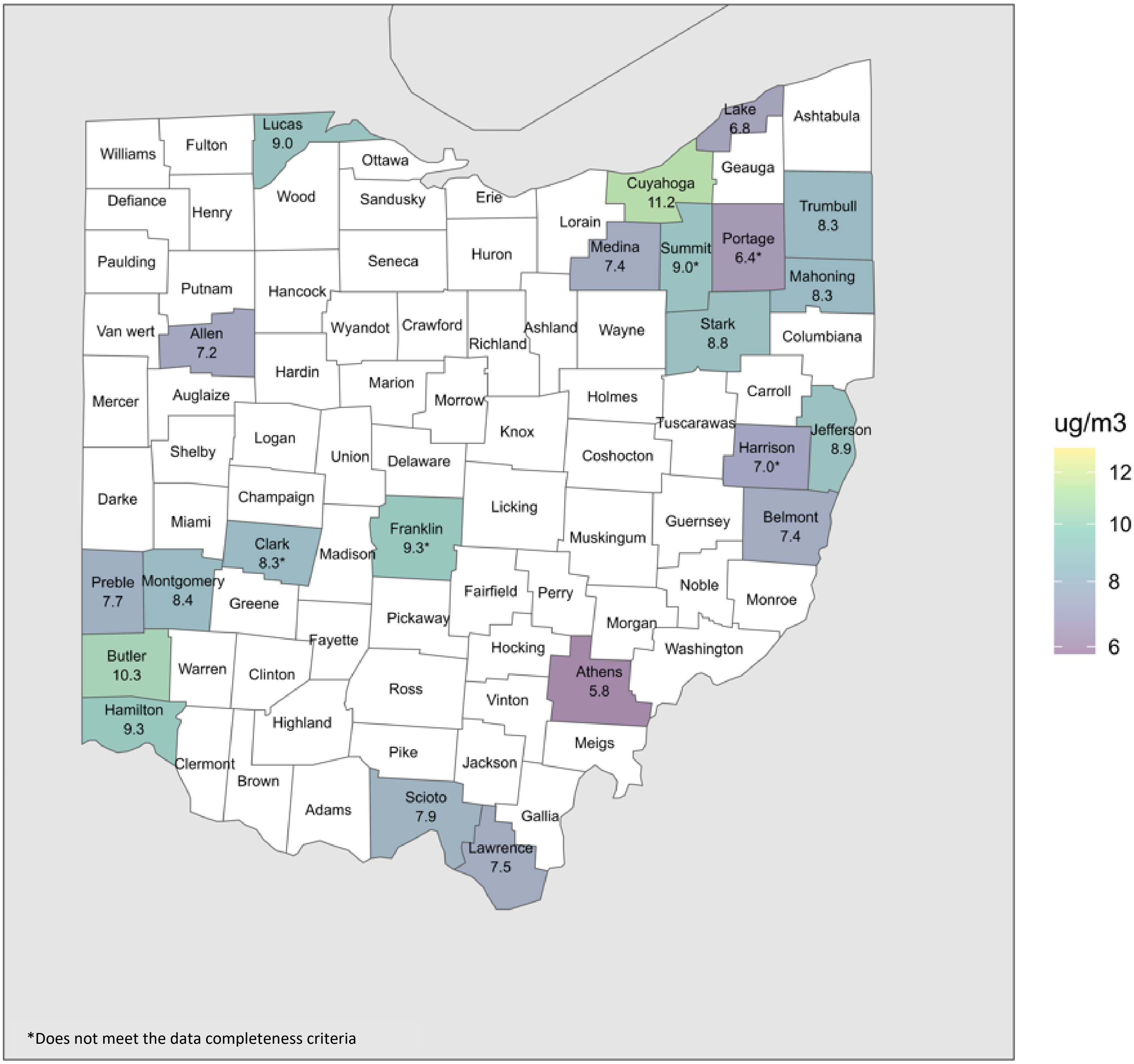


Table 8. PM$_{2.5}$ Annual Averages and Annual Design Values (µg/m^3)

Site	County	City	Year 2022	Year 2023	Year 2024	Design Value 2022-2024
39-003-0009	Allen	Lima	7.1	8.5	6.0	7.2
39-009-0003	Athens	Sharpsburg	5.5	6.8	5.3	5.8
39-013-0006	Belmont	Shadyside	6.7	8.5	7.2	7.4
39-017-0015	Butler	Middletown	8.4	10.5	8.3	9.1
39-017-0016	Butler	Fairfield	7.8	-----*	-----*	7.8
39-017-0019	Butler	Middletown	8.0	10.1	8.1	8.7
39-017-0022	Butler	Middletown	9.5	12.1	9.4	10.3
39-023-0005	Clark	Springfield	7.5*	9.8	7.5	8.3
39-035-0034	Cuyahoga	Cleveland	6.7	8.4	6.4	7.2
39-035-0038	Cuyahoga	Cleveland	8.9	11.2	8.8	9.7
39-035-0045	Cuyahoga	Cleveland	8.2	8.9*	7.9	8.4
39-035-0060	Cuyahoga	Cleveland	8.8	11.9	9.3	10.0
39-035-0065	Cuyahoga	Newburgh Heights	11.0	12.8	9.8	11.2
39-035-0073	Cuyahoga	Warrensville Heights	7.6	9.1	6.4	7.7
39-035-1002	Cuyahoga	Brook Park	6.5	-----*	-----*	6.5
39-049-0034	Franklin	Columbus	7.7	9.4	8.9	8.7
39-049-0038	Franklin	Columbus	7.9	9.7	8.1	8.6
39-049-0040	Franklin	Columbus	8.7*	10.0	9.1	9.3
39-049-0081	Franklin	Columbus	7.4	9.1	8.0	8.1
39-061-0006	Hamilton	Blue Ash	8.6	8.9	6.2	7.9
39-061-0014	Hamilton	Cincinnati	8.7	10.9	8.4	9.3
39-061-0040	Hamilton	Cincinnati	7.6	10.0	8.0	8.5
39-061-0042	Hamilton	Cincinnati	8.2	10.1	7.8	8.7
39-061-0048	Hamilton	Cincinnati	9.7	9.8	8.4	9.3
39-067-0005	Harrison	Hopedale	7.0*	-----*	-----*	7.0
39-081-0017	Jefferson	Steubenville	9.1	9.8	7.7	8.9
39-085-0007	Lake	Painesville	6.2	8.5	5.7	6.8
39-087-0012	Lawrence	Ironton	7.1	8.5	6.7	7.5
39-095-0024	Lucas	Toledo	6.6*	8.7	8.2	7.8
39-095-0026	Lucas	Toledo	6.9	8.0	7.5	7.5
39-095-1003	Lucas	Toledo	8.7	9.3	9.0	9.0
39-099-0015	Mahoning	Youngstown	7.8	9.7	7.2	8.3
39-103-0004	Medina	Westfield	6.3	9.1	6.9	7.4
39-113-0038	Montgomery	Dayton	7.9	9.8	7.5	8.4
39-133-0002	Portage	Ravenna	6.4	-----*	-----*	6.4
39-135-1001	Preble	New Paris	7.1	9.0	6.9	7.7
39-145-0013	Scioto	Portsmouth	6.8	8.7	7.0	7.5
39-145-0015	Scioto	Portsmouth	7.1	8.8	7.6	7.9
39-151-0017	Stark	Canton	8.2	9.5	8.8	8.8
39-151-0020	Stark	Canton	7.9	9.0	7.8	8.2
39-153-0017	Summit	Akron	7.9	9.3	7.3	8.2
39-153-0023	Summit	Akron	6.8	11.2*	-----*	9.0
39-155-0014	Trumbull	Warren	7.3	10.0	7.8	8.3

(Green shading) Insufficient data for valid statistical average. * Does not meet the data completeness criteria.

IV.OZONE (O3)

A. Overview

Ozone differs from other pollutants in that it is not directly emitted into the atmosphere from sources. Rather, it is created photochemically in the lower atmosphere by the reaction of volatile organic compounds (VOC) and oxides of nitrogen (NO_x) in the presence of sunlight. For this reason, it is referred to as a secondary pollutant. Ozone is the predominant oxidant component of photochemical smog.


39-151-4005, Stark County

In urban areas, NO_x is emitted primarily from combustion sources such as the internal combustion engine, electric power generation units, and gas and oil-fired boilers. VOCs, important in sustaining the reactions, are emitted in the exhausts of gasoline, diesel and jet engines, through the evaporation of gasoline and solvents such as dry-cleaning fluids, from industrial and non-industrial surface coating operations such as paint booths, from open burning, and from other combustion sources.

The ozone NAAQS has been revised frequently. Prior to 1997, the one-hour NAAQS was 0.12 ppm, with a violation occurring when there were more than three exceedances annually. In 1997, the NAAQS was supplanted with an 8-hour average of 0.08 ppm where a violation occurred when the annual 4th highest daily maximum eight-hour concentration averaged over three years exceeded the level of the NAAQS. In 2006, the one-hour NAAQS was revoked. Then, in 2008, the eight-hour NAAQS was lowered to 0.075 ppm. In 2015, the NAAQS was revised to 0.070 ppm, where a violation occurs when the annual 4th highest daily maximum eight-hour average concentration averaged over three years exceeds the level of the NAAQS.

In 2024, there were 50 ozone sites.

B. Sampling Method

Ozone is monitored continuously during the ozone season and year-round at a select few sites in Ohio. Beginning in 2017, the ozone season was extended to March 1 through October 31. Prior to 2017, the ozone season was from April 1 through October 31.

An ozone analyzer operates using ultraviolet absorption. The air sample is drawn into the analyzer and irradiated with an ultraviolet light of 253.7 nanometers wavelength. The amount of light absorbed is related to the amount of ozone present.

C. Air Quality Data

Table 9 presents daily maximum eight-hour ozone data from continuous instruments Ohio EPA uses to evaluate air quality for the state. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. The eight-hour NAAQS is 0.070 ppm and should be compared against the column labeled "4th Max." The column marked "Exceedance" indicates the number of days that monitor had an eight-hour period above the NAAQS. Because the form of the NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2024. All concentrations are reported in ppm.

Table 9. Ozone Eight-Hour Air Monitoring Statistics (ppm)

County	Site ID	POC	City	% Obs	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max	Exceedances
Allen	39-003-0009	1	Lima	100	244	245	0.069	0.066	0.066	0.065	0
Ashtabula	39-007-1001	1	Conneaut	100	244	245	0.073	0.072	0.068	0.067	2
Butler	39-017-0018	1	Middletown	99	243	245	0.077	0.074	0.070	0.067	2
Butler	39-017-0023	1	Hamilton	100	244	245	0.073	0.071	0.068	0.068	2
Butler	39-017-9991^	1	Oxford Township	99	242	245	0.070	0.067	0.066	0.066	0
Clark	39-023-0001	1	Springfield	100	244	245	0.080	0.074	0.071	0.068	3
Clark	39-023-0003	1	Enon	99	242	245	0.078	0.070	0.069	0.067	1
Clermont	39-025-0022	1	Batavia	100	244	245	0.076	0.075	0.071	0.068	3
Clinton	39-027-1002	1	Wilmington	97	238	245	0.074	0.074	0.073	0.071	4
Cuyahoga	39-035-0034	1	Cleveland	97	237	245	0.075	0.074	0.072	0.072	4
Cuyahoga	39-035-0060	1	Cleveland	96	350	366	0.068	0.067	0.065	0.065	0
Cuyahoga	39-035-0064	1	Berea	98	240	245	0.069	0.068	0.067	0.065	0
Cuyahoga	39-035-5002	1	Mayfield	100	244	245	0.077	0.071	0.070	0.070	2
Delaware	39-041-0002	1	Delaware	98	241	245	0.072	0.070	0.068	0.067	1
Franklin	39-049-0029	1	New Albany	99	243	245	0.072	0.071	0.070	0.069	2
Franklin	39-049-0081	1	Columbus	98	240	245	0.066	0.066	0.065	0.065	0
Geauga	39-055-0004	1	Chardon	97	238	245	0.071	0.068	0.068	0.066	1
Greene	39-057-0006	1	Xenia	95	232	245	0.076	0.068	0.067	0.067	1
Hamilton	39-061-0006	1	Blue Ash	98	241	245	0.082	0.079	0.073	0.073	7
Hamilton	39-061-0010	1	Cleves	99	243	245	0.072	0.071	0.071	0.070	3
Hamilton	39-061-0040	1	Cincinnati	99	364	366	0.082	0.079	0.073	0.073	9
Jefferson	39-081-0017	1	Steubenville	98	239	245	0.068	0.068	0.066	0.066	0
Knox	39-083-0003	1	Centerburg	100	244	245	0.071	0.068	0.066	0.065	1
Lake	39-085-0003	1	Eastlake	99	242	245	0.081	0.073	0.073	0.071	4
Lake	39-085-0007	1	Painesville	99	242	245	0.077	0.070	0.069	0.069	1
Lawrence	39-087-0011	1	Willow Wood	98	239	245	0.065	0.060	0.059	0.059	0
Lawrence	39-087-0012	1	Ironton	99	243	245	0.065	0.064	0.063	0.062	0
Licking	39-089-0005	1	Heath (Fourmile Lock)	98	240	245	0.065	0.064	0.064	0.063	0
Licking	39-089-0008	1	Reynoldsburg	99	243	245	0.070	0.066	0.065	0.063	0
Lorain	39-093-0018	1	Sheffield	100	244	245	0.062	0.062	0.062	0.061	0

County	Site ID	POC	City	% Obs	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max	Exceedances
Lucas	39-095-0024	1	Toledo	100	244	245	0.067	0.065	0.064	0.063	0
Lucas	39-095-0027	1	Waterville	100	244	245	0.072	0.070	0.065	0.063	1
Lucas	39-095-0035	1	Curtice	97	237	245	0.076	0.075	0.073	0.071	4
Madison	39-097-0007	1	Paint Township	99	243	245	0.070	0.070	0.069	0.067	0
Mahoning	39-099-0015	1	Youngstown	100	244	245	0.068	0.068	0.067	0.067	0
Medina	39-103-0004	1	Westfield Township	100	244	245	0.070	0.068	0.067	0.065	0
Miami	39-109-0005	1	Casstown	100	244	245	0.071	0.069	0.069	0.068	1
Montgomery	39-113-0037	1	Dayton	98	240	245	0.084	0.079	0.073	0.072	4
Noble	39-121-9991^	1	Wayne Township	99	243	245	0.067	0.066	0.066	0.066	0
Portage	39-133-1001	1	Kent	100	244	245	0.073	0.072	0.068	0.067	2
Preble	39-135-1001	1	New Paris	96	352	366	0.070	0.066	0.066	0.065	0
Stark	39-151-0016	1	Canton	99	243	245	0.067	0.064	0.064	0.060	0
Stark	39-151-0022	1	Brewster	100	244	245	0.065	0.064	0.064	0.062	0
Stark	39-151-4005	1	Alliance	93	229	245	0.068	0.068	0.067	0.067	0
Summit	39-153-0026	1	Akron	99	242	245	0.072	0.070	0.069	0.069	1
Trumbull	39-155-0011	1	Vienna	99	243	245	0.069	0.069	0.068	0.068	0
Trumbull	39-155-0013	1	Kinsman	98	240	245	0.068	0.066	0.064	0.064	0
Warren	39-165-0007	1	Lebanon	100	244	245	0.084	0.078	0.073	0.073	6
Washington	39-167-0004	1	Marietta	99	242	245	0.067	0.065	0.062	0.062	0
Wood	39-173-0003	1	Bowling Green	100	244	245	0.071	0.066	0.066	0.065	1

^ Indicates monitor is operated by U.S. EPA.

Table 10 presents daily maximum one-hour ozone data from continuous instruments. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. There is no longer a one-hour NAAQS for ozone. It is important to note that many of these monitors have a single maximum hour reading above the eight-hour ozone NAAQS of 0.070 ppm. Ozone concentrations can change quickly due to factors such as meteorological conditions and activity at nearby sources (e.g, rush hour traffic). These values are not comparable to the NAAQS. All concentrations are reported in ppm.

Table 10. Ozone One-Hour Air Monitoring Statistics (ppm)

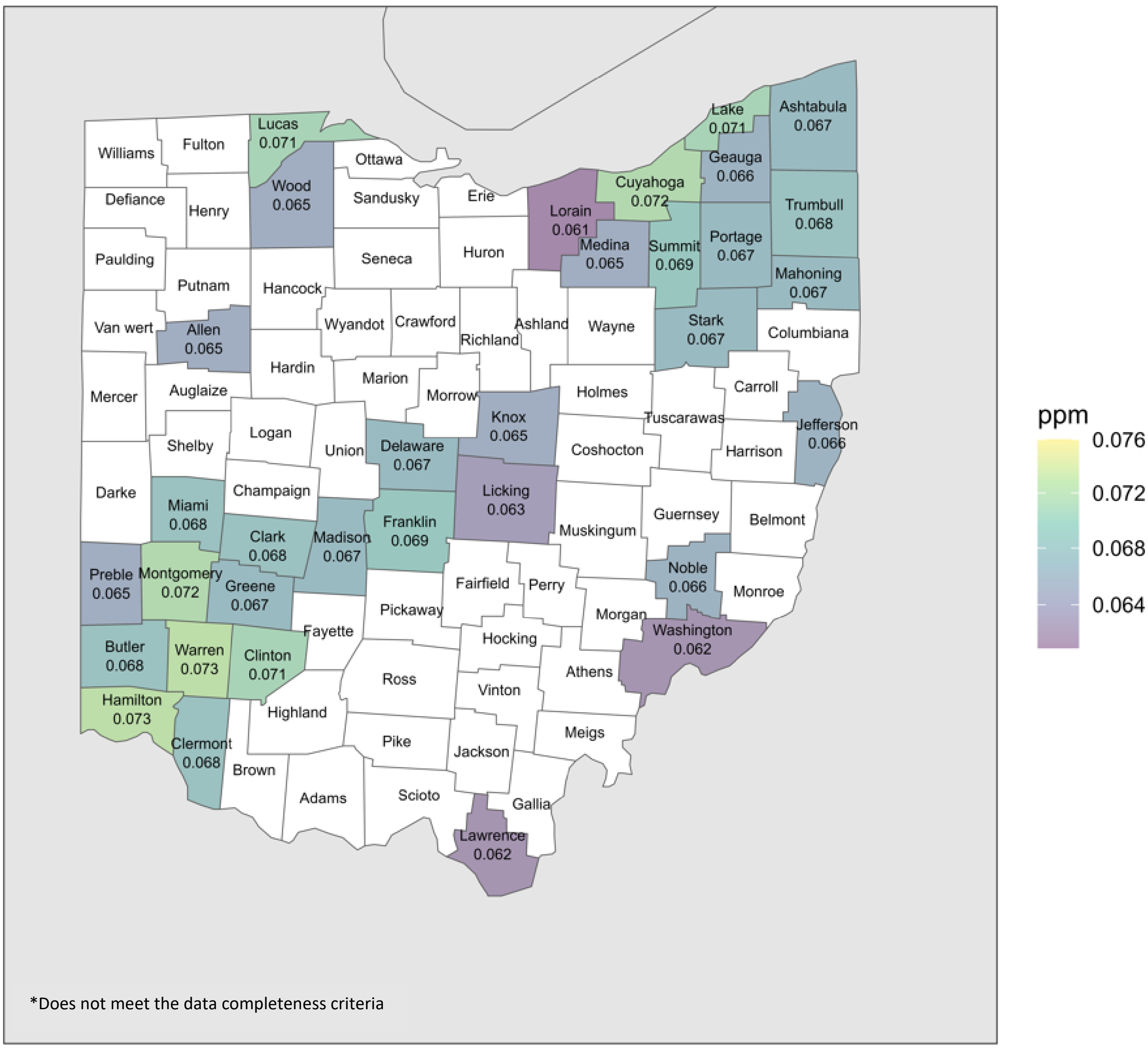
County	Site ID	POC	City	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max
Allen	39-003-0009	1	Lima	245	245	0.072	0.072	0.069	0.067
Ashtabula	39-007-1001	1	Conneaut	245	245	0.085	0.077	0.076	0.073
Butler	39-017-0018	1	Middletown	244	245	0.082	0.081	0.080	0.076
Butler	39-017-0023	1	Hamilton	245	245	0.080	0.076	0.075	0.074
Butler	39-017-9991^	1	Oxford Township	243	245	0.080	0.073	0.073	0.072
Clark	39-023-0001	1	Springfield	245	245	0.091	0.087	0.076	0.075
Clark	39-023-0003	1	Enon	243	245	0.086	0.079	0.075	0.075
Clermont	39-025-0022	1	Batavia	244	245	0.087	0.081	0.076	0.076
Clinton	39-027-1002	1	Wilmington	240	245	0.081	0.081	0.080	0.079
Cuyahoga	39-035-0034	1	Cleveland	236	245	0.089	0.082	0.081	0.076
Cuyahoga	39-035-0060	1	Cleveland	357	365	0.073	0.072	0.072	0.071
Cuyahoga	39-035-0064	1	Berea	241	245	0.075	0.074	0.074	0.070
Cuyahoga	39-035-5002	1	Mayfield	245	245	0.084	0.076	0.075	0.075
Delaware	39-041-0002	1	Delaware	242	245	0.081	0.079	0.073	0.072
Franklin	39-049-0029	1	New Albany	244	245	0.077	0.077	0.076	0.076
Franklin	39-049-0081	1	Columbus	240	245	0.078	0.076	0.074	0.070
Geauga	39-055-0004	1	Chardon	239	245	0.076	0.076	0.076	0.071
Greene	39-057-0006	1	Xenia	234	245	0.085	0.076	0.075	0.072
Hamilton	39-061-0006	1	Blue Ash	242	245	0.092	0.086	0.082	0.082
Hamilton	39-061-0010	1	Cleves	245	245	0.082	0.081	0.077	0.076
Hamilton	39-061-0040	1	Cincinnati	364	365	0.093	0.086	0.085	0.083
Jefferson	39-081-0017	1	Steubenville	239	245	0.073	0.071	0.071	0.071
Knox	39-083-0003	1	Centerburg	245	245	0.078	0.075	0.074	0.071

County	Site ID	POC	City	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max
Lake	39-085-0003	1	Eastlake	244	245	0.091	0.085	0.085	0.078
Lake	39-085-0007	1	Painesville	244	245	0.090	0.077	0.075	0.075
Lawrence	39-087-0011	1	Willow Wood	240	245	0.071	0.069	0.068	0.063
Lawrence	39-087-0012	1	Ironton	245	245	0.078	0.075	0.074	0.071
Licking	39-089-0005	1	Heath (Fourmile Lock)	242	245	0.074	0.072	0.068	0.068
Licking	39-089-0008	1	Reynoldsburg	244	245	0.077	0.073	0.073	0.069
Lorain	39-093-0018	1	Sheffield	245	245	0.074	0.071	0.068	0.065
Lucas	39-095-0024	1	Toledo	245	245	0.078	0.077	0.075	0.068
Lucas	39-095-0027	1	Waterville	244	245	0.081	0.074	0.070	0.068
Lucas	39-095-0035	1	Curtice	238	245	0.084	0.084	0.084	0.083
Madison	39-097-0007	1	Paint Township	244	245	0.082	0.078	0.073	0.071
Mahoning	39-099-0015	1	Youngstown	245	245	0.073	0.073	0.071	0.071
Medina	39-103-0004	1	Westfield Township	245	245	0.080	0.078	0.071	0.070
Miami	39-109-0005	1	Casstown	245	245	0.076	0.073	0.072	0.071
Montgomery	39-113-0037	1	Dayton	242	245	0.090	0.085	0.078	0.076
Noble	39-121-9991^	1	Wayne Township	244	245	0.073	0.071	0.071	0.070
Portage	39-133-1001	1	Kent	245	245	0.080	0.079	0.074	0.072
Preble	39-135-1001	1	New Paris	354	365	0.074	0.074	0.070	0.070
Stark	39-151-0016	1	Canton	245	245	0.069	0.068	0.067	0.065
Stark	39-151-0022	1	Brewster	245	245	0.069	0.069	0.067	0.067
Stark	39-151-4005	1	Alliance	229	245	0.074	0.073	0.073	0.072
Summit	39-153-0026	1	Akron	242	245	0.080	0.077	0.076	0.076
Trumbull	39-155-0011	1	Vienna	242	245	0.076	0.074	0.074	0.073
Trumbull	39-155-0013	1	Kinsman	241	245	0.071	0.071	0.069	0.069
Warren	39-165-0007	1	Lebanon	244	245	0.093	0.089	0.085	0.082
Washington	39-167-0004	1	Marietta	244	245	0.080	0.080	0.067	0.066
Wood	39-173-0003	1	Bowling Green	245	245	0.080	0.073	0.071	0.071

^ indicates monitor is operated by U.S. EPA.

