Introduction to West Virginia Air Quality

west virginia department of environmental protection
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West Virginia Department of Environmental Protection
Division of Air Quality

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Charleston, WV 25304

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Introduction

The Division of Air Quality (DAQ) has issued an Annual Report since 2002. This report has provided a snapshot of West Virginia's air quality over the years. This year, based on the feedback we have received, we decided that in addition to the annual report we would issue a companion guide, *Introduction to West Virginia Air Quality.*

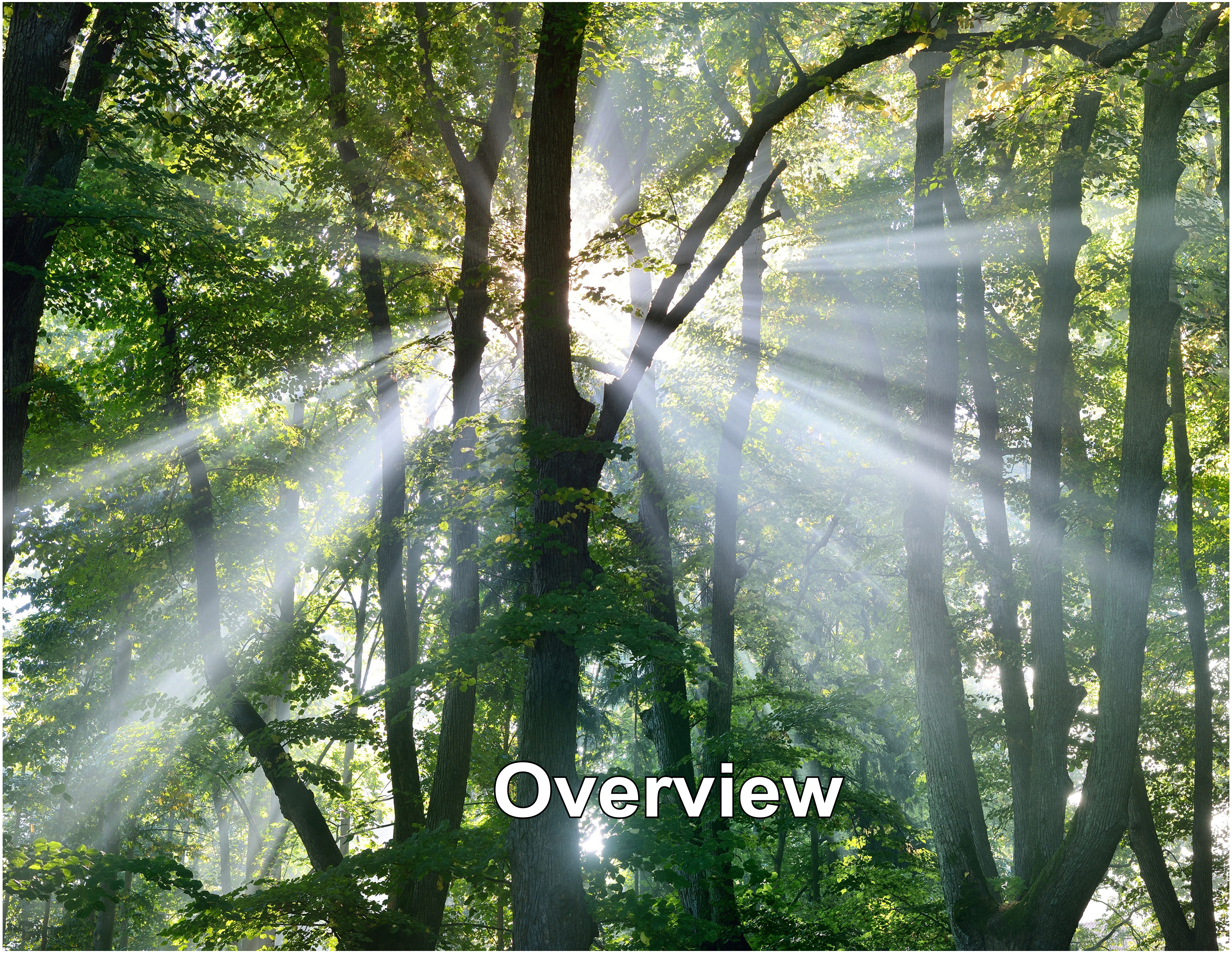
Introduction to West Virginia Air Quality provides an overview of the DAQ, its history and responsibilities, and an overview and history of the National Ambient Air Quality Standards (NAAQS). We do not attempt to answer all questions about air quality, however, we hope we have provided a basic explanation of air quality, air quality regulations, and the function of the DAQ.

The companion document, *2016 West Virginia Air Quality Annual Update*, highlights the work of the Division of Air Quality for the calendar year 2016. The update provides data on the air quality monitoring network, attainment status with the various NAAQS, summary data of permitting actions, compliance and enforcement actions, small business assistance activities, emissions trends in air toxics and highlights of outreach events.

The DAQ intends to continue to provide annual updates, highlighting the work of the agency each year. We also intend to update *Introduction to West Virginia Air Quality* as needed.

We hope that you find the information contained in *Introduction to West Virginia Air Quality* and *2016 West Virginia Air Quality Annual Update* both informative and helpful.

Blackwater Falls, West Virginia


Overview

Overview

How often do you think about the air you breathe? Unless you or a loved one suffers from a respiratory disease, such as asthma, your answer may be “rarely.” Here at the West Virginia Division of Air Quality (DAQ), we think about the air every day – as we maintain our statewide network of monitoring stations; as we investigate citizen complaints; when we help a small business comply with air quality requirements; during review of air permit applications to ensure new facilities operate according to rules and regulations; and as we develop plans to meet federal air quality standards to improve and maintain air quality in the Mountain State.

This report provides an introduction and overview of air quality in West Virginia. It contains two parts – a general overall description of our office and the responsibilities we are charged with; and, a supplement which will be updated with specific yearly information to provide a “snapshot in time” of our air quality.

Let’s start with how we got to where we are today. In 1970, Congress passed the Clean Air Act that authorized the U. S. Environmental Protection Agency (EPA) to protect and enhance the quality of the nation’s air resources to promote the public health and welfare. Subsequently, standards were established for pollutants which were shown to threaten human health and the environment. These are known as the National Ambient Air Quality Standards (NAAQS).

Congress determined that air pollution prevention and control at the source are the primary responsibilities of states and local governments. These responsibilities require federal financial and technical assistance to develop coordinated and effective programs.

The Clean Air Act Amendments of 1990 dramatically increased the number and types of businesses subject to the Act’s requirements. The amendments called for establishing a national permitting program to make the law more comprehensive and an improved enforcement program to help ensure better compliance with the Act. Additionally, these amendments set the stage for protecting the ozone layer, reducing acid rain and toxic pollutants, and improving air quality and visibility. Consequently, air quality has dramatically improved nationwide. Many other countries have not achieved such benefits (see Beijing picture below).

Beijing, China, January 14, 2013.

Some stations reported more than 20 times the

World Health Organization guideline for particulate matter pollution

(24-hour $PM_{2.5}$ average 25 µg/m^3)

Overview

As the Charleston pictures on the right show, industrial activities sometimes led to poor air quality. In 1961, the West Virginia Legislature passed the Air Pollution Control Law of West Virginia, making West Virginia the sixteenth state to have a statewide air pollution control statute. This law provided for a separate state agency comprised of a seven-member Air Pollution Control Commission, a Director and staff. About 30 years later this agency evolved into the West Virginia Division of Air Quality within the Department of Environmental Protection (DEP).

Through the years, the essential air quality goals have remained the same – the achievement and maintenance of the NAAQS and specific controls targeting Hazardous Air Pollutants (HAPs). The DAQ administers various programs which collectively work together to develop and maintain an effective, comprehensive air quality management program. Monitoring air quality statewide; assisting companies with compliance; permitting to ensure economic growth in harmony with existing rules and regulations; requiring the installation of monitoring and control equipment; investigating complaints; and, taking enforcement actions against violators are all part of the DAQ's responsibilities.