Figure 12 presents the 4th highest eight-hour ozone concentrations for every county with an ozone monitor in 2024. For counties with more than one ozone monitor, the highest concentration for the county was used. All concentrations are reported as ppm. Note, in nearly all cases these values will match the "4th Max" column of Table 9. However, the data in the map is taken from a U.S. EPA Design Value Report, which includes the official 4th high daily maximum concentration used in calculating the three-year averages to determine the design value for each county that is compared against the NAAQS, after factoring in any potential data exclusions. Table 9 shows data from a U.S. EPA Quick Look Report, which may not include data exclusions.

Figure 12. 2024 Ozone 4th Highest Eight-Hour Concentrations



D. Ten Year Air Quality Trends

Assessing progress towards attainment of the ozone NAAQS is complicated because of the influence of meteorology on ozone levels. Differences in weather conditions can cause variations from year to year in ozone NAAQS exceedances.

Figure 13 presents the average of each year's eight-hour 4th high daily maximum concentration for all monitoring sites for the years 2015 through 2024. Ozone pollution has maintained fairly consistent concentrations in the state throughout the past decade.

Figure 13. Ozone Trend: Average Eight-Hour 4th High Daily Max Concentrations for all Sites

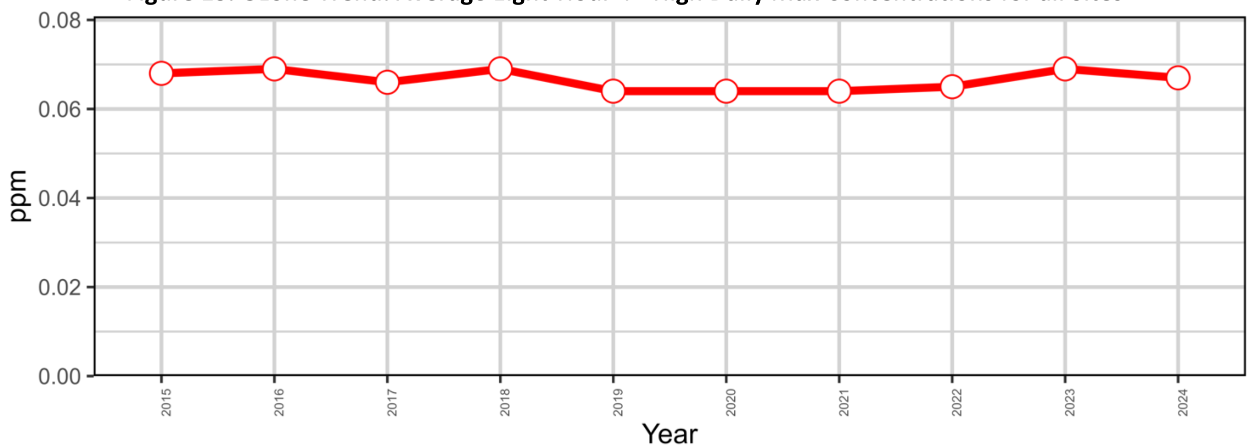


Figure 14 presents the statewide average of each year's eight-hour 4th high daily maximum concentration from Figure 13 in comparison to the average of each year's eight-hour 4th high daily maximum concentration for the three largest MSAs in Ohio. Ozone pollution has maintained fairly consistent concentrations in the state throughout the past decade.

Figure 14. Ozone Trend: Average Eight-Hour 4th High Daily Max Concentrations for all Sites Statewide and Within MSAs

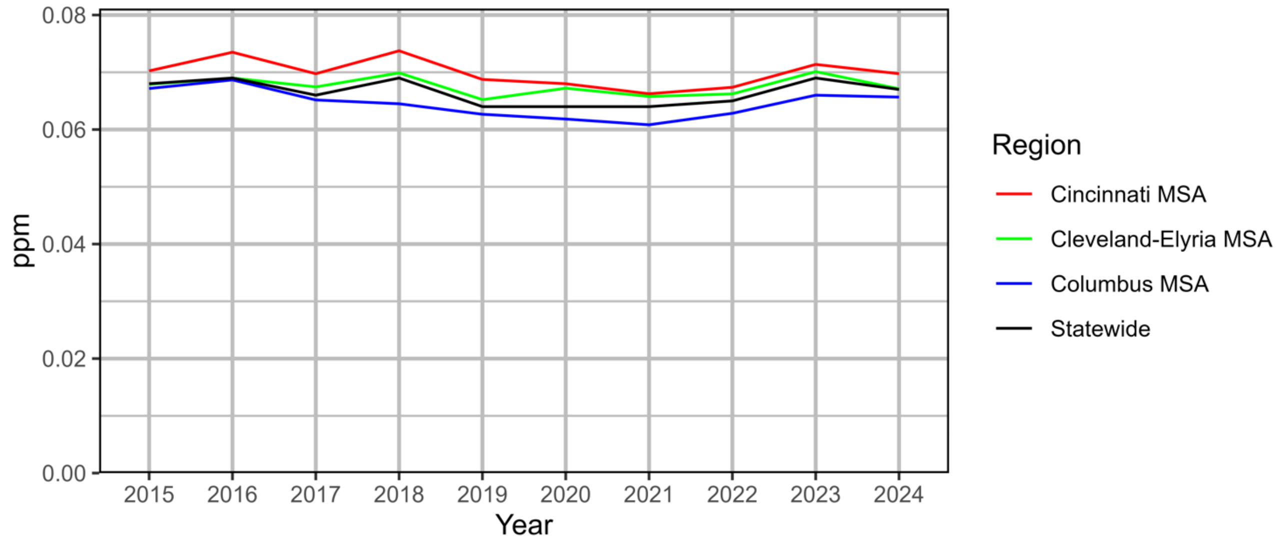


Table 11 presents the following statistics for 2015 to 2024: the date the first ozone exceedance occurred for each ozone season along with the number of sites with one or more exceedance during the ozone season compared to the number of sites in operation that season; and the date of the last ozone exceedance for each ozone season along with the number of sites with an exceedance that day, and the highest eight-hour reading that day in ppb.

Table 11. Date of First Seasonal Exceedance with Number of Exceeding Sites Compared to Total Sites, and Date of Last Seasonal Exceedance with Number of Sites with Exceedance on Last Exceedance Day and the Highest Concentration from those Sites (2015-2024)

Year	Date of First Exceedance	Number of Total Exceedances During the Season /Total Sites	Date of Last Exceedance	Number of Exceeding Sites on Last Day	Statewide Max on Day of Last Exceedance
2015	5 May	36/51	17 September	3	74
2016	17 April	43/52	23 September	10	76
2017	15 May	30/51	26 September	2	74
2018	17 May	38/52	4 August	1	80
2019	28 June	17/51	14 July	3	80
2020	9 June	29/51	10 August	1	80
2021	18 May	33/52	24 August	5	80
2022	12 May	83/51	4 July	1	73
2023	14 April	146/50	21 August	1	73
2024	20 May	73/50	20 September	1	73

E. Attainment Status

At the time of this report, Ohio has one area that remains designated as moderate nonattainment for the ozone NAAQS of 0.070 ppm: the Cleveland area (Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit Counties). The Columbus area (Delaware, Fairfield, Franklin, and Licking Counties) was formerly in nonattainment, however, in April of 2019 the counties were eligible to be reclassified to attainment for the NAAQS based on 2016 through 2018 air quality data. U.S. EPA approved Ohio EPA's redesignation and maintenance plan request for the Columbus area effective August 21, 2019. Furthermore, the Cincinnati area (Butler, Clermont, Hamilton, and Warren Counties) was formerly in nonattainment. The area was reclassified to attainment for the NAAQS based on 2019 through 2021 air quality data. U.S. EPA approved Ohio EPA's redesignation and maintenance plan request for the Cincinnati area effective June 9, 2022.

Moderate nonattainment areas have up to six years from initial nonattainment designation to attain the NAAQS. For the 2015 ozone NAAQS, moderate attainment was required by August 3, 2024, which means areas must show attainment using air quality data for the full three-year period of 2021 through 2023. Based on the valid ozone data for this period that have been certified by Ohio EPA, the Cleveland nonattainment area did not meet the ozone standard by the moderate attainment date. On January 16, 2025, U.S. EPA promulgated a reclassification (commonly referred to as a "bump-up") of the Cleveland area to serious nonattainment. For the 2015 ozone NAAQS, serious attainment was required by August 3, 2027, which means areas must show attainment using air quality data by no later than the full three-year period of 2024 through 2026. After collecting quality assured data for the full three-year period of 2023 through 2025, and considering exceptional events due to wildfires in 2023, Ohio determined the Cleveland nonattainment area was eligible to be reclassified to attainment for the NAAQS. Ohio EPA submitted a request for redesignation to U.S. EPA on December 8, 2025 and is awaiting U.S. EPA action. More information regarding this process can be found on our State Implementation Plans (SIP) website (https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans).

The map and data table below present the design value for the NAAQS for years 2022 through 2024. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values for comparison to the NAAQS and are highlighted in green in Table 12.

Figure 15 presents the highest eight-hour 4th high daily maximum concentration averaged over three-years (2022 through 2024). This is the counties design value. Table 12 presents each year's individual eight-hour 4th high daily maximum concentration and the three-year averages used to determine the eight-hour design value for each county.

Figure 15. 2022-2024 Eight-Hour Ozone Design Values

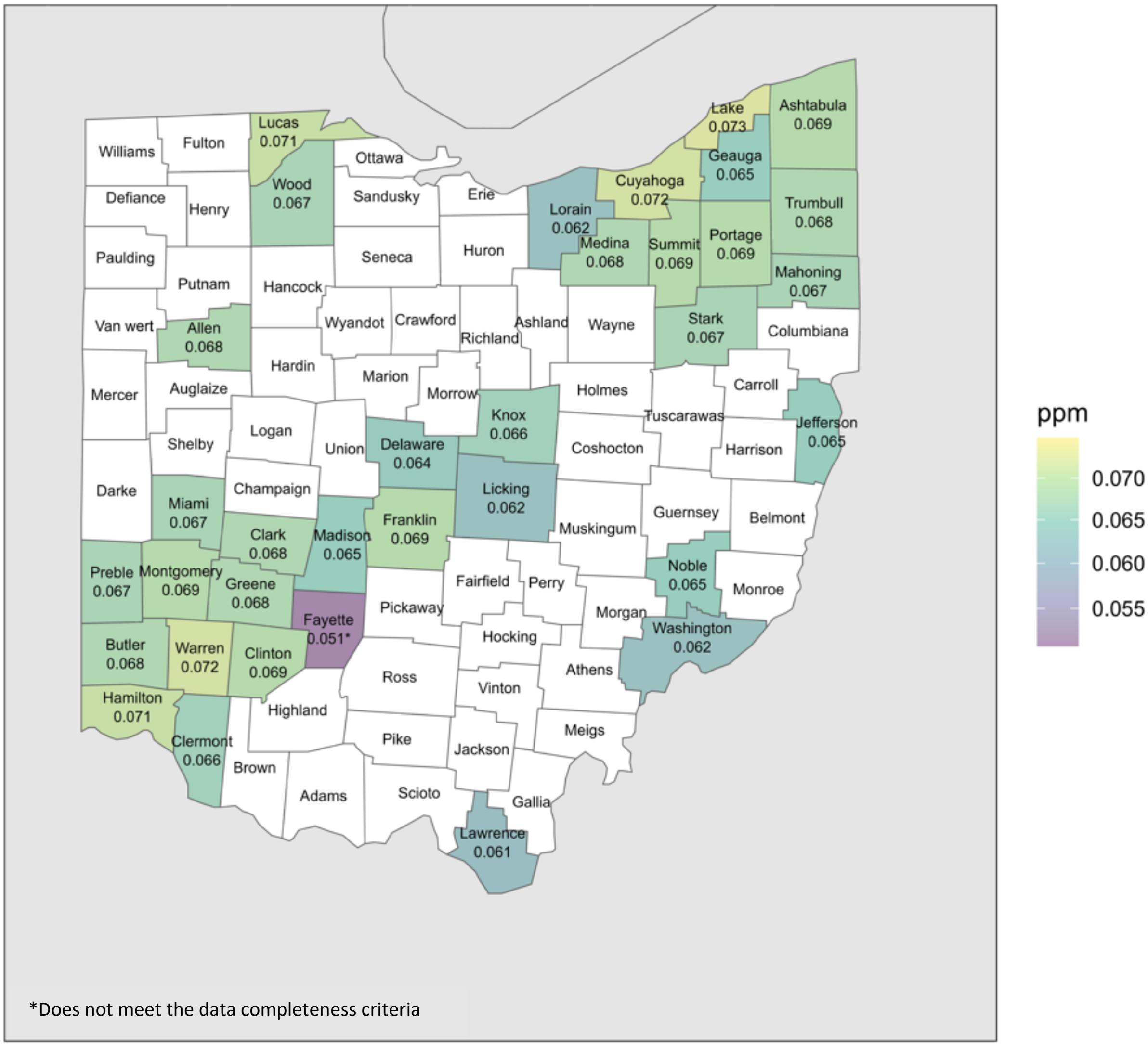


Table 12. Eight-Hour Ozone 4th High Daily Maximum Concentrations and Eight-Hour Design Values (ppm)

Site ID	County	City	4th High in Year 2022	2023	2024	Design Value 2022-2024
39-003-0009	Allen	Lima	0.067	0.072	0.065	0.068
39-007-1001	Ashtabula	Conneaut	0.073	0.069	0.067	0.069
39-017-0018	Butler	Middletown	0.067	0.071	0.067	0.068
39-017-0023		Hamilton	0.070	0.068	0.068	0.068
39-017-9991^		Oxford Township	0.066	0.069	0.066	0.067
39-023-0001	Clark	Springfield	0.068	0.069	0.068	0.068
39-023-0003		Enon	0.064	0.068	0.067	0.066
39-025-0022	Clermont	Batavia	0.063	0.068	0.068	0.066
39-027-1002	Clinton	Wilmington	0.064	0.074	0.071	0.069
39-035-0034	Cuyahoga	Cleveland	0.073	0.071	0.072	0.072
39-035-0060		Cleveland	0.061	0.065	0.065	0.063
39-035-0064		Berea	0.065	0.075	0.065	0.068
39-035-5002		Mayfield	0.065	0.073	0.070	0.069
39-041-0002	Delaware	Delaware	0.060	0.066	0.067	0.064
39-047-9991^	Fayette	Mt. Sterling	0.051	---*	---*	0.051
39-049-0029	Franklin	New Albany	0.069	0.069	0.069	0.069
39-049-0081		Columbus	0.062	0.067	0.065	0.064
39-055-0004	Geauga	Chardon	0.064	0.066	0.066	0.065
39-057-0006	Greene	Xenia	0.065	0.073	0.067	0.068
39-061-0006	Hamilton	Blue Ash	0.069	0.073	0.073	0.071
39-061-0010		Cleves	0.068	0.073	0.070	0.070
39-061-0040		Cincinnati	0.067	0.075	0.073	0.071
39-081-0017	Jefferson	Steubenville	0.061	0.069	0.066	0.065
39-083-0003	Knox	Centerburg	0.064	0.069	0.065	0.066
39-085-0003	Lake	Eastlake	0.076	0.072	0.071	0.073
39-085-0007		Painesville	0.062	0.073	0.069	0.068
39-087-0011	Lawrence	Willow Wood	0.059	0.060	0.059	0.059
39-087-0012		Ironton	0.060	0.063	0.062	0.061
39-089-0005	Licking	Heath (Fourmile Lock)	0.060	0.065	0.063	0.062
39-089-0008		Reynoldsburg	0.063	0.062	0.063	0.062
39-093-0018	Lorain	Sheffield	0.063	0.064	0.061	0.062
39-095-0024	Lucas	Toledo	0.069	0.072	0.063	0.068
39-095-0027		Waterville	0.065	0.074	0.063	0.067
39-095-0035		Curtice	0.070	0.073	0.071	0.071
39-097-0007	Madison	Paint Township	0.063	0.067	0.067	0.065
39-099-0015	Mahoning	Youngstown	0.067	0.068	0.067	0.067
39-103-0004	Medina	Westfield Township	0.067	0.072	0.065	0.068
39-109-0005	Miami	Casstown	0.066	0.069	0.068	0.067
39-113-0037	Montgomery	Dayton	0.066	0.071	0.072	0.069
39-121-9991^	Noble	Wayne Township	0.063	0.066	0.066	0.065
39-133-1001	Portage	Kent	0.071	0.070	0.067	0.069
39-135-1001	Preble	New Paris	0.069	0.068	0.065	0.067
39-151-0016	Stark	Canton	0.066	0.070	0.060	0.065
39-151-0022		Brewster	0.063	0.066	0.062	0.063
39-151-4005		Alliance	0.066	0.068	0.067	0.067
39-153-0026	Summit	Akron	0.069	0.071	0.069	0.069
39-155-0011	Trumbull	Vienna	0.068	0.068	0.068	0.068
39-155-0013		Kinsman	0.066	0.065	0.064	0.065
39-165-0007	Warren	Lebanon	0.069	0.074	0.073	0.072

Site ID	County	City	4th High in Year 2022	2023	2024	Design Value 2022-2024
39-167-0004	Washington	Marietta	0.060	0.064	0.062	0.062
39-173-0003	Wood	Bowling Green	0.066	0.071	0.065	0.067

^ Indicates monitor is operated by U.S. EPA.

* Does not meet the data completeness criteria.

V. NITROGEN DIOXIDE (NO_2)

A. Overview

NO_2 is formed in high temperature combustion processes, when nitrogen in the air is oxidized to nitric oxide (NO) or nitrogen dioxide (NO_2). The major sources of NO_2 are high temperature fuel combustion, motor vehicles, and certain chemical processes. NO_2 is also a significant pollutant because the combination of NO_2 and ground level hydrocarbon compounds causes the production of photochemical oxidants, primarily ozone.

39-061-0048, Hamilton County

In 1971, U.S. EPA established the annual NAAQS for NO_2 at 53 ppb (annual mean). In 2010, U.S. EPA revised the NAAQS for NO_2 by establishing a one-hour NAAQS of 100 ppb which is the three-year average of the 98th percentile of one-hour daily maximum values. The annual NAAQS of 53 ppb was retained.

In 2024, there were seven NO_2 sites.

B. Sampling Method

Continuous monitoring of NO_2 is based on a chemiluminescent reaction between NO and ozone. When these two gases react, ultraviolet light at a specific wavelength is produced. In the monitor, ambient air is drawn along two paths. In the first path, the air is reacted directly with ozone, and the light energy produced is proportional to the amount of nitric oxide in the air. In the second path, the air is reacted with ozone after it passes through a catalytic reduction surface. The reduction surface converts NO_2 to NO and the light energy produced is a measure of the total oxides of nitrogen in the air sample. The electronic difference of these two signals yields the concentration of NO_2.