Charleston, West Virginia, 1970 (above) and 2011 (below)

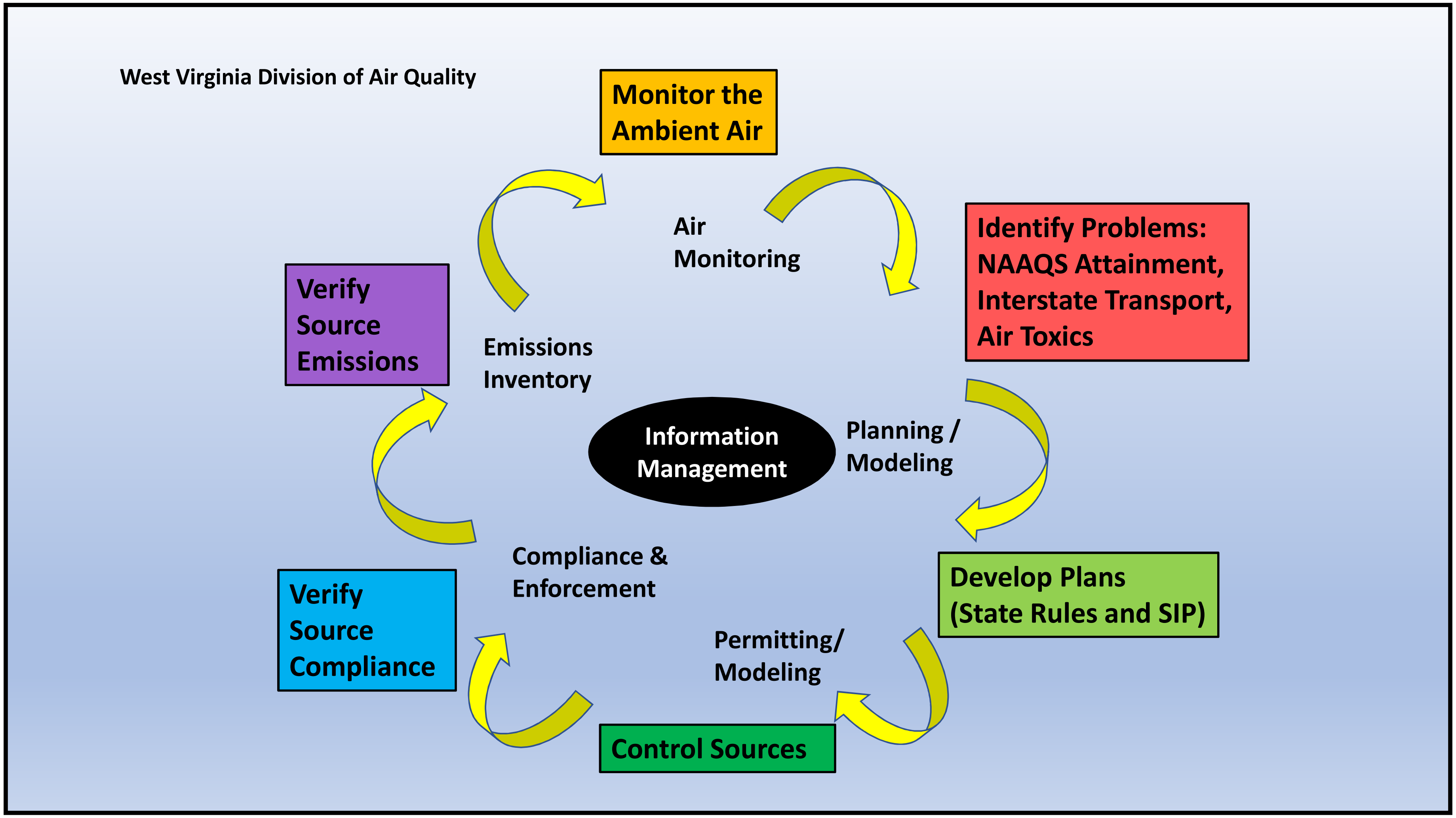
Regulations and related programs are developed and implemented to control air pollutant emissions from industrial and commercial facilities. Current air quality is assessed by the monitoring network which routinely measures for "criteria" pollutant levels as established by the NAAQS. Monitors are generally located near areas having higher population densities, near facilities with high pollutant emissions, or a combination of both factors.

As we continue to protect and improve today's air quality and preserve it for future generations, the study of past and present air quality data is a crucial component of program planning and developing future strategies.

Everyone can contribute to good air quality. Pollution prevention is often the most effective and least costly mechanism. Some ideas to help you save money and reduce pollution are listed on page 5.

Overview

Components of Air Quality Progams



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- Turn off lights, computers and electrical appliances when not in use. Use timers and motion detectors to turn off lights and be sure to unplug TV entertainment systems when traveling (use power strips for easy on/off switching). Don't leave your computer and monitor on needlessly.
- Lower the thermostat on your water heater to 120˚F. Water heaters are the second highest source of energy use in the home.
- Wash only full loads of dishes and clothes.
- Check furnace, heat pump and AC filters once a month and replace them regularly. A dirty air filter can increase your energy costs and cause problems with your equipment.
- Caulk and weather-strip around drafty doors and windows.
- Replace incandescent light bulbs with energy efficient compact fluorescent (CFL) or, better yet, LED bulbs. While you pay more up-front, these use up to 25 percent less energy and can last up to twelve times longer.
- Use a programmable thermostat and set it to 78˚F in the summer and 68˚F in the winter. Proper installation and use of a programmable thermostat can save up to $180 per year in energy costs.
- Use a rake or broom instead of a gasoline leaf blower.
- Store solvents in airtight containers and use spill-proof gasoline containers.
- Fuel your car when it is cooler, after sunset, to minimize evaporation.
- Don't "top-off" gas tank when fueling your vehicle and properly tighten the gas cap when finished.
- Don't idle – idling gets zero miles to the gallon.
- Carpool, ride the bus, bike or walk when possible. Combine errands for fewer trips.
- Your utility company may offer free energy audits that can identify expensive energy losses in your home, such as leaky ductwork. Sealing your ducts can reap big savings on energy bills and help keep you from turning up the thermostat because of one cold room.
- Look for products and appliances that have earned the ENERGY STAR label. These meet strict energy efficiency criteria that will reduce your utility bills and contribute to a healthier environment. ENERGY STAR clothes washers, for example, use approximately 40 percent less water and 25 percent less energy for washing than standard models.

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Air Monitoring Section

Before the 1970 Clean Air Act, air quality monitoring was conducted using methods recommended by the U. S. Department of Health, Education and Welfare (HEW). Most of the sampling technology employed under HEW was transitioned to the newly formed EPA in the early 1970's. At the same time, the West Virginia Air Pollution Control Commission, which became the DAQ several decades later, began incorporating the EPA air quality standards and sampling methods into its State Implementation Plans. Although monitoring networks and air sampling technology have dramatically changed since the 1970 Clean Air Act, the primary reason for the network has remained the same: to determine an area's compliance with the health-based NAAQS established for "criteria" pollutants. National changes can also affect the role and application of air monitoring. For instance, the DAQ used to analyze for lead concentrations in particulate matter but when lead was removed nationally as an additive to gasoline, the lead values plummeted and statewide lead monitoring was no longer needed.

The DAQ operates monitoring sites at various locations around the state. The criteria air pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_2), particulate matter (PM), and sulfur dioxide (SO_2). Nearly all air quality monitoring equipment is located at leased permanent sites, in buildings or specialized shelters designed for monitoring purposes. Not all sites are configured the same way. Some sites are single monitor sites located on a building rooftop, while other sites monitor for two or more parameters and are in our own environmentally-controlled shelters. Over the years, the EPA established and refined regulations and guidance that specifies the siting criteria, measurement requirements and quality assurance objectives for all air monitoring sites.

In West Virginia, DAQ uses collected data to:

- assess the extent of pollution;
- provide air pollution data to the public in a timely manner;
- support implementation of air quality goals and standards;
- evaluate the effectiveness of emissions control strategies;
- provide information on air quality trends;
- provide data for the evaluation of air quality models; and,
- support research (e.g., long-term studies of the health effects of air pollution).

Monitoring stations use EPA-approved Federal Reference Methods (FRMs) or Federal Equivalent Methods (FEMs) to collect data for direct comparison to the NAAQS. Our largest site, NCore, located in Charleston, is an advanced, multi-pollutant site that samples for trace

NCore site located in Charleston, West Virginia

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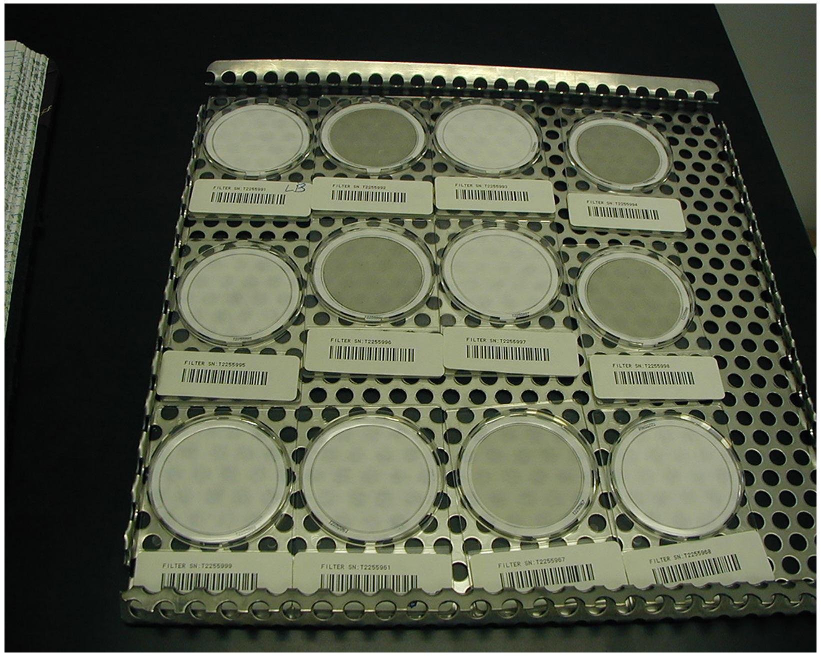
Air Monitoring Section

level gaseous pollutants and other pollutants. While most of the DAQ's monitoring program is focused on NAAQS assessment, other types of monitors, such as $PM_{2.5}$ speciation trends network samplers, air toxics monitors, periodic special project monitors and small meteorological towers, are also operated. It is an ongoing and costly challenge to operate sites, replace outdated equipment, modernize sites and maintain leases. Ambient air networks need to maintain stability and longevity to provide consistent, long-term data to detect long-term air pollution trends and support health effects research. Monitoring is also used to assess air quality levels based upon population exposure, industry emissions, background levels and other special purposes.