C. Air Quality Data

Table 13 presents NO_2 data Ohio EPA uses to evaluate air quality for the state. The annual NAAQS is 53 ppb and is compared against the column labeled "Mean" while the one-hour NAAQS is 100 ppb and compared against the column labeled "98th Percentile". Because the form of the one-hour NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2024. Compliance with the annual NAAQS is directly compared to this data. All concentrations are reported as ppb.

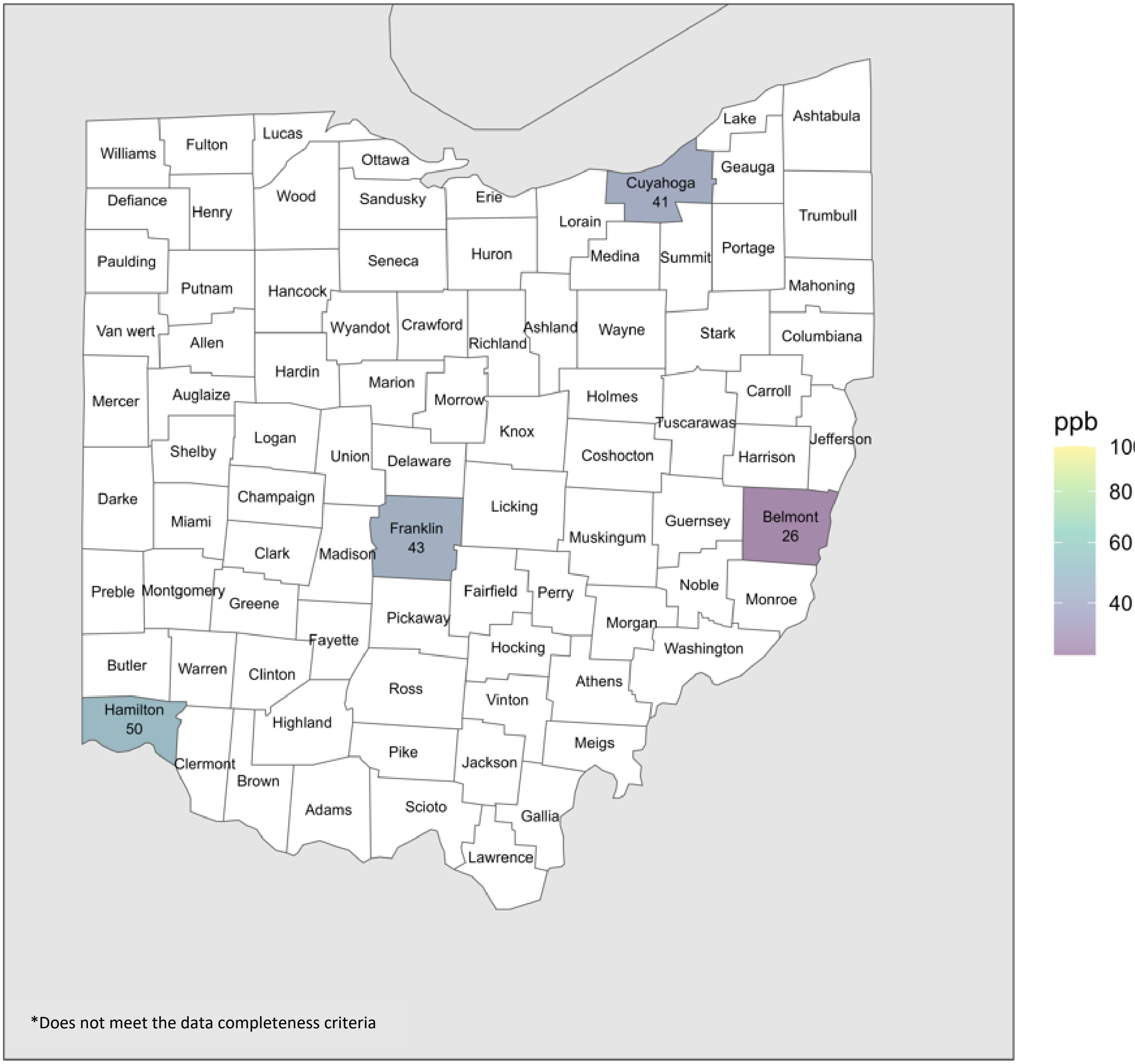
Table 13. NO_2 Air Monitoring Statistics (ppb)

County	Site ID	POC	City	Complete Quarters	Obs	% Complete	1st Max 1-Hr	2nd Max 1-Hr	98th Percentile	Mean
Belmont	39-013-0006	1	Shadyside	4	8176	93	35	34	26	4
Cuyahoga	39-035-0060	1	Cleveland	4	8231	94	49	48	41	9
Cuyahoga	39-035-0073	1	Warrensville	3	7604	87	47	42	30	7
Franklin	39-049-0034	1	Columbus	4	8325	95	75	47	43	8
Franklin	39-049-0038	1	Columbus	4	8552	97	44	38	34	7
Hamilton	39-061-0040	2	Cincinnati	4	8548	97	47	45	41	9
Hamilton	39-061-0048	1	Cincinnati	4	8586	98	59	58	50	17

Figure 16 presents the 98th percentile one-hour maximum concentration for every county with an NO_2 monitor in 2024. For counties with more than one NO_2 monitor, the highest concentration for the county was used. All concentrations are reported as ppb.

Figures presenting the annual concentrations for monitors in 2024 are included in the Attainment Status section below since these values are directly comparable to the NAAQS and therefore indicate monitored attainment status.

Figure 16. 2024 NO_2 98th Percentile One-Hour Concentrations



D. Ten Year Air Quality Trends

Figure 17 presents the 98th percentile one-hour maximum concentrations for all monitoring sites for years 2015 through 2024.

Figure 17. NO_2 Trend: Average 98th Percentile One-Hour Maximum Concentrations for all Sites

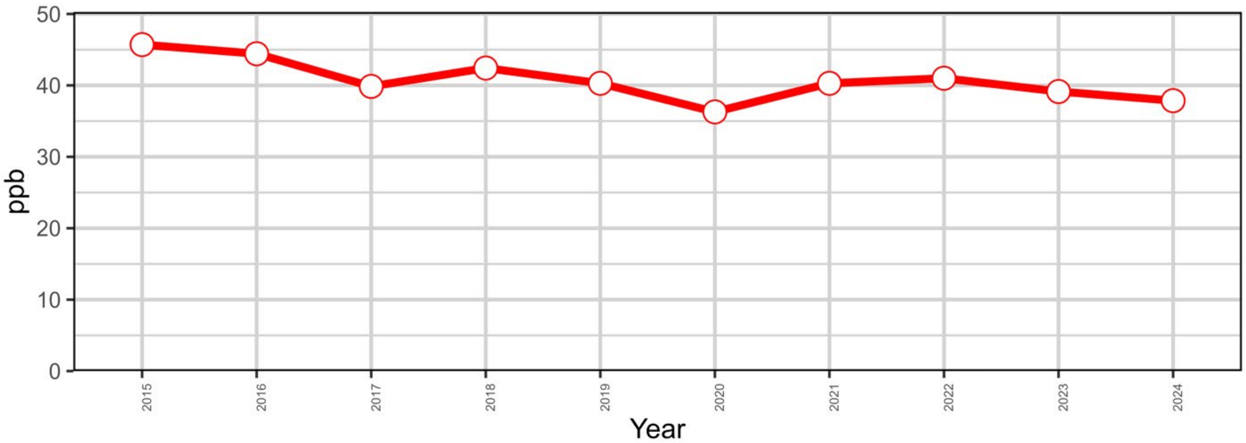
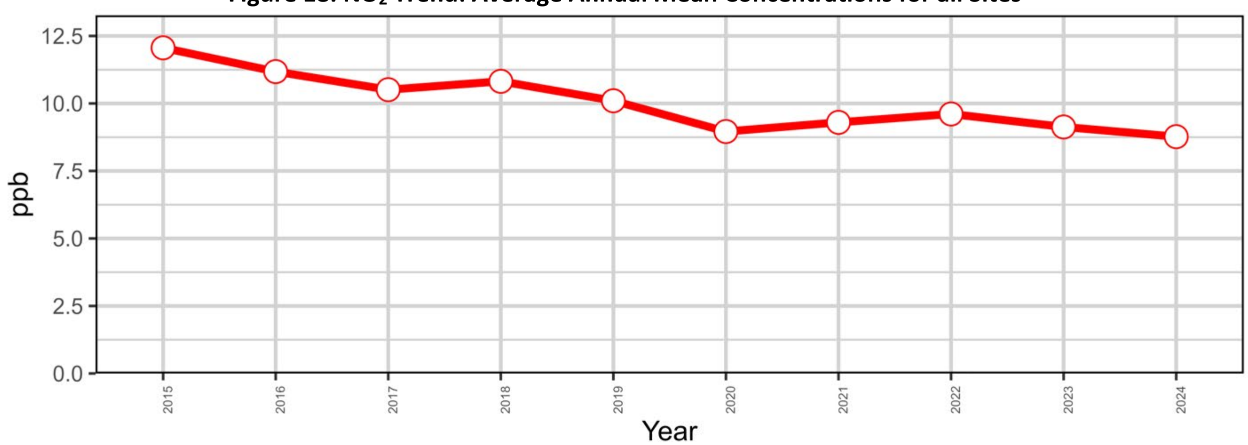


Figure 18 presents the average annual mean concentrations for all monitoring sites for years 2015 through 2024. NO_2 concentrations have been well under the NAAQS and overall have been on a downward trend over the last ten years.

Figure 18. NO_2 Trend: Average Annual Mean Concentrations for all Sites



E. Attainment Status

The entire state has always been designated as in attainment for both of the one-hour (100 ppb) and annual (53 ppb) NO_2 NAAQS. Table 14 and Figure 19 below present the design values for the one-hour NAAQS for years 2022 through 2024. Refer to Table 13 for the annual mean concentration for each county for 2024 which is presented in

Figure 20 below, and is the design value for the annual NAAQS. Counties that do not show data do not contain monitors and the value shown in the map is the highest concentration for each county where multiple monitors are operated in the same county. For the one-hour NAAQS, monitors without three years' worth of complete data are not considered to have valid design values for comparison to the one-hour NAAQS and are highlighted in green in Table 14.

Figure 19 presents the one-hour design value calculated by the three-year average of the 98th percentile concentrations and the three-year averages used to determine the one-hour design value for each county.

Figure 19. 2022-2024 One-Hour 98th Percentile NO_2 Design Values

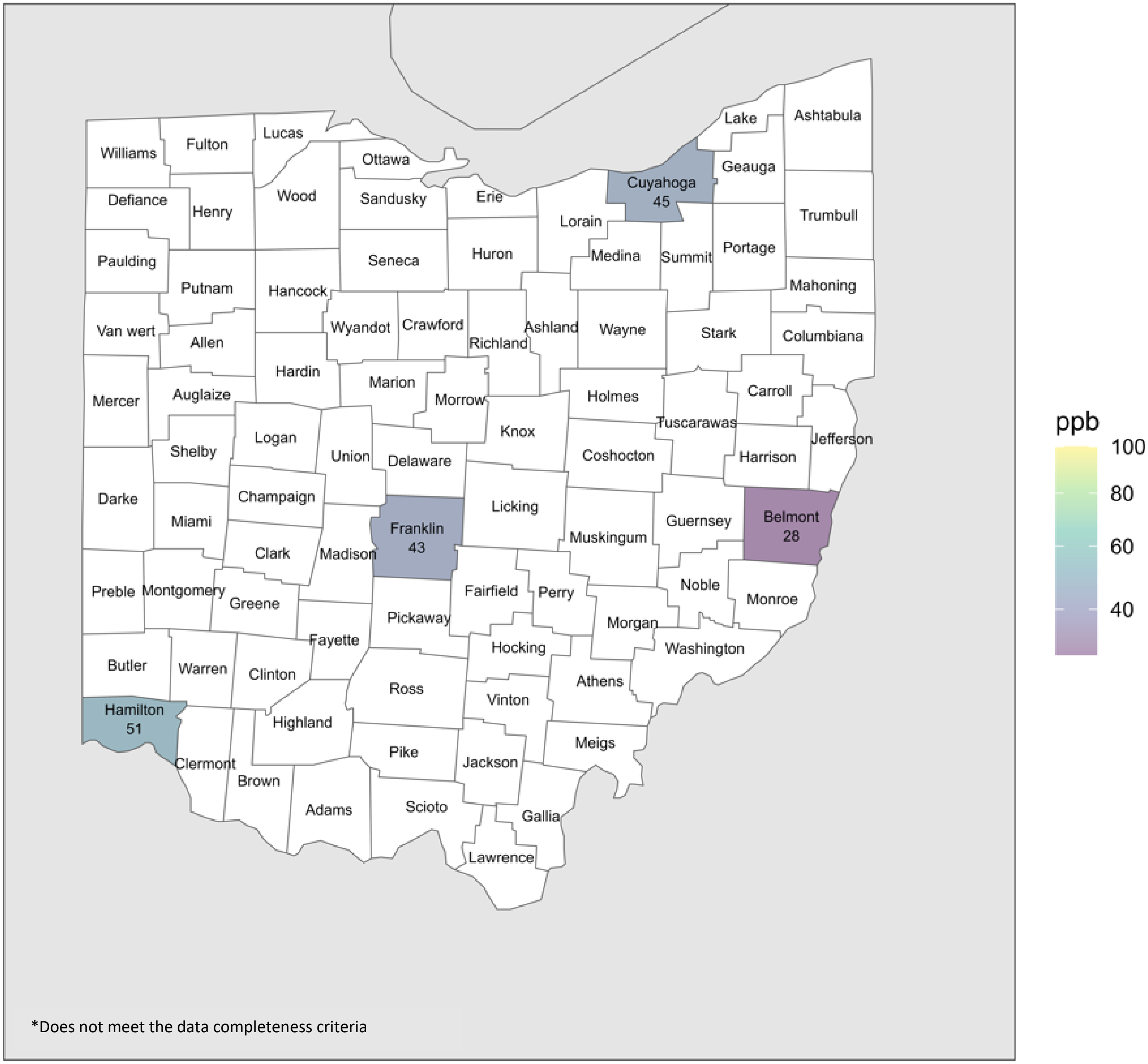


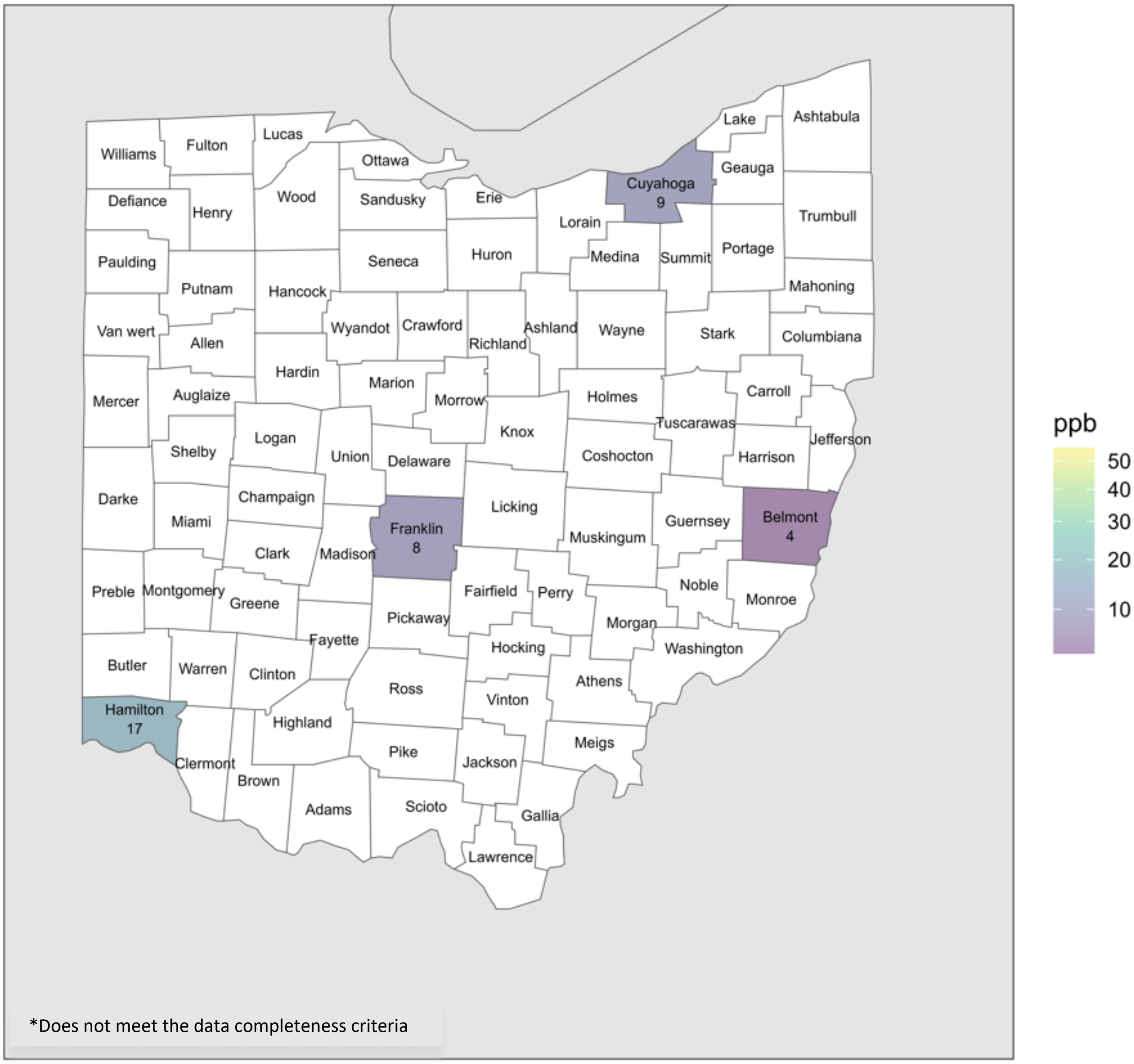
Table 14. NO_2 One-Hour 98th Percentile Concentrations and One-Hour Design Values (ppb)

Site ID	County	City	98th Percentile in Year 2022	2023	2024	Design Value 2022-2024
39-013-0006	Belmont	Shadyside	31	27	26	28
39-035-0060	Cuyahoga	Cleveland	49	44	41	45
39-035-0073		Warrensville Heights	34	34	30	33
39-049-0034	Franklin	Columbus	42	43	43	43
39-049-0038		Columbus	38	35	34	36
39-061-0040	Hamilton	Cincinnati	38	42	41	41
39-061-0048		Cincinnati	55	49	50	51

Insufficient data for valid statistical average. * Does not meet the data completeness criteria.

Figure 20 presents the annual design value which is the annual mean concentrations from Table 13 and is the annual design value for each county.

Figure 20. 2024 NO_2 Annual Concentrations



VI. SULFUR DIOXIDE (SO_2)

A. Overview

SO_2 is a colorless gas formed through the combination of sulfur and oxygen during combustion. The major sources of SO_2 are the burning of sulfur-containing fossil fuels (mainly coal), with lesser amounts caused by industrial processes such as smelting. The control of SO_2 emissions can be accomplished by burning coal or oil with a relatively low sulfur content. Newer boilers may be equipped with flue gas desulfurization systems that use a caustic solution to scrub SO_2 from the exhaust gas stream.

39-053-0006, Gallia County

In 2010, U.S. EPA revised the NAAQS for SO_2 by establishing a one-hour NAAQS at a level of 75 ppb based on the three-year average of the annual 99th percentile of one-hour daily maximum concentrations. In the same action, the primary annual and 24-hour NAAQS in effect were revoked. The three-hour 500 ppb secondary NAAQS (not to be exceeded more than once per year) was retained. On December 11, 2024, U. S. EPA revised the secondary NAAQS for SO_2 from a three-hour average, not to be exceeded more than once per year of 0.5 ppm to an annual average, averaged over three consecutive years, with a level of 10 ppb.

In 2024, there were 26 SO_2 sites.

B. Sampling Method

SO_2 is measured continuously by instruments using ultraviolet fluorescent techniques. The analyzers irradiate and air sample with ultraviolet light. SO_2 gas molecules absorb a portion of this energy, and then re-emit the energy at a characteristic wavelength of light. This light energy emitted by SO_2 molecules is sensed by a photomultiplier tube and converted to an electronic signal proportional to the concentration of SO_2 present.

C. Air Quality Data

Table 15 below present one-hour 99th percentile SO_2 data from continuous instruments Ohio EPA uses to evaluate air quality for the state (including one monitor located in West Virginia). Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. The one-hour[7] NAAQS is 75 ppb and compared against the column labeled "99th Percentile." Because the form of the one-hour primary NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2024. Results are reported as ppb. Data

[7] The annual 10 ppb NAAQS for SO_2 is the only NAAQS that is a secondary only NAAQS and is not directly analyzed as a part of this report's statistics.

reported below will also refer to a POC followed by a number. For SO_2, POC1 and POC2 instruments are dedicated for comparison with the NAAQS (or designated for quality assurance purposes).

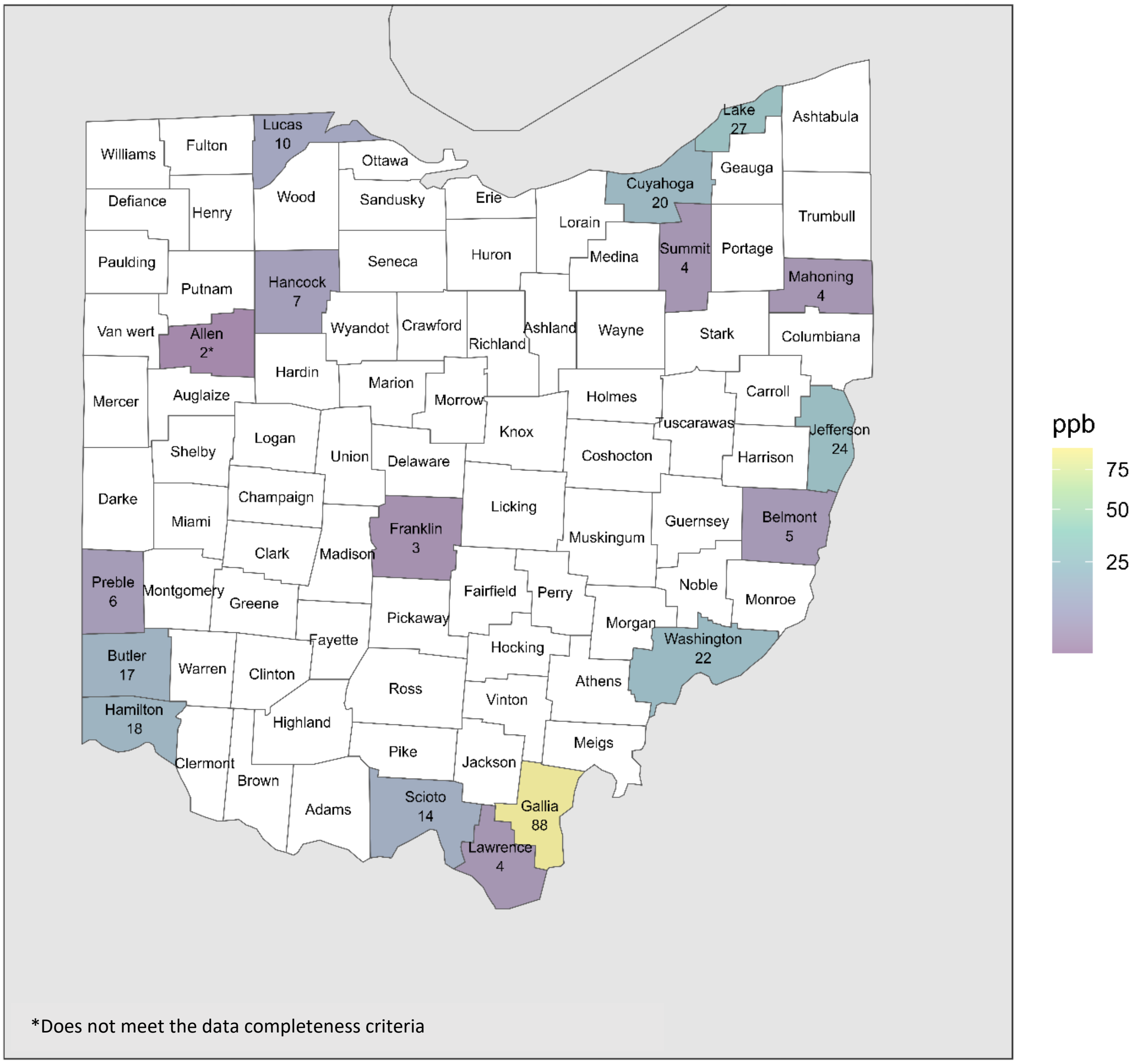
Table 15. SO_2 Air Monitoring Statistics (ppb)

County	Site ID	POC	City	Complete Quarters	Obs	1st Max 1-Hr	2nd Max 1-Hr	99th Percentile	Mean
Allen	39-003-0009	1	Lima	3	7774	4	3	2	0.42*
Belmont	39-013-0006	1	Shadyside	4	8303	8	6	5	0.22
Butler	39-017-0019	1	Middletown	4	8563	68	44	17	0.27
Butler	39-017-0020	1	Middletown	4	8621	19	16	11	0.63
Butler	39-017-0021	1	Middletown	4	8674	21	16	14	0.22
Cuyahoga	39-035-0038	2	Cleveland	4	8383	27	23	20	0.72
Cuyahoga	39-035-0060	2	Cleveland	4	8351	22	12	10	0.15
Cuyahoga	39-035-0065	1	Newburgh Heights	4	8462	34	10	7	0.04
Franklin	39-049-0034	1	Columbus	4	8356	3	3	3	0.14
Gallia	39-053-0004	1	Cheshire	4	8335	85	71	58	1.08
Gallia	39-053-0005	1	Cheshire	4	8326	136	122	88	1.71
Gallia	39-053-0006	1	Cheshire	4	8325	152	89	82	2.16
Hamilton	39-061-0010	2	Cleves	4	8669	29	19	18	0.21
Hamilton	39-061-0040	1	Cincinnati	4	8636	16	14	9	0.50
Hancock	39-063-0005	1	Fostoria	4	8359	24	13	7	1.17
Jefferson	39-081-0017	1	Steubenville	4	8342	28	27	24	1.71
Lake	39-085-0007	1	Painesville	4	8661	76	33	27	0.98
Lawrence	39-087-0012	1	Ironton	4	8328	6	5	4	0.22
Lucas	39-095-0008	2	Toledo	4	7923	67	18	10	0.19
Mahoning	39-099-0015	1	Youngstown	4	8377	6	5	4	1.10
Mason	54-053-0001^	1	Lakin	4	8287	132	100	70	1.37
Preble	39-135-1001	1	New Paris	4	7438	28	16	7	0.14
Scioto	39-145-0020	1	Franklin Furnace	4	8664	22	15	14	0.52
Scioto	39-145-0022	1	Franklin Furnace	4	8555	9	9	6	0.14
Summit	39-153-0017	1	Akron	4	8712	7	7	4	0.11
Washington	39-167-0011	1	Beverly	4	8475	30	29	22	0.71

*Does not meet the data completeness criteria. ^Indicates monitor is located in West Virginia.

Figure 21 presents the 99th percentile one-hour concentrations for 2024. For counties with more than one SO_2 monitor the highest value was used. Only monitors in Ohio counties are represented in this map. All concentrations for SO_2 are reported in ppb.

Figure 21. 2024 SO_2 99th Percentile One-Hour Concentrations



D. Ten Year Air Quality Trends

Figure 22 presents the average of each year's 99th percentile values for all monitoring sites for 2015 through 2024.

Figure 22. SO_2 Trend: Average One-Hour 99th Percentile Concentrations for all Sites

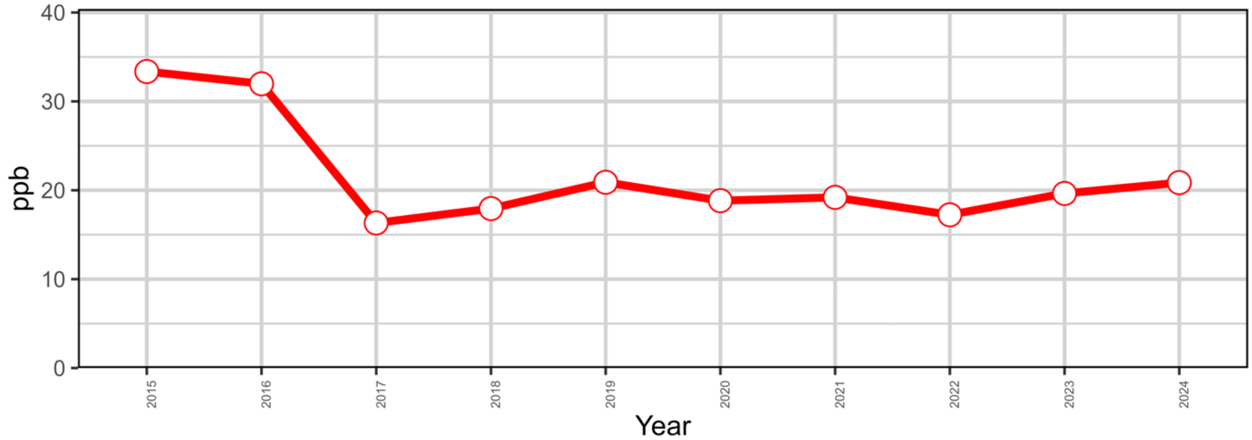
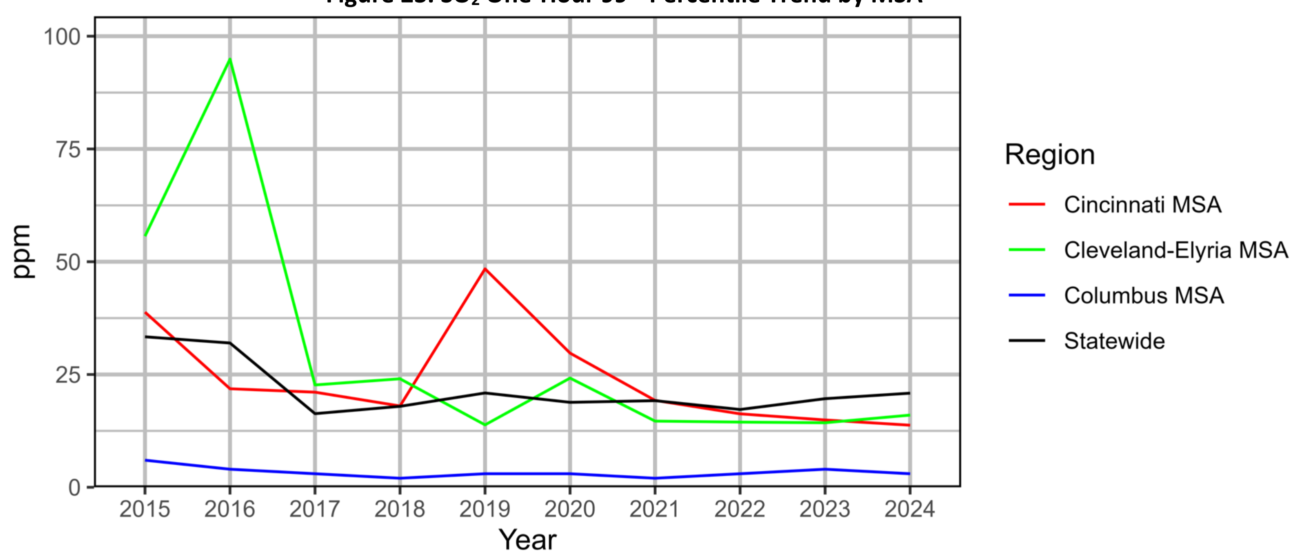


Figure 23 presents the statewide average of each year's annual averages from Figure 22 in comparison to the average of each year's annual averages for three largest MSAs in Ohio. There has historically been significant SO_2 reductions over the years since the promulgation of the first SO_2 NAAQS in 1971. While the graph in Figure 23 indicates a few occasions with increases in SO_2 concentrations, these instances have occurred with industry specific increases in emissions. Ohio EPA has addressed these instances as they have occurred. Most recently, as seen in Table 12, hourly exceedances have occurred in Gallia and Mason (WV) Counties. These monitoring sites were established to monitor emissions from two power plants located in the area. Ohio EPA is currently working with these facilities to understand possible causes of these exceedances. As seen in Figure 23, even with the few industry-specific increases in SO_2 emissions over the years, Ohio continues to see steady concentrations below the NAAQS.

Figure 23. SO_2 One-Hour 99th Percentile Trend by MSA



E. Attainment Status

In 2024, there was one nonattainment area for the one-hour (75 ppb) primary SO_2 NAAQS. This nonattainment area is located in southeastern Ohio and includes Center Township in Morgan County and Waterford Township in Washington County and is known as the Muskingum River nonattainment area. The area has been monitoring attainment with a three-year design value since 2017. Ohio EPA submitted revisions to the attainment strategy for the area on May 24, 2023. On September 8, 2023, U.S. EPA approved (88 FR 61969) Ohio EPA's attainment plan for the Muskingum River nonattainment area. Ohio EPA followed the attainment demonstration submittal with a redesignation request and maintenance plan submittal on March 31, 2025. On October 2, 2025, U.S. EPA proposed to approve this redesignation request and maintenance plan (90 FR 47686). At the time of this report, Ohio EPA is awaiting final rulemaking from U.S. EPA to formally redesignate the Muskingum River nonattainment area to attainment for the one-hour primary SO_2 NAAQS.

With the newly revised secondary SO_2 NAAQS, Ohio EPA prepared recommended designations and submitted those for U.S. EPA's review and approval on December 5, 2025. Ohio EPA is recommending a designation of attainment/unclassifiable for the entire state. All of the above-mentioned documents can be found on our SIP website (https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans).

The maps and data tables below present the design values for the primary one-hour NAAQS for years 2022 through 2024. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values for comparison to the NAAQS and are highlighted in green in Table 16.

Figure 24 presents the one-hour design value calculated by the three-year average of the 99^{th} percentile of one-hour maximum concentrations and Table 16 presents each year's individual 99^{th} percentile of one-hour maximum concentration and the three-year averages used to determine the one-hour design value for each county.

Figure 24. 2022-2024 One-Hour SO_2 Design Values

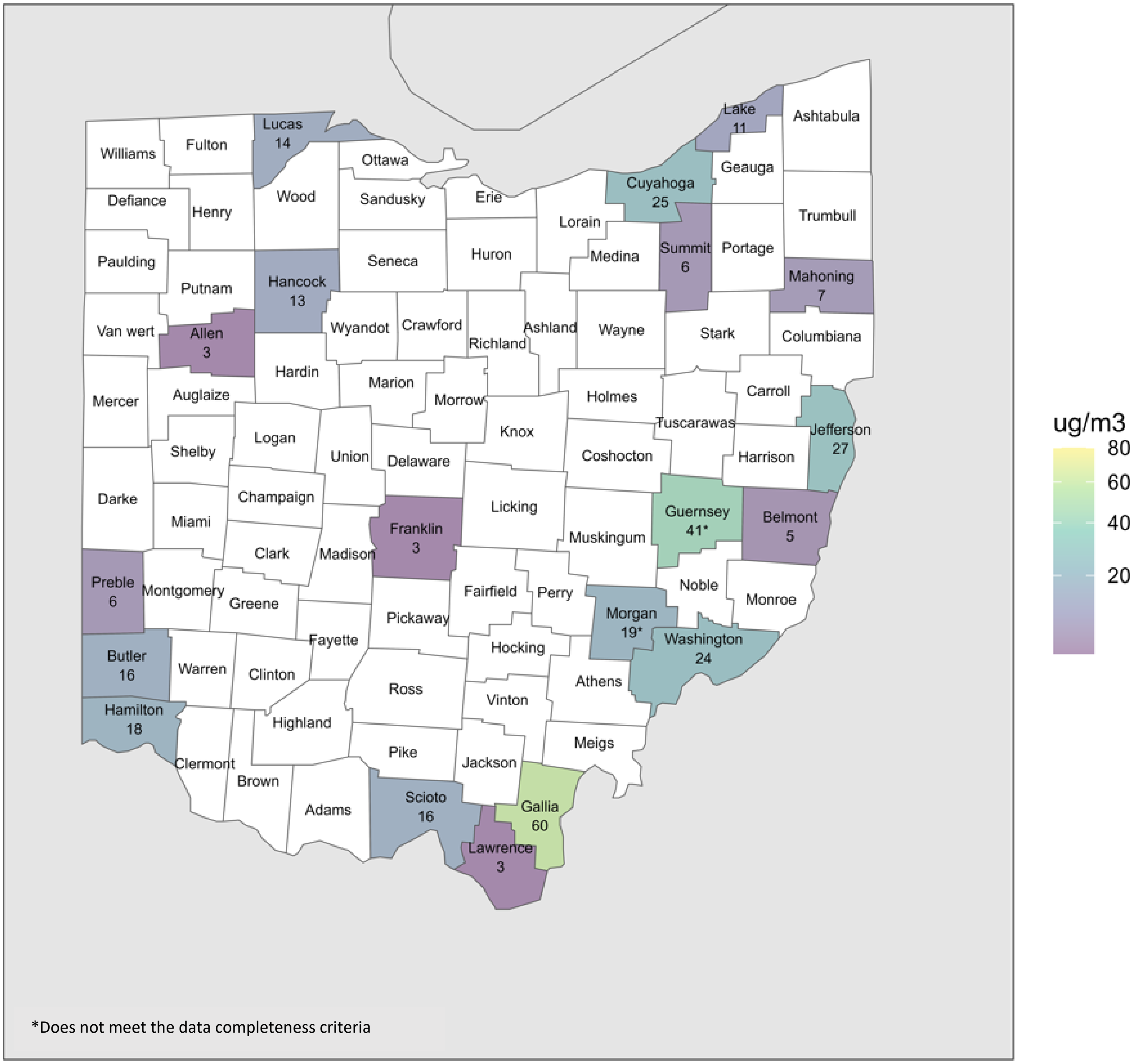


Table 16. SO_2 99th Percentile Concentrations and One-Hour Design Values (ppb)

Site ID	County	City	99th Percentile in Year			Design Value
			2022	2023	2024	2022-2024
39-003-0009	Allen	Lima	4.0	3.0	2.0*	3
39-013-0006	Belmont	Shadyside	4.0	5.0	5.0	5
39-017-0019	Butler	Middletown	18.0	14.0	17.0	16
39-017-0020		Middletown	13.0	21.0	11.0	15
39-017-0021		Middletown	13.0	20.0	14.0	16
39-035-0038	Cuyahoga	Cleveland	28.0	27.0	20.0	25
39-035-0060		Cleveland	12.8	19.2	10.0	14
39-035-0065		Newburgh Heights	13.0	8.0	7.0	9
39-049-0034	Franklin	Columbus	3.0	4.0	3.0	3
39-053-0004	Gallia	Cheshire	30.0	47.0	58.0	45
39-053-0005		Cheshire	40.0	52.0	88.0	60
39-053-0006		Cheshire	32.0	52.0	82.0	55
39-059-0003	Guernsey	Byesville	33.1	49.2	---*	41
39-059-0004		Byesville	19.2	37.0	---*	28
39-061-0010	Hamilton	Cleves	24.0	13.0	18.0	18
39-061-0040		Cincinnati	13.4	6.6	8.8	10
39-063-0005	Hancock	Fostoria	13.0	18.0	7.0	13
39-081-0017	Jefferson	Steubenville	36.0	22.0	24.0	27
39-085-0007	Lake	Painesville	4.0	3.0	27.0	11
39-087-0012	Lawrence	Ironton	4.0	2.0	4.0	3
39-095-0008	Lucas	Toledo	17.0	15.0	10.0	14
39-099-0015	Mahoning	Youngstown	6.0	10.0	4.0	7
54-053-0001^	Mason	Lakin	32.0	36.0	70.0	46
39-115-0004	Morgan	Center Township	13.0	24.0	---*	19
39-135-1001	Preble	New Paris	6.5	4.6	6.5	6
39-145-0020	Scioto	Franklin Furnace	21.0	12.0	14.0	16
39-145-0022		Franklin Furnace	17.0	11.0	6.0	11
39-153-0017	Summit	Akron	6.0	8.0	4.0	6
39-167-0011	Washington	Beverly	24.0	26.0	22.0	24

[Shaded] Insufficient data for valid statistical average; * Does not meet the data completeness criteria.

^Indicates monitor is located in West Virginia.

VII. CARBON MONOXIDE (CO)

A. Overview

CO is a colorless and odorless gas and the most abundant and widely distributed NAAQS pollutant found in the lower atmosphere. It is produced by the incomplete combustion of carbon containing fuels, primarily in the internal combustion engine.

39-035-0051, Cuyahoga County

There are two NAAQS for CO, the one-hour is set at 35 ppm and the eight-hour is set at 9 ppm, neither to be exceeded more than once per year.

In 2024, there were seven CO sites.

B. Sampling Method

CO is monitored continuously by analyzers that operate on the infrared absorption principle. Air is drawn into a sample chamber and a beam of infrared light is passed through it. CO absorbs infrared radiation, and any decrease in the intensity of the beam is due to the presence of CO molecules. This decrease is directly related to the concentration of CO in the air. A special detector measures the difference in the radiation between this beam and a duplicate beam passing through a reference chamber with no CO present. This difference in intensity is electronically translated into a reading of the CO.

C. Air Quality Data

Table 17 presents one-hour and eight-hour CO data from continuous instruments Ohio EPA uses to evaluate air quality for the state. The one-hour NAAQS is 35 ppm and compared against the column labeled "1st Max 1-Hr" while the eight-hour NAAQS is 9 ppm and compared against the column labeled "1st Max 8-Hr". Results are reported as ppm.

Table 17. CO One-Hour and Eight-Hour Air Monitoring Statistics (ppm)

County	Site ID	POC	City	Obs	1st Max 1-Hr	2nd Max 1-Hr	Obs >1-Hr NAAQS	1st Max 8-Hr	2nd Max 8-Hr	Obs >8-Hr NAAQS
Cuyahoga	39-035-0051	1	Cleveland	8470	8.7	5.9	0	4.2	2.2	0
Cuyahoga	39-035-0060	1	Cleveland	8343	1.5	1.4	0	0.7	0.6	0
Cuyahoga	39-035-0073	1	Warrensville Heights	7871	1.1	1.0	0	0.9	0.8	0
Franklin	39-049-0038	1	Columbus	6512	1.9	1.8	0	1.4	1.1	0
Hamilton	39-061-0040	1	Cincinnati	8318	1.8	1.7	0	1.1	0.8	0
Hamilton	39-061-0048	1	Cincinnati	8459	1.7	1.6	0	1.4	1.2	0
Preble	39-135-1001	1	New Paris	7676	0.7	0.5	0	0.3	0.3	0

Figures presenting the one-hour 1st highest maximum concentrations and eight-hour 1st highest maximum concentration for monitors in 2024 are included in the Attainment Status section below since these values are directly comparable to the NAAQS and therefore indicate monitored attainment status.