There are other types of national networks in addition to those that assess compliance with the NAAQS. These include National Air Toxics Trends Sites, National Core Network, Photochemical Assessment Monitoring Stations, Chemical Speciation Network, Interagency Monitoring of Protected Visual Environments, Clean Air Status Trends Network, the National Atmospheric Deposition Program, and the nationwide Environmental Radiation Monitoring Network. Monitoring networks are subject to continual changes in priorities and objectives, and increased quality assurance requirements. New and revised federal regulations, rigorous quality assurance guidance, changing air quality, and technological advancements challenge the operation of our nation's networks.

The EPA requires that the monitoring network be reviewed annually to identify any changes to the network. This review is posted on the web (www.dep.wv.gov/daq/publicnoticeandcomment/) for a 30-day public comment period and then submitted to the EPA for review and approval. The air quality data collected is quality assured before being submitted to the EPA's Air Quality System (AQS) national data bank in North Carolina. During ozone season, data is submitted several times a day to the EPA's AirNow Air Quality Index (AQI) Map on the internet (airnow.gov). Available continuous $PM_{2.5}$ and NCore ozone data is submitted year-round to AirNow. Weekday AQI information is also available on the DEP's website (www.dep.wv.gov/daq/air-monitoring/Pages/AirQualityIndex.aspx).



$PM_{2.5}$ filters that have sampled air for a 24-hour period

The DAQ also operates a laboratory that conducts gravimetric analysis of $PM_{2.5}$ filters and analysis of toxic metals using Induced-Coupled-Plasma Mass Spectrometry (ICP-MS). The weigh lab is an environmentally-controlled room that meets the EPA regulatory standards for temperature and humidity. The ICP-MS program receives particulate samples for metals analysis from various state and local agencies, including the Washington D.C. National Air Toxics Trends (NATTS). The DAQ's Air Monitoring Section and its Laboratory Programs are subject to rigorous quality assurance (QA) requirements.

The Air Monitoring Section is also required to conduct QA checks and audits on gaseous instruments and manual samplers. The Air Monitoring Section participates in the EPA's National

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Performance Audit Program that independently audits the gaseous ozone, SO_2 and CO analyzers, the national Performance Evaluation Program that independently audits $PM_{2.5}$ and the NATTS ICP-MS Performance Evaluation Program. Every three years, the EPA conducts a comprehensive on-site Technical Systems Audit (TSA) of the monitoring and laboratory program, which includes examining the sites to assure they meet established criteria. The EPA also contracts for a rigorous audit of the ICP-MS NATTS metals analysis program every few years.

Data from the continuous gas and PM monitors are automatically polled nightly by the Data Acquisition System (DAS) located in both the Charleston and Wheeling offices. Data from Chain of Custodies, instrument data files, QA checks, audit results and the Laboratory Information Management System are processed through internal databases. All data, including quality assurance checks and internal audit results, are quality assured and uploaded to the EPA's national Air Quality System database. The data is publicly available at the EPA's Air Data site www.epa.gov/outdoor-air-quality-data.

$PM_{2.5}$ monitoring site in Morgantown, West Virginia

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Air Monitoring Section

Air Quality Index

The Air Quality Index (AQI) is a simplified guide for understanding daily air quality. It indicates how clean or polluted the air is and identifies associated health concerns. The AQI focuses on health effects that can occur within a few hours or days after breathing polluted air. The EPA uses the AQI for five major air pollutants regulated by the CAA: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide and nitrogen dioxide. For each of these pollutants, the EPA has established national air quality standards to protect against harmful health effects. The AQI does not indicate the levels of natural allergens, such as pollen count, which may also affect respiratory function.

The AQI can be thought of as a ruler that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health danger. For example, an AQI value of 50 represents good air quality and little potential to affect public health. An AQI value of over 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant and is thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy for certain sensitive groups of people, and then for everyone as AQI values rise.

An AQI of 100 is the upper end of the "Moderate" or "Code Yellow" range and marks the level above which the EPA begins cautioning at-risk groups. The "Unhealthy for Sensitive Groups" or "Code Orange" range (AQI of 101-150) starts at 71 PPB for ozone and extends to 85 PPB.

The AQI for nine areas in West Virginia can be accessed by going to www.dep.wv.gov/daq and clicking on the AQI icon. The index may also be accessed by calling the DEP's hotline at (866) 568-6649, ext. 274.

The AQI is reported for Charleston, Huntington, Morgantown, Moundsville, Parkersburg, Weirton and Wheeling year round. The reported index is the calculated value for the past 24 hours and is updated daily, Monday through Friday, at approximately 8:30 a.m. During summer ozone season, Greenbrier County and Martinsburg are also reported.

Due to computer security constraints, the AQI must be manually updated by the DAQ staff and is not available on the weekends. However, these monitoring sites are linked with the EPA's AirNOW network at www.airnow.gov, which provides an hourly update during ozone season.

The purpose of the AQI is to help citizens understand what local air quality means in relation to short-term health effects. To make the AQI as easy to understand as possible, the EPA has divided the AQI scale into five levels of health concern as follows.

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AQI Value	Actions to Protect Your Health
Good 0-50	None
Moderate 51-100	Unusually sensitive people should consider reducing prolonged or heavy outdoor exertion.
Unhealthy for Sensitive Groups 101-150	The follow groups should reduce prolonged or heavy outdoor exertion: • People with heart or lung disease, such as asthma • Children and older adults • People who are active outdoors
Unhealthy 151-200	The follow groups should avoid prolonged or heavy outdoor exertion: • People with heart or lung disease, such as asthma • Children and older adults • People who are active outdoors Everyone else should reduce prolonged outdoor exertion.
Very Unhealthy 201-300	The follow groups should avoid all physical activity outdoors: • People with heart or lung disease • Children and older adults • People who are active outdoors Everyone else should limit outdoor exertion.

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Permitting Section

The DAQ's Permitting Section implements West Virginia's permit programs established under the State's Air Pollution Control Act. West Virginia's permit program includes review of applications, determination of permit applicability and issuance of permits for both minor and major sources. Minor sources are primarily permitted under the minor source rule found at 45 CSR 13. Major sources are primarily permitted under the New Source Review rules found at 45 CSR 14 and 45 CSR 19. Major sources are also issued operating permits under the authority of 45 CSR 30 (Requirements for Operating Permits) which is the state implementing rule of Title V of the 1990 Federal Clean Air Act Amendments.

We strive to ensure that economic growth will occur in harmony with the preservation of existing clean air resources; to prevent the development of any new nonattainment problems; to protect the public health and welfare from any adverse effects which might occur even at air quality levels better than the National Ambient Air Quality Standards; and, to preserve, protect and enhance the air quality in areas of special natural, recreational, scenic and/or historic value.

West Virginia coal-fired power plant

<u>New Source Review (NSR)</u>

West Virginia State Air Quality Rules 45 CSR 13, 45 CSR 14, and 45 CSR 19 set forth the procedures for obtaining air quality permits, registrations, and permit determinations.

45 CSR 13, known commonly as Rule 13, sets forth the procedures for stationary source reporting, and the criteria for obtaining a permit to construct and operate a new stationary source which is not a major stationary source, to modify a non-major stationary source, to make modifications which are not major modifications to an existing major stationary source, to relocate non-major stationary sources within the state of West Virginia, and to set forth procedures to allow facilities to commence construction in advance of permit issuance. This rule also establishes the requirements for obtaining an administrative update to an existing permit, a temporary permit or general permit registration, and for filing notifications and maintaining records of changes not otherwise subject to the permit requirements of this rule.