D. Ten Year Air Quality Trends

Figure 25 presents the average of each year's one-hour 1st highest maximum concentration for all monitoring sites for years 2015 through 2024. Figure 26 presents the average of each year's eight-hour 1st highest maximum concentration for all monitoring sites for years 2015 through 2024. CO concentration have remained well below the NAAQS for the last few decades despite a slight increase in 2023. This increase is attributed to one monitoring site on a day when smoke from wildfires was documented in the area of the monitoring location. 2024 concentrations have since returned to levels that are consistent with previous years that did not have impacts from wildfire smoke.

Figure 25. CO Trend: Average 1st Highest Maximum One-Hour Concentrations for all Sites

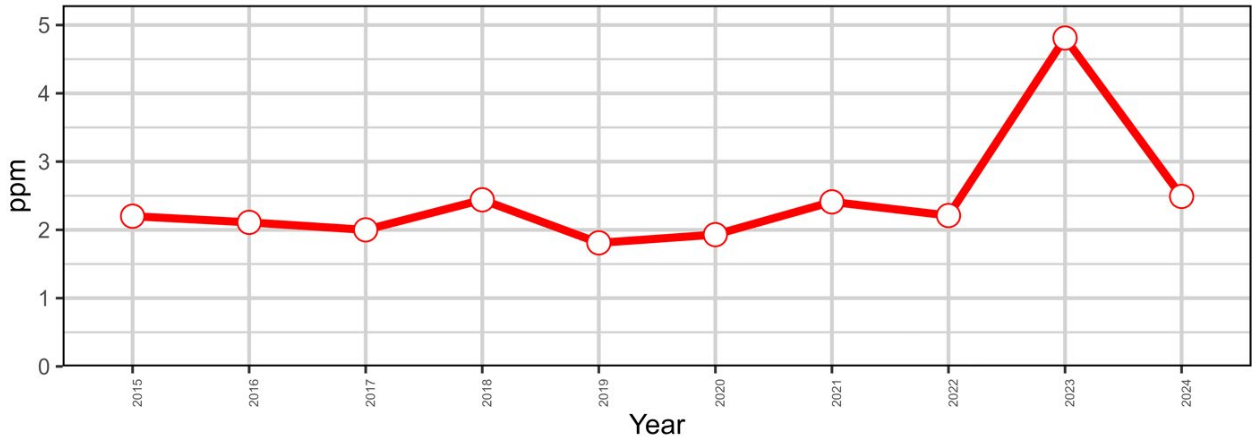
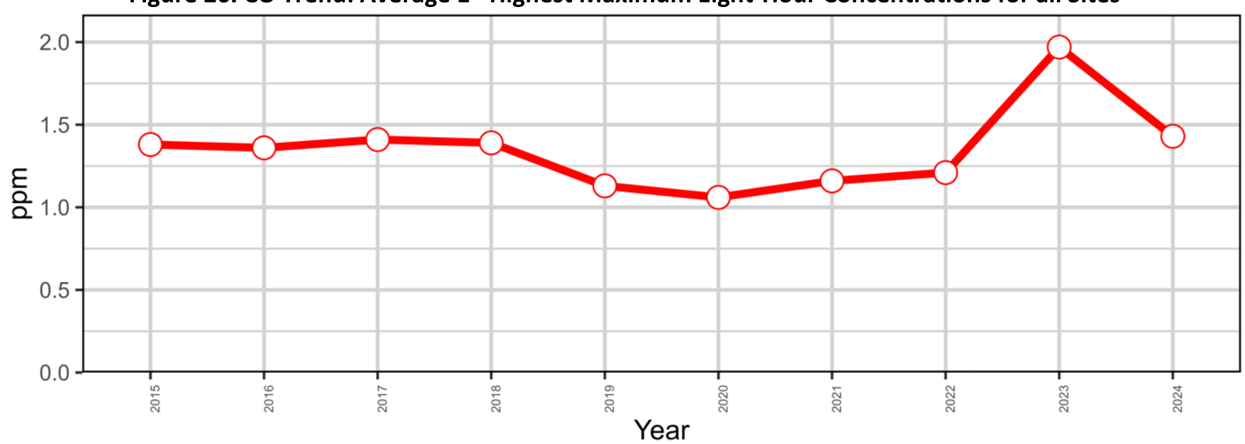


Figure 26. CO Trend: Average 1st Highest Maximum Eight-Hour Concentrations for all Sites



E. Attainment Status

The entire state has been designated as attainment for both the one-hour and eight-hour NAAQS since 1994. The last violation of the one-hour CO NAAQS occurred in 1990 in Jefferson County. The last violation of the eight-hour NAAQS occurred in 1993 in Cuyahoga County. The maps below present the design values for both NAAQS for 2024. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Refer to Table 17 above for the one-hour and eight-hour highest maximum concentrations that are considered the design values for 2024. These concentrations are displayed in the figures below.

Figure 27 presents the one-hour design value calculated by the 2024 1st highest maximum one-hour concentration.

Figure 27. 2024 One-Hour CO Design Values

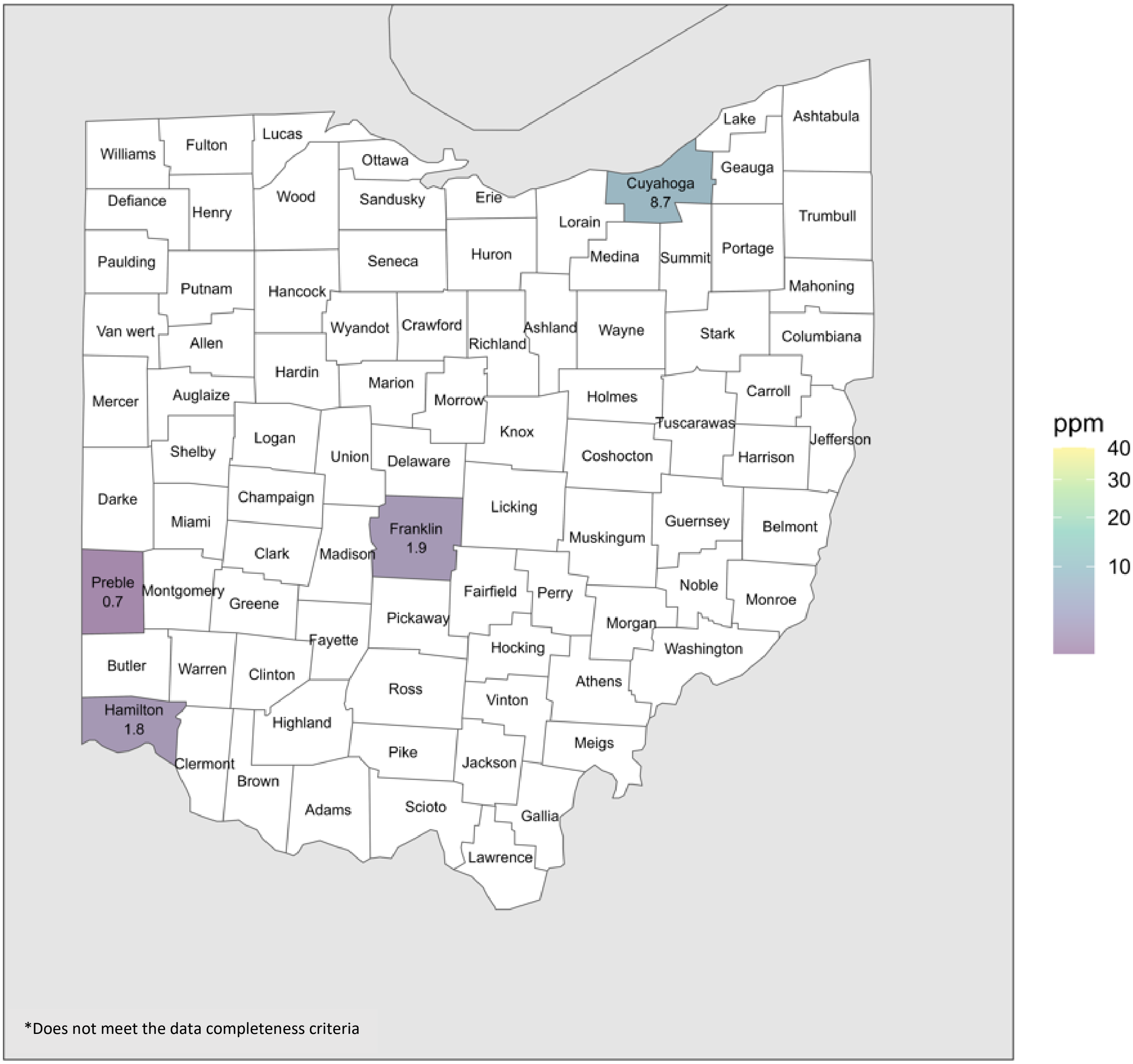
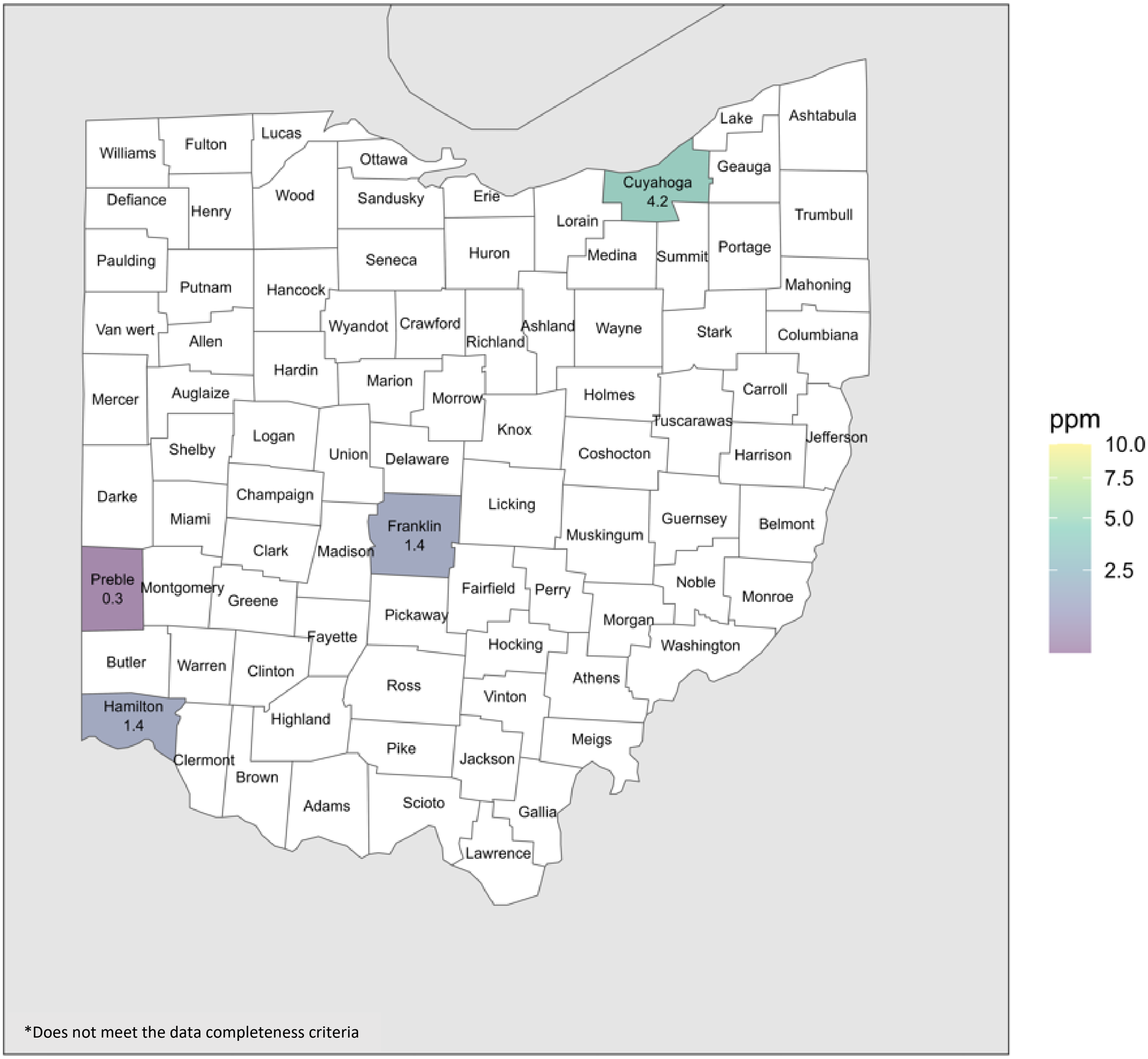


Figure 28 presents the eight-hour design value calculated by the 2024 1st highest maximum eight-hour concentration.

Figure 28. 2024 Eight-Hour CO Design Values



VIII. LEAD (PB)

A. Overview

Airborne lead was historically caused by vehicles using leaded fuels. Now the primary sources of airborne lead include lead smelting facilities, lead-acid storage battery manufacturing plants and other manufacturing operations.

In the period from 1978 to 1991, lead concentrations at traffic-oriented sites dropped by over 90%, reflecting the removal of lead from gasoline. In 1999, the U.S. EPA eliminated the requirement for traffic-oriented sites and shifted focus to monitoring at industrial sources. Ohio EPA discontinued monitoring at traffic-oriented sites in 1999.

39-029-0019, Columbiana County

In 2008, U.S. EPA promulgated revisions to the NAAQS for lead by strengthening it from 1.5 µg/m^3 as a calendar quarter average to 0.15 µg/m^3 as a rolling three-month average. The revised lead NAAQS requires monitoring at lead sources that report actual emissions of greater than 0.5 tons per year.

In 2024, there were 11 lead sites with 16 total monitors.

B. Sampling Method

Lead samples are collected as TSP on glass fiber filters according to 40 CFR Part 50, Appendix B, Reference method for the Determination of Suspended Particulate Matter in the Atmosphere. These filters are then analyzed by the manual Equivalent method: EQL-0710-192, *Heated Nitric Acid Hot Block Digestion and ICP/MS Analysis for Lead (Pb) on TSP High-Volume Filters*. In this method, one ¾"x 8" portion or strip, of the TSP filter is dissolved in a solution of nitric acid, heated on a hot block, on which the solution is reduced to final volume for analysis. The extracted solution is then analyzed by inductively coupled plasma-mass spectrometry, (ICP/MS) to determine the amount of lead collected on the original filter.

C. Air Quality Data

Table 18 displays maximum one-month average and maximum three-month rolling averages for lead data from intermittent instruments Ohio EPA uses to evaluate air quality for the state. The lead NAAQS is 0.15 µg/m^3 as a three-month rolling average not to be exceeded and is compared against the column labeled "Max 3-Month Average." The maximum one-month average and the month it occurred are also included in the table below but are not comparable to the NAAQS. All concentrations for lead are reported as µg/m^3.

Table 18. Lead Air Monitoring Statistics (µg/m³)

County	Site ID	City	Max 1-Month Average	Month of 1-Month Max^	Max 3-Month Average	Month of 3-Month Max	Valid Months
Columbiana	39-029-0019	East Liverpool	.02	December	.01	April	12
Columbiana	39-029-0020	East Liverpool	.01	December	.01	October	12
Columbiana	39-029-0023	East Liverpool	.02	April	.01	January	12
Cuyahoga	39-035-0038	Cleveland	.06	July	.04	July	12
Cuyahoga	39-035-0049	Cleveland	.02	July	.02	July	12
Franklin	39-049-0040	Columbus	.01	July	.01	July	12
Fulton	39-051-0001	Delta	.01	December	.01	January	11
Marion	39-101-0003+	Marion	.01	May	.01	January	5
Marion	39-101-0004+	Marion	.01	May	.01	January	5
Stark	39-151-0024	Canton	.01	October	.00	January	12
Stark	39-151-0025	Canton	.01	October	.01	October	12

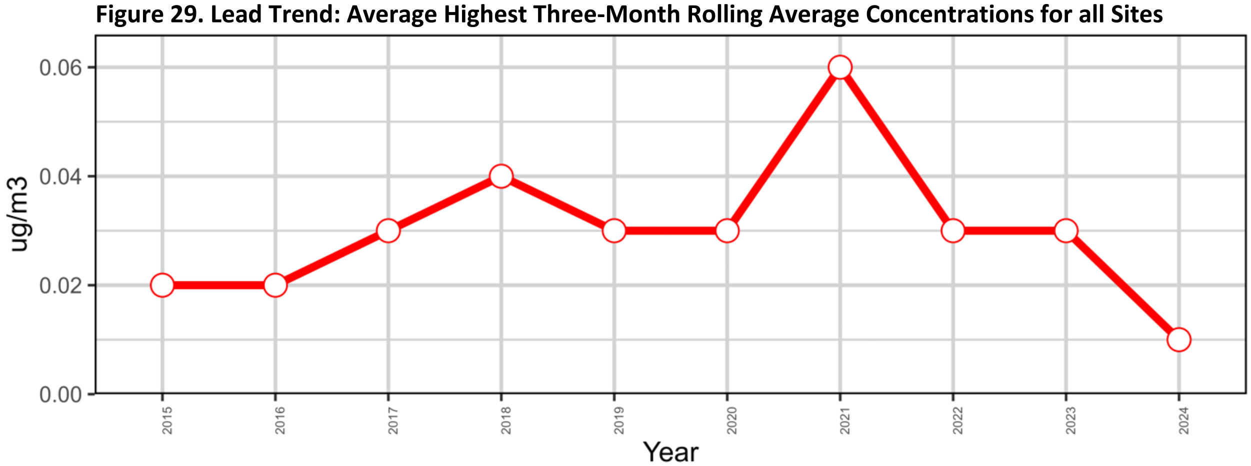
^Where multiple months have the same 1-Month Max, the last month of the year is identified. + Monitoring discontinued June 2024.

A figure displaying the highest three-month rolling average concentrations for monitors in 2024 is included in the Attainment Status section below since these values are directly comparable to the NAAQS and therefore indicate monitored attainment status.

D. Ten Year Air Quality Trends

Figure 29 presents the average of each year's highest three-month rolling average concentration for all monitoring sites for years 2015 through 2024.

Figure 29. Lead Trend: Average Highest Three-Month Rolling Average Concentrations for all Sites



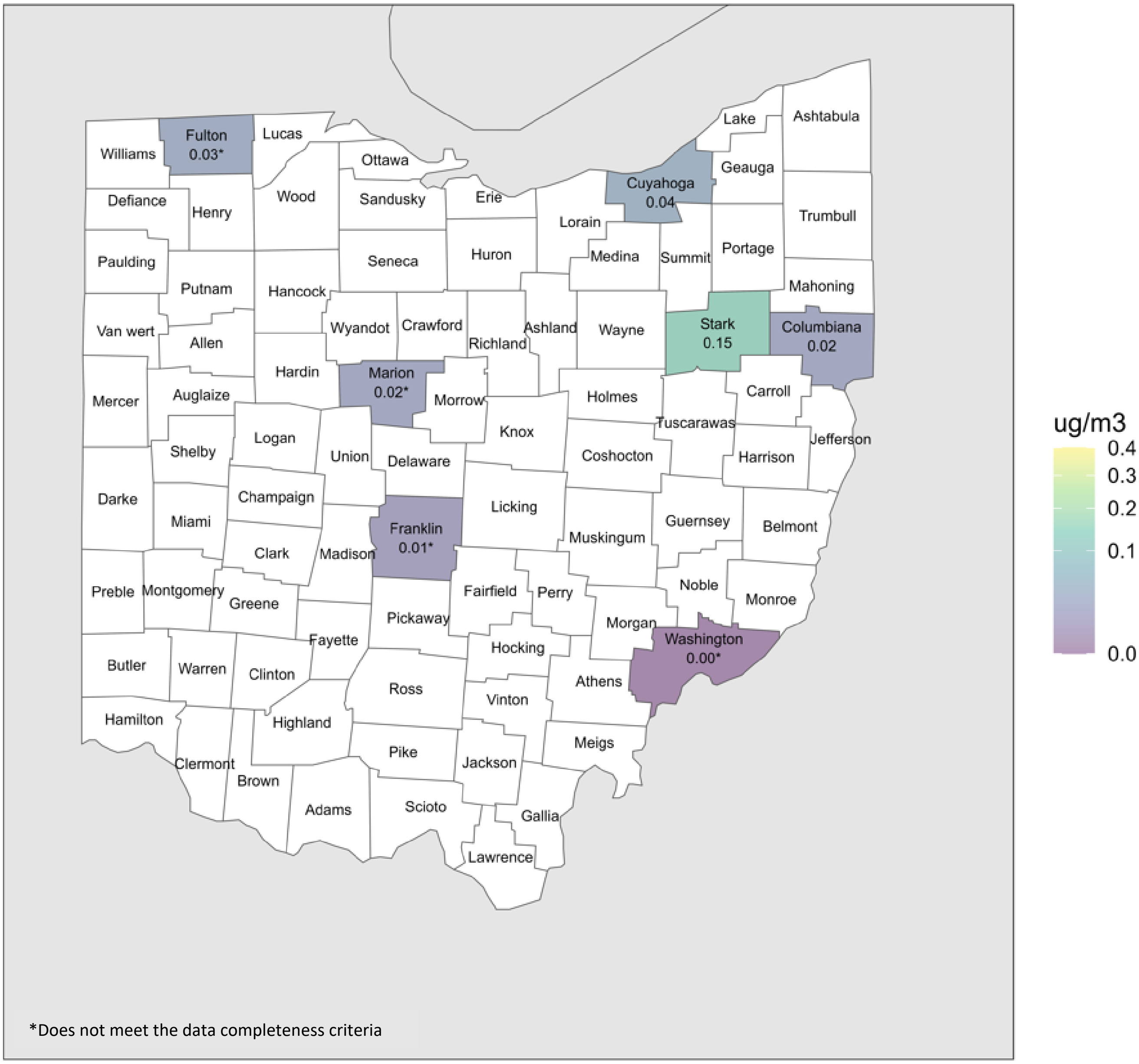
Overall Ohio has made great strides in reducing lead emissions over the last few decades and continues to do so today. The increase in the statewide average concentration, beginning in 2017, is due to a sole source in Stark County (monitor 39-151-0024), which ceased operations in 2023.

E. Attainment Status

Since March 2018, the entire state had been designated as in attainment for the lead NAAQS. However, on May 3, 2022 (87 FR 26147), U.S. EPA provided public notice they intend to redesignate a portion of the Canton Ohio area in northeastern Stark County from attainment to nonattainment for the 2008 lead NAAQS. On March 10, 2023 (88 FR 14920), U.S. EPA issued final determination on this matter to redesignate a portion of Stark County as nonattainment for the lead NAAQS, effective April 10, 2023. Ohio EPA submitted an attainment demonstration to U.S. EPA on September 19, 2024. Ohio EPA followed the attainment demonstration submittal with a redesignation request and maintenance plan on April 25, 2025, and is currently awaiting a response from U.S. EPA on this matter. All documentation submitted can be found on our SIP website (https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans).

The map below presents the design values for the lead NAAQS for 2024. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Refer to Table 18 for the highest three-month rolling average concentrations that are considered the design values for 2024 and included in the figure below. Figure 30 presents the three-month rolling average design value for lead for 2024.

Figure 30. 2024 Lead Design Values



IX. TOTAL SUSPENDED PARTICULATE (TSP)

A. Overview

TSP is defined as any liquid (aerosol) or solid substance found in the atmosphere. Particles larger than approximately 100 microns in diameter settle rapidly due to gravity and are not considered suspended particulates. Fly ash, process dusts, soot and oil aerosols are all common forms of suspended particulate matter. The major sources of particulate pollution are industrial processes, electric power generation, industrial fuel combustion, and dust from roadways and construction sites. Particulate pollution causes a wide range of damage to materials, as well as limiting visibility and reducing the amount of sunlight reaching the earth. Components of particulates may be harmful, such as sulfates, nitrates and metals. The major adverse health effects on humans are related to damage to the respiratory system through interference with the lungs' natural cleansing processes.

39-035-0038, Cuyahoga County

In 1987, TSP sampling was gradually replaced by PM_{10} and then $PM_{2.5}$ sampling. The number of monitors decreased from over 200 in 1987 to two sites with three total monitors in 2024. TSP monitors are now primarily used for the purpose of collecting data for lead and other metals, although in some cases Ohio will still collect TSP data for the purpose of comparing to historical trends. There are no longer any NAAQS for TSP.

B. Sampling Method

TSP is measured by the high-volume air sampler method. This instrument draws measured volumes of air through a glass fiber filter for 24 hours. Particulate matter trapped on the filter is weighed to determine the mass of the particulates collected per volume of air.

C. Air Quality Data

Table 19 displays TSP data Ohio EPA uses to evaluate air quality for the state and evaluate historical trends. Data presented with an asterisk (*) indicates the data completeness criteria established by U.S. EPA were not met. All concentrations for TSP are reported as $\mu g/m^3$.

Table 19. TSP Air Monitoring Statistics (µg/m³)

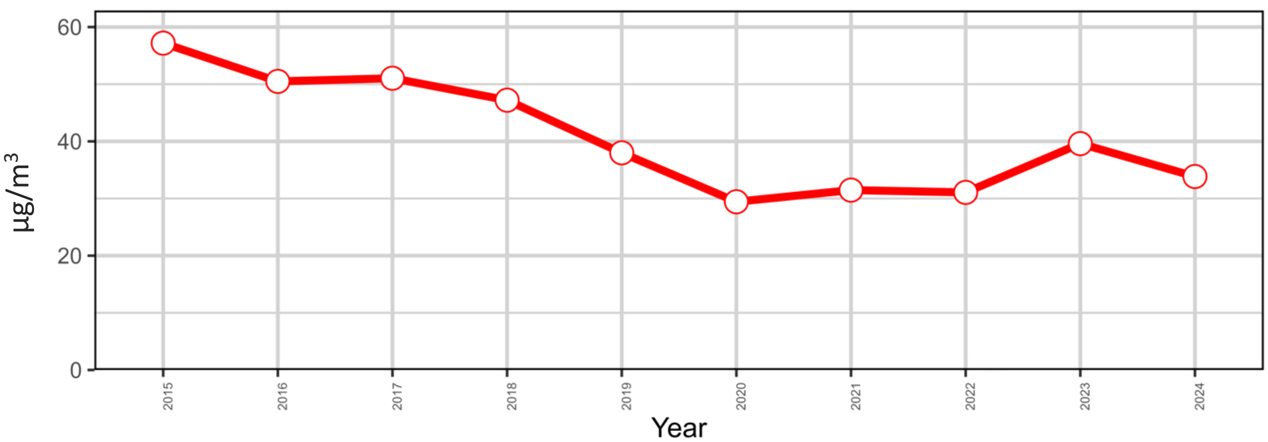
County	Site ID	POC	City	Obs	1st Max	2nd Max	3rd Max	4th Max	Mean
Columbiana	39-029-0023	1	East Liverpool	61	82	62	53	45	23.3
Cuyahoga	39-035-0038	1	Cleveland	57	137	106	91	90	44.4

*Does not meet the data completeness criteria.

D. Ten Year Air Quality Trends

Figure 31 presents the average of each year's mean concentration for all monitoring sites for years 2015 through 2024. TSP concentrations in the state have been fairly consistent over the last ten years and overall trend downwards.

Figure 31. TSP Trend: Average Mean Concentrations for all Sites



X. AIR TOXICS

A. Overview

Ohio EPA operates a network of air toxics monitors as part of a state-wide Air Toxics Monitoring Program (ATMP). This sampling network is modeled after programs and methods recommended by U.S. EPA. The emphasis has been on urban toxics monitoring for VOCs and heavy metals. Following this introduction, there are brief sections describing sampling and analytical procedures for the pollutants monitored.

39-081-0017, Jefferson County

The principle focus of the ATMP is urban monitoring – looking for risks in areas where people live. In support of this effort, air toxics monitoring has concentrated on the following groups of compounds:

- VOCs
- examples: benzene, chloroform, styrene, toluene
- heavy metals
- examples: beryllium, manganese

Intermittent air sampling has been conducted at semi-permanent monitoring sites (where monitoring extends beyond a six-month period) for VOCs and heavy metals.

Past sampling efforts have included:

- Cross Media pollution monitoring
- Urban air toxics
- Great Lakes deposition monitoring
- Source monitoring
- Post-remediation Monitoring
- Complaint investigation
- Emergency Episode Monitoring
- Emissions verification

During 2024, Ohio EPA conducted mostly routine air toxics monitoring although some short projects were also conducted throughout the state. The sampling and analytical methods for VOCs and heavy metals are described below.

B. Volatile Organic Compound (VOC)

<u>Sampling Method</u>

A major component of the ATMP is ambient sampling for VOCs which are compounds that are generally found in the vapor state. Most VOC samples were collected using a whole air sampling system that pumps ambient air into a stainless-steel canister, which allows an air sample to be maintained virtually unchanged until it is analyzed. Samples can also be collected using only the vacuum of the canister to draw in an air sample. These vacuum-filled "grab" samples usually take only a few minutes to collect and are useful for collecting transient odors or potentially high concentration samples. Ohio EPA is now capable of collecting specific samples for one-, three, eight-, and 24-hours using this grab sampling method.

Samples at the semi-permanent sampling sites are collected consistent with the national air toxics monitoring schedule of once every 12th day or every 6th day over a 24-hour sampling period. Specific procedures for this type of sampling can be found in U.S. EPA's Compendium of Methods for the Determination of Toxic Organic Compound in Ambient Air in the section TO-15.

Analysis

The volatile tendency of VOCs allows them to be vaporized when heated, if not already in a gaseous state, and injected into an analytical instrument called a gas chromatograph mass spectrometer (GC/MS). As a sample passes through a GC column, various compounds separate out of the sample mixture. As the individual compounds exit the column, and pass through the MS, the detector records a response. That response is illustrated on a chromatogram as a peak, the area of which indicates the concentration of the compound. Compound identification is accomplished in part by comparing unknown peak retention times (the measure of time it takes for an individual compound to pass through a chromatography column) with those from a chromatogram of a known mixture of compounds analyzed under the same conditions. In addition, compound identification is confirmed by examination of the fragmentation pattern of ions of the various VOCs when compared to the pattern for each compound stored in the instrument database.

Most canister samples collected in Ohio were analyzed by the Ohio EPA, Division of Environmental Services (DES). Canister samples from counties under the jurisdiction of the Southwest Ohio Air Quality Agency were analyzed by a third-party lab. Laboratory analytical methods for VOC detection must follow procedures outlined in 40 CFR Part 136 for determining the analytical equipment's method detection limit (MDL) for each compound.

Differing from the MDL, a separate reporting limit (RL) is based on the equipment's practical quantitation limits. Any amount detected below the RL is identified as such, and the lab report further identifies if that sample was:

- less than the RL but greater than the MDL. This indicates that the compound may be present, however the concentration is estimated due to the fact it is below the RL. Even as an estimated value, the laboratory has a high confidence in the concentration of the sample and the value is reported. Or,
- less than the RL and less than the MDL. This is considered a non-detection.

Concentrations equal to or above the RL are reported without caveat, unless otherwise qualified. Most VOC target compounds' RL is 0.1 parts per billion by volume (ppbv). The RL can periodically change if the calculated MDL value, for a specific parameter, changes, or there are changes to instrument sensitivity. The qualifiers are included on the raw data from the laboratory and are not displayed in this report but affect which values are reported to the statistical database from which data for this report is generated. The tables below summarize the data for each compound collected in the state.

Table 20 presents target compounds for VOC analysis. Table 21 presents results for 24-hour samples of each target compound. Averages in Table 21 were calculated from concentrations above the reporting limit or those that are less than the RL but greater than the MDL. Non-detections or zero values are not included in the calculated averages reported below. The frequency detected column displays the number of times a compound was at or above the reporting limit or less than the RL but greater than the MDL and the number of times that compound was sampled for at sites throughout the state in 2024.

Table 22 has information about VOC sites operating in 2024, and Table 23 provides a summary of all VOC parameters for each site. Sites that did not sample for a given compound will display "DNS".

Table 20. DES VOC Target Compound List For TO-15 Analysis

	CAS #	Compound Name		CAS #	Compound Name		CAS #	Compound Name
1	000071-55-6	1,1,1-Trichloroethane	**26**	000067-64-1	Acetone	**51**	000067-63-0	Isopropyl alcohol
2	000079-34-5	1,1,2,2-Tetrachloroethane	**27**	000107-02-8	Acrolein	**52**	000080-62-6	Methyl methacrylate
3	000076-13-1	1,1,2-Trichloro-1,2,2-	**28**	000107-13-1	Acrylonitrile	**53**	001634-04-4	Methyl-butyl ether
4	000079-00-5	1,1,2-Trichloroethane	**29**	000071-43-2	Benzene	**54**	000075-09-2	Methylene chloride
5	000075-34-3	1,1-Dichloroethane	**30**	000100-44-7	Benzyl chloride	**55**	000091-20-3	Naphthalene
6	000075-35-4	1,1-Dichloroethene	**31**	000075-27-4	Bromodichloromethane	**56**	000106-97-8	n-Butane
7	000120-82-1	1,2,4-Trichlorobenzene	**32**	000075-25-2	Bromoform	**57**	000142-82-5	n-Heptane
8	000095-63-6	1,2,4-Trimethylbenzene	**33**	000074-83-9	Bromomethane	**58**	000111-84-2	n-Nonane
9	000106-93-4	1,2-Dibromoethane	**34**	000075-15-0	Carbon disulfide	**59**	000109-66-0	n-Pentane
10	000076-14-2	1,2-Dichloro-1,1,2,2-	**35**	000056-23-5	Carbon tetrachloride	**60**	000103-65-1	n-Propylbenzene
11	000095-50-1	1,2-Dichlorobenzene	**36**	000108-90-7	Chlorobenzene	**61**	000095-49-8	o-Chlorotoluene
12	000107-06-2	1,2-Dichloroethane	**37**	000075-00-3	Chloroethane	**62**	000095-47-6	o-Xylene
13	000078-87-5	1,2-Dichloropropane	**38**	000067-66-3	Chloroform	**63**	000115-07-1	Propylene
14	000108-67-8	1,3,5-Trimethylbenzene	**39**	000074-87-3	Chloromethane	**64**	000100-42-5	Styrene
15	000106-99-0	1,3-Butadiene	**40**	000156-59-2	cis-1,2-Dichloroethene	**65**	000127-18-4	Tetrachloroethylene
16	000541-73-1	1,3-Dichlorobenzene	**41**	010061-01-5	cis-1,3-Dichloropropene	**66**	000109-99-9	Tetrahydrofuran
17	000106-46-7	1,4-Dichlorobenzene	**42**	000098-82-8	Cumene	**67**	000108-88-3	Toluene
18	000123-91-1	1,4-Dioxane	**43**	000110-82-7	Cyclohexane	**68**	000108-38-3	Total m&p-xylenes
19	000540-84-1	2,2,4-Trimethylpentane	**44**	000124-48-1	Dibromochloromethane	**69**	000156-60-5	trans-1,2-Dichloroethene
20	000078-93-3	2-Butanone	**45**	000075-71-8	Dichlorodifluoromethane	**70**	010061-02-6	trans-1,3-Dichloropropene
21	000591-78-6	2-Hexanone	**46**	000064-17-5	Ethanol	**71**	000079-01-6	Trichloroethene
22	000075-65-0	2-Methyl-2-propanol	**47**	000141-78-6	Ethyl acetate	**72**	000075-69-4	Trichlorofluoromethane
23	000107-05-1	3-Chloropropene	**48**	000100-41-4	Ethylbenzene	**73**	000108-05-4	Vinyl acetate
24	000622-96-8	4-Ethyltoluene	**49**	000087-68-3	Hexachlorobutadiene	**74**	000593-60-2	Vinyl bromide
25	000108-10-1	4-Methyl-2-pentanone	**50**	000110-54-3	Hexane	**75**	000075-01-4	Vinyl chloride

Table 21. VOC Summary of Statewide Canister Data

Compound	Concentration* (ppbv)			Frequency Detected
	Reporting Limit (RL)	Average	Maximum	
1,1-Dichloroethane	0.1			0/214
1,1-Dichloroethylene	0.1			0/214
1,1,2-Trichloro-1,2,2-trifluoroethane	0.1	0.05	0.097	145/156
1,1,2-Trichloroethane	0.1			0/214
1,1,2,2-Tetrachloroethane	0.1			0/214
1,2-Dichlorobenzene	0.1	0.05	0.0634	21/214
1,2-Dichloropropane	0.1			0/214
1,2,4-Trichlorobenzene	0.5	0.08	0.13	3/214
1,2,4-Trimethylbenzene	0.1	0.12	0.6	47/214
1,3-Butadiene	0.1	0.17	0.741	51/214
1,3-Dichlorobenzene	0.1	0.06	0.0616	3/214
1,3-Dichloropropene(total)	0.1			0/127
1,3,5-Trimethylbenzene	0.1	0.06	0.18	87/214
1,4-Dichlorobenzene	0.1	0.05	0.31	52/214
1,4-Dioxane	0.1	0.03	0.032	1/185
2-Propanol	2	3.01	27	108/185
2,2,4-Trimethylpentane	0.2	0.14	1.19	80/185
3-Chloropropene	0.1	0.09	0.117	2/185
Acetone	1.2	4.8	39	208/214
Acrolein - Unverified	0.5	0.34	1.54	107/127
Acrylonitrile	0.2	0.34	1	19/156
Benzene	0.1	0.19	0.968	213/214
Benzyl chloride	0.1	0.09	0.105	8/185
Bromodichloromethane	0.1			0/214
Bromoform	0.1	0.06	0.0591	2/214
Bromomethane	0.1	0.04	0.0403	1/214
Carbon disulfide	0.2	1.77	5.6	79/214
Carbon tetrachloride	0.1	0.07	0.099	185/214
Chlorobenzene	0.1	0.02	0.042	4/214
Chloroethane	0.1			0/214
Chloroform	0.1	0.05	0.18	30/214
Chloromethane	0.1	0.53	1.2	213/214
cis-1,2-Dichloroethene	0.1			0/214
cis-1,3-Dichloropropene	0.1			0/87
Cyclohexane	0.1	0.08	0.263	66/214
Dibromochloromethane	0.1			0/214
Dibromomethane	0.5			0/58
Dichlorodifluoromethane	0.1	0.49	0.739	214/214
Dichloromethane	0.2	0.14	3.8	201/214
Ethyl acetate	0.1	0.15	0.703	64/156
Ethyl alcohol	1	7.76	96.1	185/185
Ethylbenzene	0.1	0.08	0.366	141/214
Ethylene dibromide	0.1			0/214
Ethylene dichloride	0.1	0.01	0.013	2/214

Compound	Concentration* (ppbv)			Frequency Detected
	Reporting Limit (RL)	Average	Maximum	
Freon 113	0.1	0.06	0.087	55/58
Freon 114	0.1	0.31	0.517	5/214
Furan, tetrahydro-	0.2	0.18	1.1	31/214
Hexachlorobutadiene	0.2	0.08	0.0912	7/214
Isopropylbenzene	0.1	0.04	0.106	46/185
m/p Xylene	0.1	0.18	1.23	177/214
Methyl Butyl Ketone	0.1	0.13	0.5	68/214
Methyl chloroform	0.1			0/214
Methyl ethyl ketone	0.5	0.58	4.9	197/214
Methyl isobutyl ketone	0.1	0.1	0.632	59/214
Methyl methacrylate	0.1	0.85	3.02	4/127
Methyl tert-butyl ether	0.1	0.06	0.0555	1/214
n-Butane	0.1	1.52	14.9	179/185
n-Decane	2	0.46	1.2	9/58
n-Heptane	0.1	0.13	3.29	127/214
n-Hexane	0.1	0.2	0.97	141/214
n-Nonane	0.5	0.38	1.1	6/58
n-Octane	0.5	0.12	0.12	1/58
n-Pentane	0.5	0.37	1.2	38/58
n-Propylbenzene	0.1	0.02	0.026	2/58
n-Undecane	2	0.12	0.19	13/58
Naphthalene	0.2	0.06	0.23	91/214
o-Xylene	0.1	0.08	0.471	151/214
p-Ethyltoluene	0.1	0.05	0.173	37/214
Propylene	0.2	0.97	10.5	167/214
Styrene	0.1	0.11	0.86	101/214
Tetrachloroethylene	0.1	0.13	0.84	16/214
Toluene	0.1	0.51	4.75	214/214
trans-1,2-Dichloroethylene	0.1			0/214
trans-1,3-Dichloropropene	0.1			0/214
Trichloroethylene	0.1	0.08	0.123	5/214
Trichlorofluoromethane	0.1	0.22	0.486	214/214
Vinyl acetate	0.2	0.4	1.52	109/214
Vinyl bromide	0.2			0/127
Vinyl chloride	0.1			0/214

Table 22. VOC Sampling Site Identification

AQS #	City	County	Address
39-017-0019	Middletown	Butler	1200 Oxford State Rd.
39-017-0020	Middletown	Butler	3350 Yankee Rd.
39-035-0038	Cleveland	Cuyahoga	2547 St. Tikhon Ave.
39-049-0034	Columbus	Franklin	Korbel Ave.
39-061-0047	Cincinnati	Hamilton	7529 Gracely Dr.
39-067-0005	Jewett	Harrison	46700 Giacobbi Rd.
39-081-0017	Steubenville	Jefferson	618 Logan St.