Sources required to obtain a Rule 13 permit or registration include any sources which:

- Have the potential to emit 6 pounds per hour and 10 tons per year of any criteria air pollutant; or
- 144 pounds per day of any criteria air pollutant; or

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Permitting Section

- 2 pounds per hour or 5 tons per year of any aggregated HAP or Toxic Air Pollutant (see 45 CSR 27); or
- Are subject to a substantive requirement of a state rule or federal regulation.

45 CSR 14, commonly known as Rule 14, establishes and adopts a preconstruction permit program in accordance with the Clean Air Act and the prevention of significant deterioration of air quality requirements of 40 CFR §51.166. Preconstruction permits issued pursuant to this rule shall contain emission limitations and such other measures as may be necessary for the prevention of significant deterioration of air quality.

45C CSR 19, commonly known as Rule 19, establishes and adopts a preconstruction permit program to satisfy the requirements of the Clean Air Act and the permit requirements of 40 CFR §51.165 for any area designated nonattainment for any national ambient air quality standard under 40 CFR part 81, Subpart C. This preconstruction permit program applies to any new major stationary source or major modification that is major for the pollutant for which the area is designated nonattainment, if the stationary source or modification would locate anywhere in the designated non-attainment area.

In West Virginia, New Source Review air quality permitting does not apply to nonroad engines, nonroad vehicles, motor vehicles, or other emissions sources regulated under Subchapter II of the Federal Clean Air Act. All applications must conform to the review procedures and conditions of the West Virginia Code, as well as West Virginia permitting Rules.

<u>Title V</u>

Operating permits are legally enforceable documents that permitting authorities issue to air pollution sources after the source has begun to operate. Title V of the federal Clean Air Act (CAA), as amended in 1990, required each state to develop an operating permit program for major sources (and some minor sources) of air pollution. West Virginia's operating permit program issues Title V Operating Permits under the authority of 45 CSR 30 (Requirements for Operating Permits). Sources required to obtain a Title V permit include the following:

- A major source that has the potential to emit in aggregate, 10 tons per year (tpy) or more of any hazardous air pollutant listed pursuant to §112(b) of the CAA or 25 tpy or more of any combination of such hazardous air pollutants;
- A major source that has the potential to emit 100 tpy or more of any air pollutant, subject to regulation;
- Any source, including an area source, subject to a standard or other requirements promulgated under §111 of the CAA;
- Any source, including an area source, subject to a standard or other requirements under §112 of the CAA; or
- Any affected source that includes one or more affected units under Title IV of the CAA (Acid Deposition Control).

Title V operating permits identify all "applicable requirements" and include emission limits and standards, as well as monitoring, testing, recordkeeping, and reporting requirements. These permits also require submittal of reports of any required monitoring in the form of Semi-annual Monitoring Reports and, the submittal of Annual Compliance Certifications, which require the permittee to certify compliance with the conditions of their permit.

In addition to issuing and renewing Title V permits, the Title V Permit Group also reviews and processes administrative amendments, minor modifications, significant modifications, reopenings, and off-permit changes to a facility's existing Title V operating permit.

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Small Business Assistance Program

The DEP's Division of Air Quality is home to the Small Business Assistance Program (SBAP), which has been providing outstanding customer service to citizens and industry for over 20 years. The SBAP provides confidential services related to air quality regulations for qualified small businesses and advises customers on multi-media issues during requested site visits. Qualified Small Businesses have less than 100 employees company-wide (under common ownership), and are not a major source of air pollution (10 TPY per single HAP, 25 TPY for a combination of HAPs, 100 TPY criteria pollutants).

Besides regulated facilities, SBAP customers also include many non-traditional clients, such as county, state and federal government agencies; colleges and universities; cities and towns; as well as providing guidance to consultants compiling air quality applications for their own customers.

SBAP Activities include:

- Providing technical assistance to small businesses
- Assistance with emission calculations
- Rule applicability determinations (State and Federal)
- Onsite environmental audits
- Various education and outreach efforts
- Air Permit Application completion
- Assistance with water, waste and other environmental issues

SBAP customer statistics include an average of 139 customers and 38 site visits per year, in addition to visits to our website and development of outreach materials. These outreach materials can be viewed at: www.dep.wv.gov/daq/small%20business/Pages/SmallBusinessLinks.aspx.

One of the SBAP's specialties is developing outreach materials to take complex rules and distill them down into easy-to-understand instructions for facilities to get into or stay in compliance. As always, customer satisfaction and compliance assistance are and will continue to be the key focus for this program.

SBAP staff reviewing records with small business owner

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Compliance and Enforcement Section

The DAQ's Compliance and Enforcement Section (C&E) is responsible for conducting inspections and investigations of air pollution sources, addressing citizen complaints involving alleged air pollution violations, and inspecting asbestos demolition and renovation projects.

The sources involved are subject to a wide range of regulations, including EPA-delegated programs, EPA-approved State Implementation Plans (SIPs), and state-only rules. Most of the EPA-delegated programs are rules governing the emissions of hazardous air pollutants utilizing maximum achievable control technology (MACT) standards or are subject to federal new source performance standards (NSPS).

Compliance actions are defined as follows:

Full Compliance Evaluation (FCE)

A comprehensive evaluation of a facility addressing all regulated pollutants at all regulated emission points. The DAQ conducts FCEs of both major and minor sources of air emissions.

Air Quality inspector using optical gas imaging camera

Partial Compliance Evaluation (PCE)

A comprehensive evaluation of a subset of regulated pollutants or regulated emission points at a facility.

Stack Test Activity

A stack test is the actual measurement of pollutant emissions from a process vent and is performed using a scientifically developed and approved method(s) designed for the specific pollutant being measured. Stack test activities include observing the test in person and reviewing the analytical results.

Title V Certification Review

A Title V certification is written documentation certifying that a company has or has not complied with each of the requirements of its Title V operating permit. These certifications are reviewed by the C&E Section.

Self Monitoring Report (SMR) Review

A self monitoring report is a report submitted by a company, often required by a permit or regulation, to report actual emissions of pollutants or operating conditions that may indicate emissions of pollutants. These reports are generally required to be certified by a responsible company official and then reviewed by the C&E Section.

Continuous Emissions Monitoring System (CEMS) Review

A CEMS is a system of instruments that continuously measures pollutant emission concentrations and/or quantity, and is capable of recording and reporting them. CEMS are subject to stringent quality assurance/quality control (QA/QC) requirements. The C&E Section reviews CEMS reports.

Sources are regularly inspected in order to determine compliance and meet program goals, as follow-up to previously-cited violations and/or to address citizen complaints.

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Planning Section

The DAQ has primary responsibility for developing plans to ensure the primary and secondary NAAQS concentration limits are achieved and maintained within the state. The DAQ's Planning Section is responsible for revising the State Implementation Plan (SIP) as necessary. The EPA reviews and approves the state's SIP revisions. In addition, the CAA requires states to develop more specific plans for areas not meeting a pollutant's primary or secondary NAAQS (nonattainment).

The Planning Section also develops emissions inventories for sources emitting air pollutants, performs computer air modeling and analyses to determine how to meet and maintain compliance with the NAAQS, works with local Metropolitan Planning Organizations (MPOs) to ensure emissions from vehicles do not negatively impact local air quality, and works with the West Virginia Legislature to develop state air quality rules. The Planning Section is also responsible for developing programs to meet air quality standards and other state and federal air quality requirements.

State Implementation Plan (SIPs)

The Air Pollution Control Commission, the predecessor to the DAQ, submitted West Virginia's first SIP to the EPA on January 27, 1972. Since then, there have been numerous SIP revisions submitted in accordance with the CAA and its amendments.

A SIP describes how the state will implement, maintain, and enforce the NAAQS and contains many documents that form a blueprint and timeline for how the state plans to ensure compliance with the NAAQS. A SIP is a living document that is continually edited and updated. West Virginia's SIP is a complex collection of documents that has been developed over more than 45 years. Primary documents in a SIP include:

- State air quality programs;
- Legislative air quality rules;
- Consent Orders for specific facilities;
- Plans for implementing new or revised NAAQS;
- Plans for meeting and maintaining the NAAQS;
- State inventory of air emissions;
- Plans for controlling emissions; and,
- Documentation of public involvement in the SIP process.

There are circumstances for which the CAA requires a SIP to be revised. When additions, deletions, or revisions are made to information contained in a SIP, that action is called a "SIP revision." However, for convenience, the term "SIP" is frequently used when referring to "SIP revisions."

Types of SIPs

SIP types vary depending on the pollutant of concern, regulatory requirements, and the specific geographic area where it applies. Some of the major types of SIPs are:

- Infrastructure
- Attainment for nonattainment areas
- Maintenance for former nonattainment areas
- Program

These SIP types are further discussed on pages 15 and 16.