Table 23. Summary of VOC results

	Average; Maximum (ppbv) Number of detections / total samples						
	Butler	Butler	Cuyahoga	Franklin	Hamilton	Harrison	Jefferson
Compound list	**39-017-0019**	**39-017-0020**	**39-035-0038**	**39-049-0034**	**39-061-0047**	**39-067-0005**	**39-081-0017**
Carbon disulfide	1.95/3 (30/30)	2.85/5.6 (28/28)	0.02/0.0277 (3/30)	0.05/0.206 (8/30)	0.13/0.15 (4/29)	--/-- (0/8)	0.03/0.0579 (6/59)
Propylene	0.85/1.6 (12/30)	1.65/6.6 (12/28)	0.7/1.38 (30/30)	1.05/10.5 (30/30)	0.64/1.5 (16/29)	1.07/1.48 (8/8)	1.04/4.39 (59/59)
Freon 113	0.06/0.087 (29/30)	0.06/0.081 (26/28)	DNS	DNS	DNS	DNS	DNS
Freon 114	--/-- (0/30)	--/-- (0/28)	0.51/0.508 (1/30)	0.51/0.508 (1/30)	0.02/0.018 (2/29)	--/-- (0/8)	0.52/0.517 (1/59)
Ethyl acetate	DNS	DNS	0.12/0.322 (19/30)	0.14/0.422 (11/30)	--/-- (0/29)	0.12/0.119 (3/8)	0.18/0.703 (31/59)
n-Butane	0.73/2.2 (27/30)	1.04/5.9 (25/28)	1.79/6.03 (30/30)	1.22/6.86 (30/30)	DNS	2/4 (8/8)	2.04/14.9 (59/59)
1,3-Butadiene	0.1/0.12 (2/30)	0.11/0.11 (1/28)	0.14/0.208 (8/30)	0.21/0.741 (14/30)	0.11/0.32 (8/29)	0.16/0.163 (1/8)	0.2/0.503 (17/59)
n-Pentane	0.34/0.84 (21/30)	0.41/1.2 (17/28)	DNS	DNS	DNS	DNS	DNS
n-Hexane	0.13/0.29(12/30)	0.17/0.34 (9/28)	0.19/0.357 (22/30)	0.21/0.97 (21/30)	0.14/0.64 (21/29)	0.15/0.2 (5/8)	0.26/0.915 (51/59)
n-Heptane	0.06/0.13 (6/30)	0.1/0.18 (7/28)	0.09/0.161 (23/30)	0.1/0.429 (25/30)	0.08/0.16 (6/29)	0.06/0.101 (6/8)	0.18/3.29 (54/59)
n-Octane	--/-- (0/30)	0.12/0.12 (1/28)	DNS	DNS	DNS	DNS	DNS
n-Nonane	0.46/1.1 (4/30)	0.21/0.28 (2/28)	DNS	DNS	DNS	DNS	DNS
n-Decane	0.5/0.99 (5/30)	0.42/1.2 (4/28)	DNS	DNS	DNS	DNS	DNS
Cyclohexane	0.03/0.028 (1/30)	--/-- (0/28)	0.07/0.117 (14/30)	0.08/0.203 (9/30)	0.06/0.082 (8/29)	0.08/0.103 (3/8)	0.09/0.263 (31/59)
2,2,4-Trimethylpentane	0.09/0.2 (8/30)	0.11/0.22 (6/28)	0.09/0.223 (16/30)	0.21/1.19 (12/30)	DNS	0.05/0.0567 (2/8)	0.16/1.09 (36/59)
Ethyl alcohol	4.83/16 (30/30)	5.97/11 (28/28)	4.81/33.9 (30/30)	11.77/96.1 (30/30)	DNS	7.89/21.8 (8/8)	9.54/89.7 (59/59)

	Average; Maximum (ppbv) Number of detections / total samples						
	Butler	**Butler**	**Cuyahoga**	**Franklin**	**Hamilton**	**Harrison**	**Jefferson**
Compound list	**39-017-0019**	**39-017-0020**	**39-035-0038**	**39-049-0034**	**39-061-0047**	**39-067-0005**	**39-081-0017**
2-Propanol	4.9/20 (30/30)	4.16/27(27/28)	0.33/0.79 (10/30)	0.63/2.37 (11/30)	DNS	0.09/0.131 (2/8)	1.96/12.6 (28/59)
3-Chloropropene	--/-- (0/30)	--/--(0/28)	--/-- (0/30)	0.09/0.117 (2/30)	DNS	--/-- (0/8)	--/-- (0/59)
Methyl tert-butyl ether	--/-- (0/30)	--/--(0/28)	0.06/0.0555 (1/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
Methyl methacrylate	DNS	DNS	0.12/0.115 (1/30)	0.13/0.2 (2/30)	DNS	--/-- (0/8)	3.02/3.02 (1/59)
Vinyl acetate	--/-- (0/30)	--/--(0/28)	0.34/0.92 (26/30)	0.41/1.31 (27/30)	--/-- (0/29)	0.23/0.454 (6/8)	0.45/1.52 (50/59)
Acrolein - Unverified	DNS	DNS	0.25/0.613 (27/30)	0.38/0.957 (27/30)	DNS	0.29/0.617 (6/8)	0.38/1.54 (47/59)
Acetone	7.23/31 (30/30)	9.99/39 (28/28)	3.68/9.91 (29/30)	3.19/6.83 (29/30)	3.31/11 (29/29)	2.05/4.05 (8/8)	3.46/11.4 (55/59)
Methyl ethyl ketone	0.53/1.8 (30/30)	0.84/4.9 (28/28)	0.41/1.09 (27/30)	0.84/3.73 (28/30)	0.42/1.3 (27/29)	0.38/0.797 (7/8)	0.52/2.04 (50/59)
Methyl Butyl Ketone	0.24/0.34 (2/30)	0.34/0.5 (5/28)	0.1/0.187 (11/30)	0.11/0.228 (15/30)	0.06/0.068 (2/29)	0.12/0.207 (5/8)	0.12/0.204 (28/59)
Methyl isobutyl ketone	0.08/0.14 (5/30)	0.1/0.22 (9/28)	0.08/0.111 (10/30)	0.08/0.134 (12/30)	0.08/0.084 (1/29)	0.1/0.102 (1/8)	0.12/0.632 (21/59)
Acrylonitrile	DNS	DNS	--/-- (0/30)	--/-- (0/30)	0.33/1 (18/29)	--/-- (0/8)	0.54/0.545 (1/59)
Chloromethane	0.52/1.2 (30/30)	0.54/1.2 (27/28)	0.55/0.778 (30/30)	0.57/1.16 (30/30)	0.49/0.81 (29/29)	0.54/0.571 (8/8)	0.52/1.01 (59/59)
Dichloromethane	0.15/0.2 (24/30)	0.17/0.31 (21/28)	0.16/0.444 (30/30)	0.1/0.145 (30/30)	0.13/0.2 (29/29)	0.1/0.104 (8/8)	0.15/3.8 (59/59)
Chloroform	0.03/0.036 (3/30)	0.05/0.059 (4/28)	0.12/0.18 (5/30)	0.04/0.0583 (2/30)	0.03/0.041 (16/29)	--/-- (0/8)	--/-- (0/59)
Carbon tetrachloride	0.07/0.09 (21/30)	0.07/0.094 (19/28)	0.07/0.0878 (30/30)	0.06/0.0865 (26/30)	0.07/0.099 (26/29)	0.06/0.0783 (7/8)	0.06/0.0836 (56/59)
Dibromomethane	--/-- (0/30)	--/-- (0/28)	DNS	DNS	DNS	DNS	DNS
Bromoform	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	0.06/0.0591 (1/30)	--/-- (0/29)	--/-- (0/8)	0.06/0.0584 (1/59)

Compound list	Average; Maximum (ppbv) Number of detections / total samples						
	Butler	Butler	Cuyahoga	Franklin	Hamilton	Harrison	Jefferson
	39-017-0019	**39-017-0020**	**39-035-0038**	**39-049-0034**	**39-061-0047**	**39-067-0005**	**39-081-0017**
Trichlorofluoromethane	0.21/0.28 (30/30)	0.21/0.26 (28/28)	0.23/0.253(30/30)	0.21/0.244 (30/30)	0.22/0.28 (29/29)	0.22/0.236 (8/8)	0.22/0.486 (59/59)
Chloroethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
1,1-Dichloroethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
Methyl chloroform	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
Ethylene dichloride	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	0.01/0.013 (2/29)	--/-- (0/8)	--/-- (0/59)
Tetrachloroethylene	--/-- (0/30)	0.22/0.84 (5/28)	--/-- (0/30)	0.13/0.166 (2/30)	0.03/0.047 (7/29)	--/-- (0/8)	0.25/0.323 (2/59)
1,1,2,2-Tetrachloroethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
Bromomethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	0.04/0.0403 (1/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
1,1,2-Trichloroethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
1,1,2-Trichloro-1,2,2-trifluoroethane	DNS	DNS	0.05/0.0691 (29/30)	0.05/0.0663 (26/30)	0.07/0.097 (29/29)	0.04/0.0513 (8/8)	0.05/0.0686 (53/59)
Dichlorodifluoromethane	0.47/0.58 (30/30)	0.46/0.58 (28/28)	0.52/0.596 (30/30)	0.49/0.588 (30/30)	0.51/0.66 (29/29)	0.49/0.536 (8/8)	0.49/0.739 (59/59)
Trichloroethylene	--/-- (0/30)	--/-- (0/28)	0.06/0.0998 (3/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	0.09/0.123 (2/59)
1,1-Dichloroethylene	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
Bromodichloromethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
1,2-Dichloropropane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
trans-1,3-Dichloropropene	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
cis-1,3-Dichloropropene	--/-- (0/30)	--/-- (0/28)	DNS	DNS	--/--(0/29)	DNS	DNS

Compound list	Average; Maximum (ppbv) Number of detections / total samples						
	Butler	Butler	Cuyahoga	Franklin	Hamilton	Harrison	Jefferson
	39-017-0019	39-017-0020	39-035-0038	39-049-0034	39-061-0047	39-067-0005	39-081-0017
Dibromochloromethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
trans-1,2-Dichloroethylene	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
cis-1,2-Dichloroethene	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
1,3-Dichloropropene(total)	DNS	DNS	--/-- (0/30)	--/-- (0/30)	DNS	--/-- (0/8)	--/-- (0/59)
Ethylene dibromide	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
Hexachlorobutadiene	--/-- (0/30)	--/-- (0/28)	0.08/0.0803 (1/30)	0.07/0.0903 (3/30)	--/-- (0/29)	--/-- (0/8)	0.09/0.0912 (3/59)
Vinyl chloride	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	--/-- (0/29)	--/-- (0/8)	--/-- (0/59)
Vinyl bromide	DNS	DNS	--/-- (0/30)	--/-- (0/30)	DNS	--/-- (0/8)	--/-- (0/59)
n-Undecane	0.11/0.18 (5/30)	0.13/0.19 (8/28)	DNS	DNS	DNS	DNS	DNS
m/p Xylene	0.14/0.46 (29/30)	0.15/0.41 (25/28)	0.19/0.376 (22/30)	0.23/1.23 (26/30)	0.09/0.32 (29/29)	0.13/0.137 (2/8)	0.26/0.956 (44/59)
Benzene	0.21/0.79 (30/30)	0.2/0.43 (28/28)	0.22/0.504 (30/30)	0.19/0.968 (29/30)	0.14/0.29 (29/29)	0.1/0.169 (8/8)	0.2/0.739 (59/59)
Toluene	0.94/1.9 (30/30)	1.09/1.9 (28/28)	0.24/0.544 (30/30)	0.38/2.16 (30/30)	0.21/0.57 (29/29)	0.13/0.203 (8/8)	0.42/4.75 (59/59)
Ethylbenzene	0.06/0.14 (16/30)	0.06/0.13 (12/28)	0.07/0.15 (22/30)	0.09/0.366 (22/30)	0.04/0.1 (22/29)	0.07/0.0919 (3/8)	0.1/0.276 (44/59)
o-Xylene	0.06/0.18 (23/30)	0.07/0.19 (17/28)	0.08/0.159 (21/30)	0.11/0.471 (22/30)	0.05/0.15 (23/29)	0.06/0.0641 (2/8)	0.11/0.355 (43/59)
1,3,5-Trimethylbenzene	0.06/0.18 (5/30)	0.03/0.044 (4/28)	0.06/0.0834 (16/30)	0.07/0.168 (12/30)	0.02/0.033 (11/29)	0.05/0.0519 (1/8)	0.07/0.12 (38/59)
1,2,4-Trimethylbenzene	0.11/0.6 (12/30)	0.08/0.14 (9/28)	0.12/0.12 (1/30)	0.47/0.495 (2/30)	0.04/0.1 (16/29)	--/-- (0/8)	0.28/0.43 (7/59)
n-Propylbenzene	0.02/0.026 (2/30)	--/-- (0/28)	DNS	DNS	DNS	DNS	DNS

Compound list	Average; Maximum (ppbv) Number of detections / total samples						
	Butler	Butler	Cuyahoga	Franklin	Hamilton	Harrison	Jefferson
	39-017-0019	**39-017-0020**	**39-035-0038**	**39-049-0034**	**39-061-0047**	**39-067-0005**	**39-081-0017**
Isopropylbenzene	0.02/0.059 (5/30)	0.01/0.018 (4/28)	0.05/0.106 (12/30)	0.05/0.0652 (4/30)	DNS	0.03/0.0328 (1/8)	0.04/0.0496 (20/59)
p-Ethyltoluene	0.05/0.085 (10/30)	0.04/0.1 (8/28)	0.06/0.0571 (2/30)	0.09/0.173 (4/30)	0.02/0.044 (9/29)	--/-- (0/8)	0.08/0.131 (4/59)
Styrene	0.04/0.11 (12/30)	0.04/0.077 (5/28)	0.09/0.113 (9/30)	0.12/0.223 (26/30)	0.17/0.86 (27/29)	0.08/0.105 (4/8)	0.1/0.178 (18/59)
Chlorobenzene	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	0.02/0.042 (4/29)	--/-- (0/8)	--/-- (0/59)
1,2-Dichlorobenzene	--/-- (0/30)	--/-- (0/28)	0.04/0.0472 (5/30)	0.05/0.0634 (6/30)	0.02/0.024 (2/29)	--/-- (0/8)	0.05/0.057 (8/59)
1,3-Dichlorobenzene	--/-- (0/30)	--/-- (0/28)	0.06/0.0573 (1/30)	0.06/0.0616 (1/30)	--/-- (0/29)	--/-- (0/8)	0.06/0.0567 (1/59)
1,4-Dichlorobenzene	0.03/0.052(22/30)	0.06/0.31 (17/28)	0.07/0.0749 (1/30)	0.07/0.0795 (2/30)	0.02/0.042 (6/29)	--/--(0/8)	0.06/0.0735 (4/59)
Benzyl chloride	--/-- (0/30)	--/-- (0/28)	0.08/0.0798 (1/30)	0.09/0.105 (4/30)	DNS	0.1/0.0963 (1/8)	0.1/0.101 (2/59)
1,2,4-Trichlorobenzene	--/-- (0/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	0.08/0.13 (3/29)	--/-- (0/8)	--/-- (0/59)
Naphthalene	0.04/0.23 (20/30)	0.04/0.085 (16/28)	0.08/0.156 (10/30)	0.1/0.193 (11/30)	0.02/0.059 (13/29)	0.08/0.0996 (4/8)	0.1/0.171 (17/59)
1,4-Dioxane	0.03/0.032 (1/30)	--/-- (0/28)	--/-- (0/30)	--/-- (0/30)	DNS	--/-- (0/8)	--/-- (0/59)
Furan, tetrahydro-	0.15/0.25 (5/30)	0.37/1.1 (7/28)	0.09/0.143 (5/30)	0.07/0.0944 (4/30)	0.17/0.28 (7/29)	--/-- (0/8)	0.07/0.0939 (3/59)

*DNS- Did not sample for this compound

C. Heavy Metals

Sampling Method

Ambient air toxic monitoring by Ohio EPA for heavy metals other than lead was initiated in 1989. Since that time, all Ohio EPA air filter samples have been analyzed by Ohio EPA, DES. A summary of results can be found in Table 25 through Table 35. Sampling for heavy metals is conducted using a high-volume TSP sampler with a glass fiber filter. Sampling is conducted with 24-hour samples collected once every six days. The operating procedures for lead can be found in the Code of Federal Regulations, 40 CFR, Part 50, Appendix G. These basic procedures are also used for other metals.

Analysis

Data below presents filters collected at each site that were analyzed as a monthly composite. Typically, there are five sampling days per month in which a filter is collected. One strip is cut from the individual filter and combined with strips from all the filters collected that month and analyzed as one sample for the entire month. These composite samples are acid extracted with the resulting solution analyzed by Inductively Coupled Plasma/Optical Emissions Spectroscopy (ICP/OES) and/or Inductively Coupled Plasma/Mass Spectroscopy (ICP/MS) instruments, in a method that is similar to that which is used for the determination of lead from TSP filters. The methods identify and quantitate elements through ionization in plasma and measuring them by either light emission spectroscopy (ICP/OES) or separation by mass/charge ratio and detection via an electron multiplier (ICP/MS).

Parameters

Lead was the first metal Ohio EPA sampled in ambient air as a part of the NAAQS monitoring. Over the years, Ohio EPA added other metals to the analysis program, although lead remains the only metal for which a NAAQS has been established.

For this section, data presented is from the monthly composite samples collected and analyzed for eight metals:

- Arsenic
- Cadmium
- Chromium
- Beryllium
- Lead
- Nickel
- Zinc
- Manganese

From each sample, most parameters are analyzed using a very sensitive ICP/MS analytical system. The following parameters, typically detected in higher concentrations, are still analyzed with the ICP method only:

- Iron
- Potassium
- Zinc
- Manganese

Particulate mercury that can be detected from a glass or quartz fiber filter has been added to the parameter list for few samples collected from sites in communities with specific concerns about potential mercury sources. Mercury analysis for each sample is performed separately from the other metals. Total mercury is determined using a cold vapor method developed by Ohio DES.

Table 24 identifies monitoring sites' locations and references the respective tables that follow summarizing each site's results.

Table 24. Metals Sampling Site Identification

AQS #	City	County	Address	Table
39-029-0019	E. Liverpool - 1	Columbiana	1250 St. George St.	Table 25
39-029-0020	E. Liverpool - 2	Columbiana	2220 Michigan Ave.	Table 26
39-029-0023	E. Liverpool - 3	Columbiana	500 Maryland Ave.	Table 27
39-035-0038	Cleveland - 1	Cuyahoga	2547 St. Tikhon Ave.	Table 28
39-035-0049	Cleveland - 3	Cuyahoga	4150 East 56th St.	Table 29
39-049-0040	Columbus	Franklin	2104 Jackson Pike	Table 30
39-051-0001	Delta	Fulton	200 Van Buren St.	Table 31
39-101-0003	Marion - 1	Marion	Hawthorne Ave.	Table 32
39-101-0004	Marion - 2	Marion	640 Bellefontaine Ave.	table 33
39-151-0024	Canton- 1	Summit	3159 Georgetown Rd. NE	Table 34
39-151-0025	Canton- 2	Summit	719 Marietta Ave. NE	Table 35

Table 25. Heavy Metals: E. Liverpool - 1 (39-029-0019)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.628	<0.033400	0.37	0.802	3.22	15.1	0.668	0.0145	25.9
February	0.627	<0.050100	0.125	1.46	3.43	57	0.688	0.024	24.3
March	1.02	0.0378	0.214	<1.710000	3.97	48.2	<1.710000	0.0182	35.9
April	0.696	<0.039700	0.115	1.01	5.83	21.8	<0.397000	0.0111	21.4
May	2	<0.050800	0.16	1.14	3.89	23.1	0.727	0.0174	20.1
June	1.01	<0.054000	0.127	1.52	4.09	67.9	1.08	0.0138	20.9
July	1.43	<0.043900	0.222	1.62	3.02	15.5	0.556	0.0105	18.9
August	2.18	<0.054100	0.202	1.21	2.93	28.8	<1.080000	0.0122	24.2
September	1.97	<0.054300	0.218	2.21	3.54	84.5	0.771	0.0172	25.3
October	0.999	<0.054800	0.153	1.83	3.59	33.8	0.629	0.0175	30.6
November	0.916	<0.055200	0.201	<1.100000	2.58	19.5	<1.100000	0.0189	24.8
December	1.02	<0.055800	0.233	1.28	14.3	35.8	0.745	0.0158	48

Table 26. Heavy Metals: E. Liverpool - 2 (39-029-0020)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.912	<0.048200	0.187	1.29	3.01	46.8	0.633	0.0166	24.9
February	0.872	<0.071200	0.121	4.76	3.44	430	2.28	0.0274	27.5
March	0.987	<0.047000	0.22	2.83	7.42	326	2.26	0.0215	33.4
April	0.846	<0.057100	0.0931	2.45	2.19	148	1.07	0.0145	17.8
May	1.49	<0.067100	0.2	2.42	4.31	112	1.12	0.019	32.8
June	0.981	<0.053900	0.0834	4.26	2.58	530	1.59	0.0184	30.7
July	1.24	<0.053800	0.147	7.41	2.49	86.5	1.52	0.0148	18.3
August	1.23	<0.053900	0.154	1.77	3.47	215	<1.080000	0.0139	20
September	1.43	<0.067600	0.18	3.92	3.78	685	1.98	0.0146	26.1
October	0.822	<0.054700	0.149	7.51	6.02	532	2.36	0.0176	25.8
November	0.896	<0.054900	0.162	2.74	3.79	196	1.49	0.01	25.5
December	1.06	<0.055500	0.173	3.01	4.74	394	1.37	0.0166	30

Table 27. Heavy Metals: E. Liverpool - 3 (39-029-0023)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.592	<0.034400	0.286	0.69	5.1	10.1	<0.687000	0.022	30.3
February	0.59	<0.051500	0.1	0.936	2.33	36.7	0.554	0.0201	22.7
March	0.884	<0.034600	0.156	<1.730000	4.35	40.2	<1.730000	0.0181	28.9
April	0.588	<0.041500	0.169	0.643	16.8	15.3	<0.415000	0.0117	49.2
May	2.37	<0.048600	0.148	0.607	3.68	15.8	<0.486000	0.0195	25.3
June	0.92	<0.054000	0.111	1.36	2.72	76.1	1.08	0.0234	23.3
July	1.66	<0.053900	0.164	1.19	2.65	16.5	0.548	0.0154	18.6
August	2.05	<0.054100	0.213	<1.080000	2.6	28.3	<1.080000	0.0139	20.8
September	2.05	<0.054300	0.188	1.63	3.09	95.8	0.616	0.0187	24.5
October	0.958	<0.054800	0.142	1.11	3.4	33.9	<0.548000	0.0354	26.8
November	1.04	<0.055100	0.139	<0.551000	2.8	18.5	<0.551000	0.0124	25.6
December	1.49	<0.055700	0.263	0.866	8.13	30.6	0.629	0.0209	46.4