Infrastructure SIPs

Once the EPA establishes a new or revised NAAQS concentration limit for an air pollutant, the CAA requires states to develop an infrastructure SIP. The Infrastructure SIP demonstrates the state has the legal authority, regulatory structure, and sufficient resources to implement the NAAQS statewide. If a state cannot make this demonstration, then the EPA can develop a Federal Implementation Plan (FIP). In a FIP, the EPA takes over the deficient element of the state program and runs it until the state is able to demonstrate the ability to run its own program.

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Planning Section

If the EPA designates an area within the state as nonattainment (not meeting the NAAQS air pollutant concentration limit) in regards to a new or revised NAAQS, the Planning Section prepares an Attainment SIP. An Attainment SIP describes how the area will be brought into compliance and contains specific measures that will be taken to improve the air quality and meet the NAAQS. By federal law, for areas that the EPA has designated as nonattainment for a NAAQS, West Virginia must develop an Attainment SIP. The areas not attaining the NAAQS are typically associated with the state's more populated and industrial areas, and are defined by county or other local jurisdictional boundaries.

Maintenance SIPs

Once air quality improvement programs have been implemented in a nonattainment area and ambient air quality monitors show the area now meets the NAAQS, West Virginia may request the EPA to redesignate the area to attainment status. To make this request, the state must develop a Maintenance SIP for EPA's approval. The Maintenance SIP describes the actions the state will take to ensure the area continues to meet or maintain the NAAQS limit for the next 20 years. This is accomplished with two, 10-year plans. The first 10-year plan is reviewed to ensure the ambient air quality is continuing to meet the NAAQS and is then revised as appropriate to cover a second 10-year period. An area subject to an EPA-approved Maintenance Plan is called a "Maintenance Area."

Dolly Sods, West Virginia – Class 1 Area

Program SIPs

A Program SIP implements programs or parts of programs required by the CAA. An example of a program SIP is the Regional Haze SIP, which was required by Congress to improve visibility in national parks and wilderness areas, such as Dolly Sods in West Virginia. These programs can be related to specific types of emission sources. Sources could include specific industrial sources, such as emissions from coal-fired electric power plants, or from mobile sources such as cars, trucks, and semi-trucks. These programs can also specify the control of specific criteria pollutants from each regulated source.

Rules for SIPs

In West Virginia, state rules require legislative action. A bill containing the state rule must be approved by the Legislature before the agency can implement and enforce the rule. West Virginia usually submits legislative rules as a revision to the existing SIP as an enforceable means to implement the air emission control strategy in any type of SIP previously described.

Rules may also be submitted as stand-alone SIP revisions. The DAQ's Planning Section develops proposed rules and rule revisions for legislative approval. Once approved by the

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Legislature, the DAQ submits the rule to the EPA for their approval and incorporation into the SIP.

When the EPA approves a rule as part of the SIP, the rule becomes “federally enforceable.” Therefore, if the DAQ does not enforce the approved rule, the EPA has the authority to enforce the state’s rule at the federal level if the agency has sufficient reason to believe DAQ is not adequately implementing the rule. This is a CAA requirement to ensure a state’s air quality programs are enforced.

Emissions Inventory

The CAA requires the state to report emission inventory data to the EPA. The Planning Section is responsible for compiling a comprehensive and detailed estimate of air criteria pollutants, criteria pollutant precursors and hazardous air pollutants from air emissions sources. Emission sources include point sources, area or nonpoint sources, on-road sources, and non-road sources. These estimates are called emissions inventories. Emissions inventories are used by the EPA to inform policy decisions when setting or revising NAAQS, and developing new or revised federal regulations; and, by the state in developing SIPs.

Air Quality Modeling

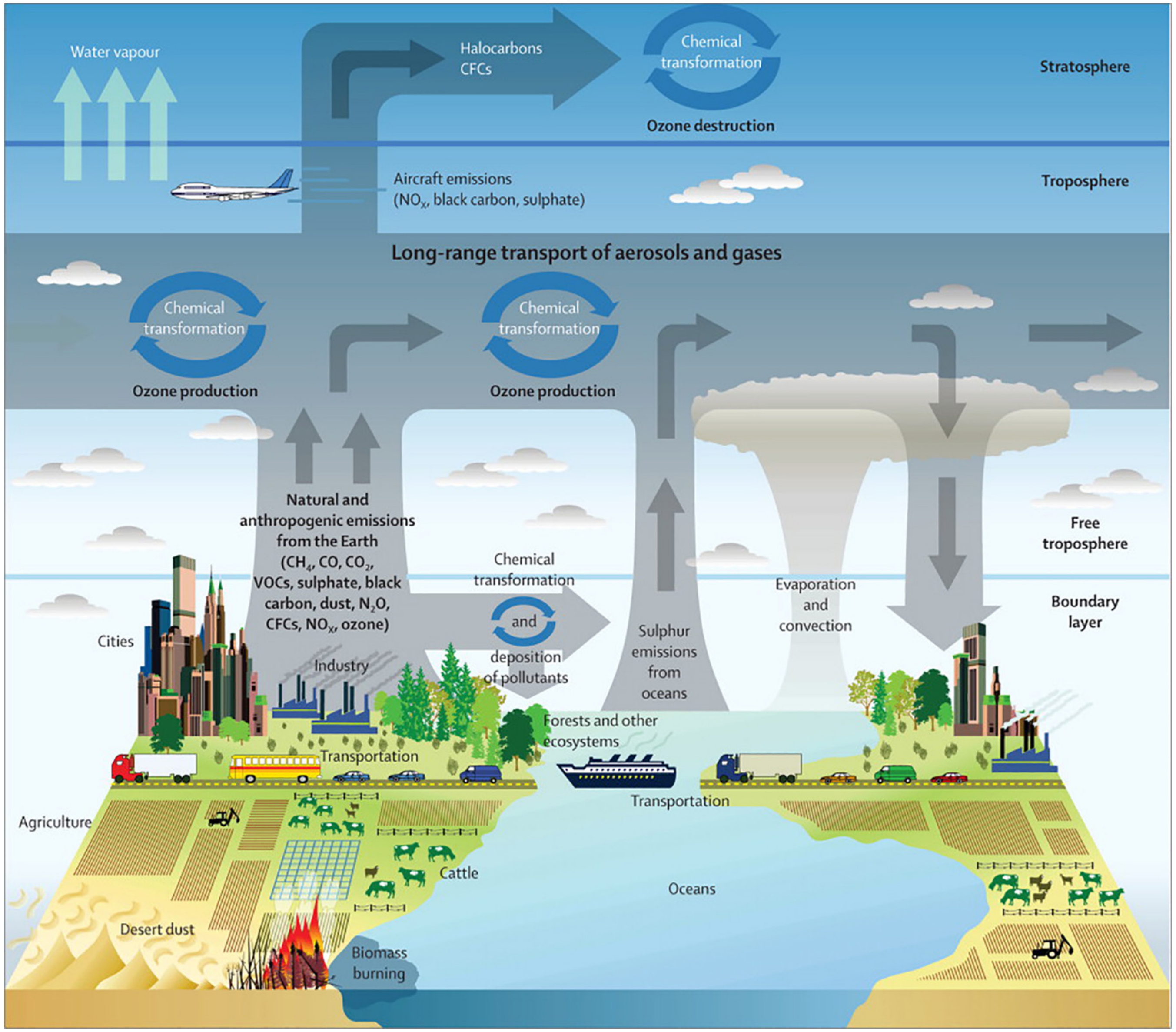
Air quality modeling simulates how air pollutants move through the atmosphere and how they affect ambient air quality. Modeling of individual or multiple emission sources helps determine the sources’ effects on ambient air quality. The DAQ uses models to identify a source’s contributions to air quality issues, and to assist in the design of effective air emission control strategies to reduce harmful air pollutants.

Meteorological data and source information such as emission rates and stack height are used as inputs for the air quality models. Some models are designed to characterize primary pollutants that are emitted directly into the atmosphere such as the criteria pollutants. Other models also characterize secondary pollutants that are formed as the result of complex chemical reactions that occur in the atmosphere.

In addition, the DAQ can use models to predict the impacts from potential new emission sources to determine appropriate permit conditions, air pollution control strategies, and air emission limits. The DAQ’s Planning Section applies these models to simulate ambient air pollution concentrations under different scenarios as a tool to help make and justify policy decisions. Models are also used to determine the relative contributions of emissions from different sources to track trends, monitor compliance, and inform policy decisions.

Division Organization

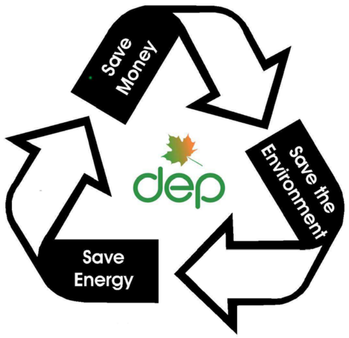
Planning Section



Sources of air pollution emissions that interact in the atmosphere

Division Organization

Outreach and Education



Due to their complexity, air quality issues are often difficult to convey to the public. In 2006, the DAQ formed an "outreach" team to explore more contemporary ways of communicating with the public. The team included personnel from all sections and job classifications of the agency and expenditures were paid for from the agency's Air Pollution Education and Environment Fund funded by enforcement settlements.