Table 28. Heavy Metals: Cleveland - 1 (39-035-0038)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.586	<0.044000	0.135	1.61	3	12.5	0.882	26.2
February	<0.664000	0.0712	0.156	4.44	6	74.5	2.52	95.2
March	1.12	0.0863	0.338	4.9	8	110	2.24	138
April	<5.210000	<0.521000	0.859	16.6	29	18.1	13.8	24.9
May	1.17	<0.051600	0.244	5.28	8	82.1	1.71	103
June	1.43	0.0645	0.388	4.74	11	121	2.07	166
July	1.49	0.0529	0.239	5.48	7	75.1	2.87	153
August	1.28	<0.051000	0.255	3.37	7	70.2	2.2	96.3
September	1.58	0.105	0.306	6.83	<25	117	5.65	157
October	1.37	0.0671	0.208	5.37	25	96.8	3.61	141
November	0.951	0.0573	0.188	3.28	5	64.6	1.77	52
December	1.16	0.0658	0.232	2.26	7	57.2	1.71	110

Table 29. Heavy Metals: Cleveland - 3 (39-035-0049)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	1.03	<0.047300	0.39	7.8	7	122	1.8	225
February	0.717	<0.071200	0.16	4.97	6	65.7	1.82	90.9
March	0.935	<0.046600	0.3	6.79	7	91.2	2.32	157
April	7.88	<0.559000	2.49	70.9	64	85.2	15.7	97.9
May	1.84	0.0657	0.356	5.34	13	123	2.88	129
June	1.38	0.0686	0.238	5.12	9	126	3.23	141
July	1.86	<0.068100	0.32	5.74	13	114	3.7	175
August	1.36	<0.054900	0.348	11.7	9	160	4.46	342
September	1.94	<0.054700	0.29	7.88	12	146	4.82	273
October	1.31	0.058	0.308	4.07	8	99.5	3.28	73.8
November	0.988	<0.056100	0.208	2.95	5	74.8	2.2	83.9
December	1.22	<0.056400	0.294	6.29	7	95.6	2	199

Table 30. Heavy Metals: Columbus (39-049-0040)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.857	<0.057700	0.202	0.917	2.44	11.6	<0.577000	41.9
February	<0.733000	<0.073300	0.158	0.788	2.98	12	0.971	45.3
March	<4.830000	<0.483000	0.695	6.2	17	8.99	6.67	28.5
April	<0.564000	<0.056400	0.0908	<0.564000	<2.82	6.72	<0.564000	22.1
May	1.12	<0.055400	0.0904	0.566	1.63	15	0.745	22.8
June	0.811	<0.055500	0.164	1.2	2.57	13.7	0.981	37.3
July	1.24	<0.056100	0.176	1.12	3.48	19.8	1.12	48.4
August	4.64	<0.274000	0.98	7.18	20.2	114	10.1	301
September	2.56	<0.055200	0.177	1.1	2.6	20.6	1.3	45.4
October	1.04	<0.056100	0.224	0.613	2.39	11.5	0.816	43.8
November	0.847	<0.056100	0.329	<0.561000	3.19	8.35	<0.561000	50.7
December	0.857	<0.057700	0.202	0.917	2.44	11.6	<0.577000	41.9

Table 31. Heavy Metals: Delta (39-051-0001)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.473	<0.037600	0.366	0.696	7.49	5.45	<0.376000	44.5
February	*	*	*	*	*	*	*	*
March	0.768	<0.037400	0.134	1.13	6.08	16.7	0.441	39
April	<4.350000	<0.435000	0.724	6.89	39.7	7.67	<4.350000	50.6
May	1.66	<0.049300	0.184	0.864	11.8	12.8	0.542	110
June	<0.536000	<0.053600	0.139	1.23	7.81	16.8	<0.536000	66.9
July	1.88	<0.067000	0.193	2.7	6.67	25.9	1.05	84.2
August	0.81	<0.053300	0.167	2.24	6.27	23.2	0.727	51.7
September	0.891	<0.051400	0.125	2.99	5.15	24.5	0.737	48.9
October	0.693	<0.046000	0.114	2.05	6.16	18.2	0.871	47.2
November	0.717	<0.041400	0.129	1.72	5.89	15.8	0.422	68.4
December	1.02	<0.047600	0.314	2.24	7.99	19.6	1.01	127

*Shipment containing February composite samples did not arrive at the laboratory for analysis and are considered missing in transit.

Table 32. Heavy Metals: Marion - 1 (39-101-0003)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.721	<0.033100	0.289	2.91	8.62	55.8	1.02	0.0192	74.4
February	<0.495000	<0.049500	0.137	4.23	3.61	76.1	0.852	0.0154	61.6
March	0.592	<0.033000	0.284	7.76	12	131	2.42	0.025	96.7
April	<4.090000	<0.409000	1.18	44.5	30.8	68	11.1	0.00865	34.2
May	0.672	<0.041500	0.176	4.04	5.03	64	1.01	0.017	58.2
June	*	*	*	*	*	*	*	*	*
July	*	*	*	*	*	*	*	*	*
August	*	*	*	*	*	*	*	*	*
September	*	*	*	*	*	*	*	*	*
October	*	*	*	*	*	*	*	*	*
November	*	*	*	*	*	*	*	*	*
December	*	*	*	*	*	*	*	*	*

*Site discontinued on 6/3/2024.

Table 33. Heavy Metals: Marion - 2 (39-101-0004)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.444	<0.042100	0.0945	1.38	3.24	14.2	0.514	0.0104	30.4
February	<0.631000	<0.063100	0.0774	2.43	3.12	26.9	<0.631000	0.013	58.7
March	0.718	<0.043100	0.18	3.78	5.16	57.3	0.988	0.0187	53
April	5.89	<0.508000	0.946	18.9	22.8	23.9	5.64	0.0108	25.7
May	1.01	<0.051600	0.101	2.23	<5.16	29.2	0.613	0.0197	77.3
June	*	*	*	*	*	*	*	*	*
July	*	*	*	*	*	*	*	*	*
August	*	*	*	*	*	*	*	*	*
September	*	*	*	*	*	*	*	*	*
October	*	*	*	*	*	*	*	*	*
November	*	*	*	*	*	*	*	*	*
December	*	*	*	*	*	*	*	*	*

*Site discontinued on 6/3/2024.

Table 34. Heavy Metals: Canton-1 (39-151-0024)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.625	<0.0404	0.246	1.43	4.69	15.2	0.513	31
February	<0.605000	<0.060500	0.0953	1.39	5.47	15.7	<0.605000	26.4
March	0.865	<0.0408	0.182	1.26	3.98	17.1	0.538	43.9
April	<4.750	<0.475	2.02	10.3	22.7	11.3	7.12	23.7
May	1.15	<0.048	0.138	0.728	3.1	9.8	0.637	27.9
June	0.882	<0.048	0.128	1.07	2	16	<0.481	31
July	0.883	<0.0457	0.09	1.4	3.86	13.2	<0.457	169
August	1.21	<0.0462	0.163	1.22	2	13	0.686	22.2
September	1.27	<0.045500	0.187	1.7	3.98	20.3	0.646	39.3
October	1.35	<0.0459	0.153	1.31	4.8	16.2	0.58	37.2
November	1.09	<0.0478	0.12	0.784	2.7	10.3	<0.478	41.4
December	0.864	<0.0479	0.152	0.983	3.2	11.7	<0.479	30.1

Table 35. Heavy Metals: Canton-2 (39-151-0025)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.543	<0.0419	0.139	1.2	4.56	10.3	0.464	23.7
February	<0.608000	<0.060800	0.102	1.59	3.08	15.3	<0.608000	24.7
March	0.846	<0.0398	0.161	1.24	3.56	15	0.631	35.2
April	<4.970	<0.497	0.858	10.9	16.8	11.6	8.59	24.4
May	1.1	<0.048	0.139	0.966	2.4	13.6	0.545	24.7
June	0.964	<0.048	0.104	1.19	3	17	<0.485	27.1
July	1.02	<0.0464	0.11	1.55	2.94	14.9	0.726	54.7
August	1.21	<0.0470	0.148	1.34	2	14	1.13	25.9
September	1.25	<0.046500	0.198	1.92	4.08	22.3	0.674	45.3
October	1.32	<0.0469	0.14	1.53	5.3	20.5	0.525	35.8
November	1.11	<0.0472	0.13	0.814	2.8	11	<0.472	46.4
December	0.776	<0.0487	0.145	0.886	2.8	9.7	<0.487	27.6

XI. AIR QUALITY INDEX (AQI)

There has been a daily reporting of ambient air quality in Ohio's major metropolitan areas in some form since 1971. A national Pollution Standards Index (PSI) was established in 1977 to report air quality. This index was adopted by Ohio EPA's District Offices and the Local Air Agencies to inform the public of daily air quality.

The AQI is a uniform "scaling" of five pollutants: particulate (PM_{10} and $PM_{2.5}$), CO, SO_2, ozone, and NO_2. The concentration level of each of these is calculated every day to determine the AQI. The pollutant with the highest AQI is reported to the media. A summary of AQI index values per pollutant is found in Table below.

When the AQI exceeds, or is expected to exceed, 100 in a major city, the agency concerned issues a "health advisory". When pollution levels exceed an AQI of 200 and are projected to persist, an "air pollution episode" exists and the Governor declares an "alert." This initiates mandatory cutbacks of emissions from specified facilities to alleviate the situation. If the AQI were to surpass 300, 400 or 500, progressively greater cutbacks would be implemented to reduce pollutants to an acceptable level.

The AQI trend shows that Ohio's air quality has improved significantly. Although alerts were commonplace in the early 1970's, none have happened in over twenty years, and the number of health advisories has been greatly reduced.

Table 36. Comparison of AQI Values

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	CO (ppm)	SO_2 (ppm)	Ozone (ppm)[1]		NO_2 (ppm)		
Index Value	**24-hr**	**24-hr**	**8-hr**	**24-hr**	**8-hr**	**1-hr**	**1-hr**	**Color**	**Category**
0-50	0-54	0.0-12.0	0.0-4.4	0-0.035	0.000-0.054		0-0.053	Green	Good
51-100	55-154	12.1-35.4	4.5-9.4	0.036-0.075	0.055-0.070		0.054-0.100	Yellow	Moderate
101-150	155-254	35.5-55.4	9.5-12.4	0.076-0.185	0.071-0.085	0.125-0.164	0.101-0.360	Orange	Unhealthy for Sensitive Groups
151-200	255-354	55.5-150.4	12.5-15.4	0.186-0.304	0.086-0.105	0.165-0.204	0.361-0.64	Red	Unhealthy
201-300	355-424	150.5-250.4	15.5-30.4	0.305-0.604	0.106-0.200	0.205-0.404	0.65-1.24	Purple	Very Unhealthy
301[2]+	425+	250.5 +	30.5+	0.605+	(2)	0.405+	1.25+	Maroon	Hazardous

[1] Areas are generally required to report the AQI based on eight-hour ozone values. The maximum of the eight-hour or one-hour is used.

[2] Eight-hour ozone values do not define AQI values >301. AQI values of 301 or higher then become calculated with one-hour ozone concentrations.

XII. MONITORING SITES

39-135-1001, Preble County

The following pages provide details on the 2024 monitoring network, including sites where VOC air toxics air monitoring is conducted. Parameters monitored at these sites are labeled as follows:

- CO Carbon Monoxide
- H2S Hydrogen Sulfide
- Met Meteorological data
- NO2 Nitrogen Dioxide
- O3 Ozone
- PMc Coarse particulate matter, *i.e.*, PM_{10} - $PM_{2.5}$ = PM_{coarse}
- Pb Lead
- PM10c PM_{10} Continuous
- PM10 Particulate matter with aerodynamic diameter < 10 µm (PM_{10})
- PM25c $PM_{2.5}$ Continuous
- PM25 Particulate matter with aerodynamic diameter < 2.5 µm ($PM_{2.5}$)
- PM1c Particulate matter with aerodynamic diameter < 1.0 µm (PM_1) Continuous
- PMsp $PM_{2.5}$ Speciation
- SO2 Sulfur Dioxide
- TSP Total Suspended Particulate
- VOC Volatile Organic Compounds

The first column of the table provides AQS codes[8], which have the following format:

- XX state code (the state code for Ohio is 39)
- XXX county code (odd numbers, alphabetical)
- XXXX site code

[8]Sites operated by U.S. EPA as part of their CASTNET monitoring network are identified with ^.

Table 37. Monitoring Network for 2024

AQS No.	County	Site Location	Parameter(s)
		A	
39-003-0009	Allen	2850 Bible Rd.	PM25, PM25c, O3, SO2
39-007-1001	Ashtabula	770 Lake Rd.	O3
39-009-0003	Athens	SR 377	PM25, PM25c
		B	
39-013-0006	Belmont	2 E. Ball Park St.	PM10c, PM25, PM25c, NO2, SO2
39-017-0015	Butler	3901 Lefferson	PM10c, PM25, PM25c
39-017-0018	Butler	1701 Runway Dr.	O3
39-017-0019	Butler	1200 Oxford State Rd.	PM10c, PM25, PM25c, SO2, VOC
39-017-0020	Butler	3350 Yankee Rd.	PM10c, PM25, PM25c, SO2, VOC
39-017-0021	Butler	1501 Made Industrial Dr.	SO2
39-017-0022	Butler	3214 Yankee Rd.	PM25, PM25c
39-017-0023	Butler	2200 Hensley Ave.	O3
39-017-9991^	Butler	Miami University	O3
		C	
39-023-0001	Clark	5171 Urbana Rd.	O3
39-023-0003	Clark	5400 Spangler Rd.	O3
39-023-0005	Clark	350 N. Fountain Ave.	PM25, PM25c
39-025-0022	Clermont	2400 Clermont Center Dr.	O3, PM25c
39-027-1002	Clinton	62 Laurel Dr.,	O3
39-029-0019	Columbiana	1250 St. George St.	Pb, metals
39-029-0020	Columbiana	2220 Michigan Ave.	PM10, Pb, metals
39-029-0023	Columbiana	500 Maryland Ave.	PM10, TSP, Pb, metals
39-035-0034	Cuyahoga	891 E. 152nd St.	PM25, PM25c, O3
39-035-0038	Cuyahoga	2547 St. Tikhon Ave.	PM10c, PM25, PM25c PMsp, SO2, TSP, Pb, metals, VOC
39-035-0045	Cuyahoga	4950 Broadway Ave.	PM10c, PM25, PM25c
39-035-0049	Cuyahoga	4150 E. 56th St.	Pb, metals
39-035-0051	Cuyahoga	1301 E. 9th	CO
39-035-0060	Cuyahoga	E. 14th & Orange	PM10c, PM25, PM25c, PMc, PM1c PMsp, O3, NO2, SO2, CO, VOC, Met
39-035-0064	Cuyahoga	390 Fair St.	O3
39-035-0065	Cuyahoga	4600 Harvard Ave.	PM10c, PM25, PM25c, PMsp, SO2
39-035-0073	Cuyahoga	25609 Emery Rd.	PM25, PM25c, NO2, CO
39-035-0076	Cuyahoga	6000 Canal Rd.	PMsp
39-035-5002	Cuyahoga	6116 Wilson Mills Rd.	O3
		D	
39-041-0002	Delaware	359 Main Rd.	O3

AQS No.	County	Site Location	Parameter(s)
		F	
39-047-9991^	Fayette	Deer Creek	O3
39-049-0029	Franklin	7600 Fodor Rd.	PM25c, O3
39-049-0034	Franklin	Korbel Ave.	PM10c, PM25, PM25c, NO2, SO2, VOC
39-049-0038	Franklin	7560 Smoky Row Rd.	PM25, PM25c, PM1c, NO2, CO, black carbon
39-049-0040	Franklin	2104 Jackson Pike	PM10c, PM25, PM25c, Pb, metals
39-049-0081	Franklin	5750 Maple Canyon Ave.	PM10c, PM25, PM25c, O3
39-051-0001	Fulton	200 Van Buren St.	Pb, metals
		G	
39-053-0004	Gallia	350 Watson Grove Rd.	SO2
39-053-0005	Gallia	583 Honeysuckle Dr.	SO2, Met
39-053-0006	Gallia	8323 SR 7 North	SO2
39-055-0004	Geauga	13000 Auburn Rd.	O3
39-057-0006	Greene	541 Ledbetter Rd.	O3
		H	
39-061-0006	Hamilton	11590 Grooms Rd.	PM25c, O3
39-061-0010	Hamilton	6950 Ripple Rd.	PM25c, O3, SO2
39-061-0014	Hamilton	Seymour & Vine, Cincinnati	PM25, PM25c VOC
39-061-0040	Hamilton	250 Wm. Howard Taft Rd.	PM10c, PM25, PM25c, PMc, PM1c, PMsp, O3, NO2, SO2, CO, VOC, black carbon, Met
39-061-0042	Hamilton	2101 W. Eighth St.	PM25, PM25c
39-061-0047	Hamilton	7529 Grace, Ave.	VOC
39-061-0048	Hamilton	3428 Colerain Ave.	PM25, PM25c, NO2, CO, black carbon
39-063-0005	Hancock	23921 Twp. Rd. 214	SO2
39-067-0005	Harrison	46700 Jewett Hopedale Rd.	VOC, Met
		J	
39-081-0017	Jefferson	618 Logan St.	PM10c PM25, PM25c, PMsp, O3, SO2, VOC
		K	
39-083-0003	Knox	4625 Lock Rd.	O3
		L	
39-085-0003	Lake	36010 Lakeshore Blvd.	O3
39-085-0007	Lake	177 Main St.	PM25, PM25c, O3, SO2
39-085-0008	Lake	5 High St.	PM10
39-087-0011	Lawrence	SR 141	O3
39-087-0012	Lawrence	450 Commerce Dr.	PM10, PM25, PM25c, O3, SO2
39-089-0005	Licking	310 Licking View Dr.	O3
39-089-0008	Licking	8955 E. Main St.	O3
39-093-0018	Lorain	4706 Detroit Rd.	O3
39-095-0008	Lucas	3040 York St.	SO2
39-095-0024	Lucas	348 S. Erie St.	PM10c, PM25, PM25c, O3
39-095-0026	Lucas	4150 Airport Highway	PM25, PM25c

AQS No.	County	Site Location	Parameter(s)
39-095-0027	Lucas	200 S. River Rd.	O3
39-095-0035	Lucas	10739 Corduroy Rd.	O3, MET
39-095-1003	Lucas	163 Lee St.	PM25, PM25c
		M	
39-097-0007	Madison	9940 SR 38 SW	O3
39-099-0015	Mahoning	91 Wick Oval St.	PM10c, PM25, PM25c, O3, SO2
39-101-0003	Marion	Hawthorne Ave.	Pb, metals
39-101-0004	Marion	640 Bellefontaine Ave.	Pb, metals
54-053-0001	Mason, WV	Highway 62	SO2, Met
39-103-0004	Medina	Ballash Rd.	PM25, PM25c, O3
39-109-0005	Miami	3825 N. SR 589	O3
39-113-0037	Montgomery	1401 Harshman Rd.	O3
39-113-0038	Montgomery	444 W. Third St.	PM10c, PM25, PM25c, PMc, PMsp
		N	
39-121-9991^	Noble	Quaker City	O3
		O	
39-123-0006	Ottawa	2517 State Rt. 590	Beryllium
39-123-0007	Ottawa	2124 S Slemmer Portage Rd.	Beryllium
39-123-0008	Ottawa	1338 S Portage River Rd.	Beryllium
39-123-0009	Ottawa	14405 W True Rd.	Beryllium
39-123-0010	Ottawa	15473 W State Rte. 105	Beryllium
39-123-0011	Ottawa	14850 State Rte. 105	Beryllium
39-123-0012	Ottawa	14244 W State Rte. 105	Beryllium
39-123-0013	Ottawa	14028 W State Rte. 105	Beryllium
39-123-0014	Ottawa	14681 W State Rte. 105	Beryllium
		P	
39-133-1001	Portage	1570 Ravenna Rd.	O3
39-135-1001	Preble	6940 Oxford Gettysburg Rd.	PM10c, PM25, PM25c, PMc, PMsp, O3, NO2, SO2, CO, Met
		S	
39-145-0013	Scioto	4862 Gallia St.	PM10c, PM25, PM25c
39-145-0015	Scioto	1526 Haverhill-Furnace Rd.	PM10c, PM25, PM25c
39-145-0020	Scioto	2840 Back Rd.	PM10c, SO2
39-145-0021	Scioto	2446 Gallia Pike	PM10c
39-145-0022	Scioto	1740 Gallia Pike	PM10c, SO2
39-151-0016	Stark	515 25th St.	O3
39-151-0017	Stark	1330 Dueber Ave.	PM10c, PM25, PM25c, PMsp
39-151-0020	Stark	420 Market Ave.	PM25, PM25c
39-151-0022	Stark	45 S. Wabash Ave.	O3
39-151-0024	Stark	3150 Georgetown Rd., NE	Pb, metals
39-151-0025	Stark	719 Marietta Ave., NE	Pb, metals

AQS No.	County	Site Location	Parameter(s)
39-151-4005	Stark	1175 W. Vine St.	O3
39-153-0017	Summit	80 Brittain Rd.	PM10, PM25, PM25c, SO2, black carbon
39-153-0026	Summit	985 Gorge Blvd.	O3
		T	
39-155-0006	Trumbull	2323 Main Ave.	PM10
39-155-0011	Trumbull	842 Youngstown-Kingsville Rd.	O3
39-155-0013	Trumbull	6380 SR 87	O3
39-155-0014	Trumbull	540 Laird Ave. SE	PM10c, PM25, PM25c
39-155-0015	Trumbull	945 S. State St.	PM10
		W	
39-165-0007	Warren	416 Southeast St.	PM25c, O3
39-167-0004	Washington	2000 Fourth St.	O3
39-167-0011	Washington	22275 SR 60	SO2
39-173-0003	Wood	347 N. Dunbridge Rd.	O3