The team brainstormed different ideas that would better draw the public's attention at outreach events. Students, in particular, and the public at large required different types of stimuli to capture their attention. New displays needed to convey the message of air quality to the public in a short amount of time. Instead of going into great detail to tell the story or present too much information, the team came up with a basic message to convey and interactive activities that would bring that message home. A core premise was that energy efficiency results in less air pollution. One of the first messages the team worked at conveying was, "Save energy, save money, save the environment."

Solar racetrack

The team identified their audience and considered how to communicate with them effectively. Games provided a wonderful opportunity for elementary students, but most adults were more receptive to a CFL bulbs display, showing energy and cost savings. Emphasizing cost saving seems to work particularly well with West Virginia citizens. A key goal was for everything to look professional and well designed. This included dressing all team members in similar clothing so visitors knew exactly who was presenting the information.

Two DAQ engineers designed and built a "smoke" simulator to demonstrate the difference between controlled and uncontrolled emissions

Smoke simulator

Crank Generator

Division Organization

Outreach and Education

of a coal-fired boiler. A short presentation was developed that told the Clean Air Act's evolution starting with the 1948 smog disaster in Donora, Pennsylvania, and ending with the simulator. Dry ice was used to simulate "pollution" and small fans, with and without a filter, were used to draw the "pollution" through two large acrylic stacks.

DAQ staff at various outreach events

Subsequently, the team wanted to encourage individuals to think of ways they could personally protect the environment by reducing their energy needs. A generator was designed and built by DAQ personnel to allow participants to manually crank it, providing power for both an incandescent light bulb and a CFL bulb. By the end of the demonstration they would not only be able to physically feel how much less energy CFL bulbs used, they would be able to equate that to reducing their own electric demands and electricity costs. This is a powerful message – not only how to save money, but on how to protect the environment as well. As LED bulbs became more popular, these were also used in the crank generator.

DAQ's interactive demonstrations have continued to grow. A voltage meter was added to compare the actual energy used by a CFL bulb and an incandescent bulb; a child's doll house was converted into an energy efficient model house complete with solar panel; a battery-powered lawn mower was added; and, staff began giving tours of the first hybrid vehicle owned by the State of West Virginia – the DAQ's 2005 Toyota Prius.

Division Organization

Outreach and Education

In 2011, to provide an alternative energy example, a slot car race track was purchased and dubbed the “Solar Racing Series.” A solar panel charges the battery pack and allows use of the solar race track in and out of doors. This has proven to be one of our most popular outreach items to date.

DAQ staff joined other offices of the DEP to work at the inaugural 2013 Boy Scout Jamboree at the Summit Bechtel Reserve near Mount Hope, West Virginia. The Jamboree was attended by over 30,000 Scouts from across the United States and 18 different countries. Two new displays were developed — the Electrostatic Precipitator (ESP) machine and the BioLite Campstove. The agency also invested in a coin smasher which could imprint environmental messages into coins and provide a low-cost souvenir to Jamboree goers and could be used at other events across the state. Commemorative pennies for the Jamboree, as well as West Virginia’s Sesquicentennial birthday, were developed.

The ESP machine demonstrated how an induced electrostatic charge controls smoke at a coal-fired power plant by removing fine particulate matter such as dust and smoke from the stacks.

The BioLite Campstove showed Scouts how heat from fire can generate electricity via a thermoelectric generator to power a fan creating airflow for improved combustion and less smoke. The surplus electricity is sent to a USB port for charging electronic devices, even in the middle of camp with no electricity.

In December of 2013, the DAQ turned the entire DEP headquarters into the newest annual outreach display. The DEP Energy Tree allows the public to provide the power, via hand crank, to light up a traditional 100-bulb incandescent tree versus an 800-plus light, 35-foot LED tree, draped to the side of the DEP building, again bringing home our core outreach message – “Save Money, Save Energy, Save the Environment.”

DEP Energy Tree

Division Organization

Air Toxics

Air toxics is a broad term that refers to air pollutants that may pose an increased chance of causing cancer or other serious health effects at sufficient concentrations and durations. Health effects may include respiratory or neurological damage, reproductive or developmental impacts, or damage to the immune system among other health problems. Some air toxics, such as mercury, can deposit onto soils or surface waters where they are then taken up by plants and may then be eaten by animals, becoming more concentrated as they move up the food chain. The 1990 Clean Air Act (CAA) specified 187 Hazardous Air Pollutants (HAPs) to regulate from various industrial sources such as chemical plants, metallurgical manufacturers, refineries and surface coaters. Some HAPs are carcinogenic, some have only non-cancerous or acute effects, and some may exhibit all of these properties at certain exposure levels. Approximately two-thirds of the HAPs are known, probable, or possible human carcinogens. A few HAPs (such as mercury) are known to bioaccumulate and bioconcentrate in humans and in the environment. Implementation of state rules, as well as federal air toxics standards and other programs authorized by the 1990 CAA, have helped reduce emissions of air toxics in West Virginia and across the nation.

Federal Regulations

The EPA has established regulations to reduce air toxics from stationary sources, as well as from mobile sources. The DAQ implements most of the EPA's air toxics rules for stationary sources (found in 40 CFR 61 and 40 CFR 63) via incorporation by reference into state rules such as 45 CSR 34. The DAQ does not regulate mobile source air emissions. The original National Emission Standards for Hazardous Air Pollutants (NESHAPs) were required by the 1970 CAA. These standards were developed for new, modified, or reconstructed sources and source categories that emitted HAPS that were determined to pose adverse risk to human health.

Congress directed EPA to develop a program to further advance the regulation of HAPs in Section 112 of the 1990 CAA. While the standards for major sources of HAPs developed per this section are also designated as NESHAPs, they are established according to Maximum Achievable Control Technology (MACT) requirements. MACT is a technology-based standard, as opposed to a risk-based standard. These NESHAPs also apply to all existing and new, modified, or reconstructed sources.

These 40 CFR 63 NESHAPs have a two-part regulatory process for major sources of HAPs in which a technology-based standard is established, followed by a health-risk-based standard eight years later. Since 1993, the EPA has issued nearly 100 MACT standards covering almost 200 categories of large industrial sources. While these MACT standards typically apply to major sources (those at facilities with potential to emit greater than 10 ton/year or more of a single HAP, or 25 ton/year or greater of aggregate HAPs), many MACTs also apply to area sources (sources with less than 10/25 ton/year HAP thresholds); a few MACTs apply only to area sources. The definition of major source depends upon a facility's potential to emit, not its actual emissions.

The EPA has also identified additional area sources (non-major sources) of air toxics for regulation pursuant to the Integrated Urban Air Toxics Strategy as mandated by Section 112(k) of the 1990 Clean Air Act Amendments (CAAA). These standards are also designated NESHAPs in 40 CFR 63, but they are established based on a lower-level of technology – Generally Achievable Control Technology (GACT) rather than MACT standards that apply to major sources of HAPs. EPA's air toxics website contains a wealth of information on these regulations at www3.epa.gov/ttn/atw/eparules.html.

Division Organization

Air Toxics

112(r) Prevention of Accidental Releases and General Duty Clause

The 1990 CAAA §112(r) program is designed to prevent accidents and releases through a program of preparedness, response, and prevention. While the DAQ does not have delegation of this program, we recognize it as an important tool in protecting lives and the environment by assisting facilities to operate safely. Additionally, regulated facilities need to be aware of these requirements and operate accordingly.

The General Duty Clause (GDC) of §112(r)(1) establishes that owners and operators of stationary sources producing, processing, and storing extremely hazardous substances have a general duty to identify hazards associated with an accidental release, design and maintain a safe facility; and, minimize consequences of any accidental releases that occur.

Additionally, a Risk Management Plan (RMP) must be developed and submitted to the EPA if a facility has more than a threshold quantity of a regulated substance in a process. The RMP includes an off-site consequence analysis, five-year accident history, prevention plan, and emergency response plan.

The EPA inspects facilities that are subject not only to the RMP provisions, but those subject to the broader GDC provisions as well. The 112(r) and RMP EPA website contains additional information.

State Rules

In addition to implementing federal air toxics programs (through 45 CSR 15 and 45 CSR 34), the DAQ addresses HAP emissions from stationary sources in its minor source permitting program (45 CSR 13), in an air toxics regulation of limited scope (45 CSR 27), as well as toxic particulates and metals through 45 CSR 7.

45 CSR 7 Particulate Emissions from Manufacturing Operations

Section 4.13 of 45 CSR 7 addresses potential hazardous material emissions. This section requires that the utmost care and consideration of potential harmful effects from air emissions be evaluated from manufacturing process source operations that emit hazardous particulate matter. These compounds include, but are not limited to lead, arsenic, beryllium, asbestos and mercury (these compounds happen to have plantwide *de minimus* thresholds established in Table 45-13A of 45 CSR 13). The DAQ is required to make these evaluations based on the adequacy, efficiency and emission potential of these facilities, while working in conjunction with other appropriate governmental agencies.

45 CSR 13 Minor New Source Review Permitting

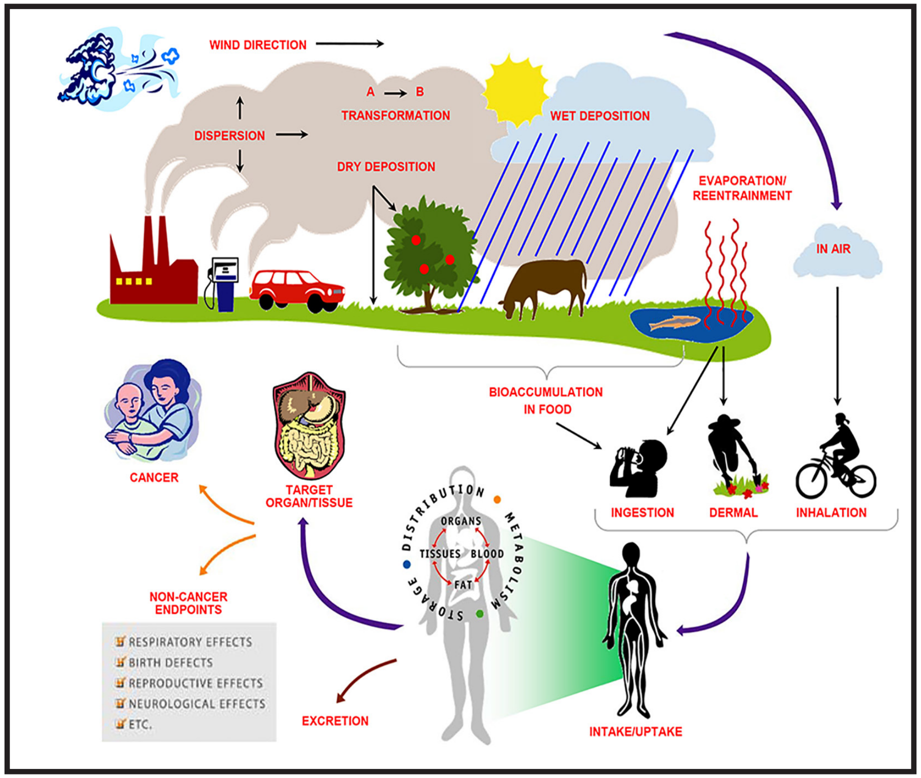
West Virginia's minor source air permitting program is enacted through 45 CSR 13. Air toxics are addressed, along with other regulated air pollutants in this rule. Some of the ways in which air toxics are addressed in 45 CSR 13 include:

- Any source that proposes to have the potential to emit before controls at or above 2 pounds/hour or 5 tons/year of HAPs considered on an aggregated basis, either through a modification or new construction, is required to obtain a preconstruction permit under 45 CSR 13.
- Sources are required to identify and quantify all HAP emissions associated with a proposed project and include them with supporting calculations as part of the 45 CSR 13 permit application review process.
- Sources that will be subject to any substantive requirement of an emission control rule promulgated by the Director (including a NSPS, NESHAP or MACT standard) are also required to obtain a preconstruction permit under 45 CSR 13.

Division Organization

Air Toxics

- A new or reconstructed source that proposes potential emissions increases of 10 tons/year of any single HAP or 25 tons/year of combined HAPs and that is not already regulated by a MACT standard may be subject to case-by-case MACT.
- Table 45-13A lists 19 specific air toxics and associated maximum potential annual plantwide emissions limits over which would require a facility to obtain a 45 CSR 13 permit. All 19 compounds listed in Table 45-13A are also included in EPA's list of HAPs.



Air Toxics Exposure Pathways

14 of the compounds listed in Table 45-13A are Toxic Air Pollutants (TAPs) as defined by 45 CSR 27. The remaining five compounds listed in Table 45-13A are metals also addressed in 45 CSR 7 - arsenic compounds (inorganic), asbestos, beryllium, lead or lead compounds and mercury - and some sources with maximum potential annual plantwide emissions over the listed amounts are required to obtain a 45 CSR 13 permit.

Any source already over the quantities listed in Table 45-13A that proposes a change that will result in an emissions increase of a pollutant listed in Table 45-13A of 10 percent or more of the amount set forth in the table is required to obtain a permit per 45 CSR 13.
Finally, the DAQ may determine that a source (not otherwise subject to this rule) should be made subject to the permitting requirements of 45 CSR 13 to prevent statutory air pollution (45 CSR 13, Section 14).

<u>45 CSR 27 Best Available Technology (BAT)</u>

45 CSR 27, "To Prevent and Control the Emissions of Toxics Air Pollutants," addresses 14 compounds recognized as "Toxic Air Pollutants" (TAPs) that are emitted by certain types of sources. All 14 TAPs are also included in the EPA's list of HAPs. A list of TAPs can be found in the rule at Table A of 45 CSR 27, or "45 CSR 27 Toxic Air Pollutants," which also includes synonyms for the TAPs. The scope and purpose of 45 CSR 27 is to prevent and control the discharge of TAPs from "chemical processing units" by requiring the application of Best Available Technology (BAT), a standard specified in the rule. Table A of 45 CSR 27 sets a plantwide *de minimus* level for each TAP, including fugitive emissions. If plantwide emissions of a particular TAP exceed the *de minimus* level, then a case-by-case review of emissions is performed to ensure these meet the state standard known as BAT.

The basis of 45 CSR 27 was a statutory air pollution finding grounded in the results of the "Kanawha Valley Toxics Screening Study Final Report" of July 1987. This study was undertaken by the agency shortly after the impacts of accidents such as that in Bhopal, India on December 3, 1984 and in Institute, West Virginia on August 11, 1985 increased citizen awareness of emissions of air toxics from chemical plants, as well as the potential for accidental releases.

Over time, many facilities have made process changes, and become subject to newer EPA NESHAP standards that typically provide an even greater level HAP emission reductions. However, 45 CSR 27 provides an anti-backsliding measure for any regulatory gaps that may exist in the federal program, and an extra measure of health protection to West Virginia's citizens.

In the case of "chemical processing units" constructed or modified after the June 30, 1990 effective date of this rule, BAT shall not be less stringent than the most stringent emissions level that is achieved in practice by similar sources or processes. For existing "chemical processing units," BAT may be less stringent than requirements for new or modified units. For all facilities, BAT shall represent the maximum degree of emission reduction that the Director determines is achievable taking into consideration the cost of achieving such emission reductions, and public health and environmental impacts. All BAT programs shall fully consider the additive or cumulative health and environmental impacts of multiple pollutant and multiple unit emissions. No BAT proposal shall be approvable that represents a level of control less stringent than any requirement for a "chemical processing unit" under 40 CFR 61 and 40 CFR 60. The DAQ typically uses a "top-down" approach to determine BAT.

45 CSR 34

45 CSR 34 incorporates by reference federal air toxics regulations promulgated under the NESHAP program at 40 CFR 61 and 40 CFR 63.

National Air Toxics Assessment (NATA)

The EPA developed the National Air Toxics Assessment (NATA) because there is not a large, nationwide monitoring network in place for the 187 pollutants identified as air toxics. To understand potential health risks from breathing air toxics, the agency developed the air dispersion model-based NATA.

The purpose of NATA is to identify and prioritize air toxics, emission source types, and locations that are of greatest potential concern in terms of contributing to population risk. However, it should not be used to single out or rank areas of the country as having the highest risk since there are many caveats to the EPA's techniques. The EPA suggests that the results of this assessment be used cautiously, as the overall quality and uncertainties of the assessment will vary from location to location, as well as from pollutant to pollutant. The results provide a snapshot of air quality for a given year.

The following types of emissions sources are included in NATA:

- **Stationary sources**, e.g., industrial facilities such as coke ovens for the steel industry, refineries and smaller sources like gas stations
- **Mobile sources**, e.g., cars, trucks and off-road vehicles like construction equipment and trains
- **Events,** e.g., wildfires, prescribed burning
- **Biogenics**, e.g., naturally-occurring emissions

In addition, NATA includes:

- **Secondary formation**, e.g., pollutants that form from chemical reactions of other pollutants emitted into the air such as formaldehyde
- **Background,** e.g., long-range transport from distant sources

NATA is available online and provides a broad estimate of health risks over geographic areas of the country: www.epa.gov/national-air-toxics-assessment.


National Ambient Air
Quality Standards

Pollutants with Standards

Criteria Pollutants

The Clean Air Act (CAA) requires the EPA to review the National Ambient Air Quality Standards (NAAQS) every five years and revise the standards as appropriate for criteria pollutants considered to be harmful to public health and the environment. Criteria pollutants are common pollutants that are found all over the United States. The EPA uses these criteria pollutants as indicators of air quality. The federal agency establishes two distinct kinds of NAAQS for acceptable concentrations of specific pollutants in the ambient (outdoor) air. Primary standards establish limits to protect public health, including the health of sensitive populations, such as children, the elderly and those with asthma. Secondary standards set limits to protect public welfare including protection against decreased visibility and damage to animals, crops, vegetation and buildings.

NAAQS standards have been established for six principal pollutants:

- ground-level ozone (O_3)
- particulate matter (PM_{10} and $PM_{2.5}$)
- sulfur dioxide (SO_2)
- carbon monoxide (CO)
- nitrogen dioxide (NO_2)
- lead (Pb)

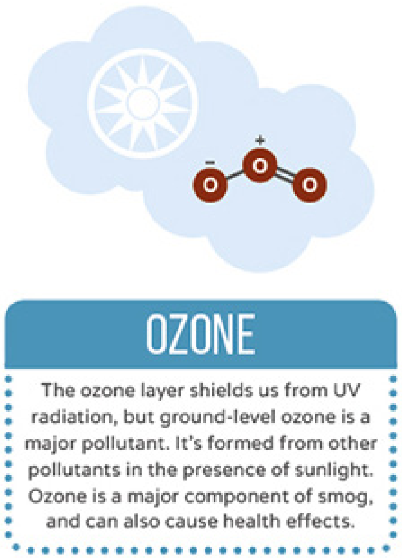
Health effects of air pollution vary greatly, depending on the exposure level, duration and pollutant. The air quality standard is expressed as an average concentration over a specific time period (an hour, a day or a year) to account for the fact that the concentration of a pollutant in the air varies over time. The concentration is expressed in parts per million (PPM) or micrograms of pollutant per cubic meter of air ($\mu g/m^3$). To help put the terms in perspective, one PPM is about one inch in 16 miles or one minute in nearly two years. Some standards may be expressed in parts per billion (PPB). It takes 1,000 PPB to equal 1 PPM. The standard also specifies whether the limit applies to an annual average concentration, a specific percentile, or a number of times the level can be exceeded during the calendar year.

West Virginia maintains a federally approved statewide network of monitoring stations. The network takes samples and measures (monitors) the air quality. If the air quality fails to meet any of the NAAQS, the EPA designates the region as a nonattainment area. The DAQ is then required to develop a state implementation plan (SIP) to achieve and maintain air quality standards in that area. SIPs must be approved by the EPA.

Finding Sources of Air Pollution

Pollutant	Sources	Health Effects	Environmental Effects
Carbon Monoxide (CO) Colorless, odorless poisonous gas, formed when carbon in fuels is not burned completely	Burning of gasoline, wood, natural gas, coal, oil, etc. (motor vehicle exhaust, industrial processes, fuel combustion)	Reduces oxygen delivery to the body's organs and tissues, causes visual impairment, and reduces work capacity, manual dexterity, and learning ability	A precursor to ozone and a useful tracer of combustion-derived pollutants
Lead (Pb) Solid metallic element	Paint, smelters, battery plants	May cause anemia, kidney disease, reproductive disorders, behavioral disorders, neurological impairments (seizures, mental retardation)	Accumulates in soils and sediments, and can cause decreased growth in plants and animals.
Nitrogen Dioxide (NO_2) From the nitrogen oxide family, forms when fuel is burned at high temperatures	Burning of gasoline, natural gas, coal, oil, etc. (Diesel trucks, wood stoves, power plants, cars)	Irritates the lungs, lowers resistance to respiratory infections, increases incidence of acute respiratory illness in children	Contributes to acid rain and eutrophication (a reduced amount of oxygen) in coastal waters, which is destructive to fish and other animal life
Ozone (O_3) Chemical reaction of nitrogen oxides and volatile organic compound emissions (primary component of smog)	Gasoline vapors, chemical solvents, combustion products of various fuels, consumer products	Reduces lung function, induces respiratory inflammation, asthma, chest pain, coughing, nausea, pulmonary congestion	Damage to plants and trees, reduced visibility due to smog, permanent structural damage to the lungs of animals
Particulate Matter (PM_{10}, $PM_{2.5}$) Solid or liquid particles found in the air, originates from a variety of mobile and stationary sources	Burning of wood, diesel, and other fuels (diesel trucks, wood stoves, power plants), agriculture (plowing and burning of fields), unpaved roads	Effects on breathing and respiratory system, damage to lung tissue, nose and throat irritation, cancer, premature death	Reduced visibility, damage to man-made materials when acidic
Sulfur Dioxide (SO_2) From the sulfur oxide family, forms when fuel containing sulfur is burned	Burning of coal and oil, industrial processes (metal smelting, paper, oil refining)	Effects on breathing, respiratory illness, alterations in pulmonary defenses, aggravation of existing cardiovascular disease	Damage to the foliage of trees and agricultural crops, acidification of lakes and streams, accelerated corrosion of buildings and monuments, reduced visibility

Ozone (O_3)



Ozone is a gas that occurs both in the Earth's upper atmosphere and at ground level. At both layers, ozone has the same chemical composition (O_3). However, ozone can be "good" or "bad" for your health and the environment depending on its location in the atmosphere. In the stratosphere, six to 30 miles above the Earth, ozone protects us from the sun's harmful ultraviolet (UV) rays. But in the troposphere, which generally extends from the ground to a level about six miles up, ozone is harmful to breathe and is a key component of smog. It also damages trees and plants.

Ozone forms from nitrogen oxides (NO_x) and volatile organic compounds (VOCs) as they "cook" in the sun. Cars, trucks, buses, engines, industries, power plants and products such as solvents and paints are among the major manmade sources of ozone-forming emissions.

Ozone levels fluctuate depending on weather conditions and air emissions. While there are some exceptions, hot, dry weather and stagnant air favor the formation of ozone and most exceedences typically occur during the hottest and driest summers. But, this isn't always the case. In parts of the western United States with high levels of local VOC and NO_x emissions and unique meteorological conditions, ozone has been high even when snow is on the ground.

Ozone, and the pollutants that form it, can travel long distances on the wind. For this reason, even rural areas or areas such as national parks that are far from pollution sources can have high levels of ozone.

In most areas, ozone levels decrease after sunset. However, if there is little movement of air masses and the heat continues, high ozone levels can continue over several days. West Virginia's mountainous topography can add to ozone levels by capturing air in the valleys, limiting air dispersion.

Ground-level ozone is a complex problem due to the variety of sources for NO_x and VOCs and the long-distance transport of ozone and its precursors. Ozone can inflame the airways causing symptoms such as chest pain, coughing, wheezing, and shortness of breath - even in healthy people. The EPA issues two standards as required by the Clean Air Act (CAA); a primary standard to protect public health and a secondary standard to protect the public welfare (in this case, trees, plants and ecosystems).

Breathing air containing ozone can reduce lung function and increase respiratory symptoms, thereby aggravating asthma or other respiratory conditions. Ozone exposure also has been associated with increased susceptibility to respiratory infections, medication use by asthmatics, doctor and emergency room visits, and hospital admissions for individuals with respiratory disease. According to the EPA, ozone exposure may also contribute to premature death, especially in people with heart and lung disease.

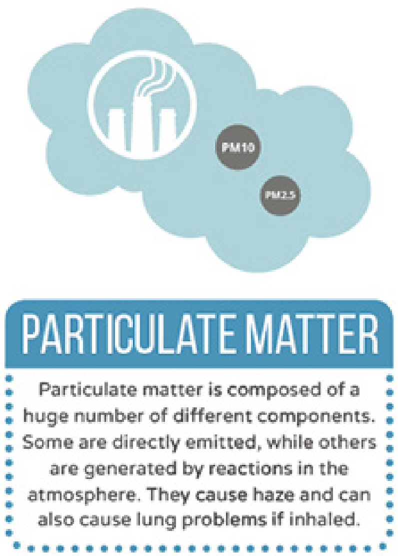
The EPA has identified environmentally protective standards under the CAA for ozone and instituted a variety of multi-faceted programs to meet these standards. Additional programs are in place to reduce NO_x and VOC emissions from vehicles, industrial facilities and electric utilities. Programs are also aimed at reducing pollution by reformulating fuels and consumer/commercial products, such as paints and chemical solvents, that contain VOCs.

Ozone (O_3)

History of the Ozone (O_3) NAAQS

Final Rule/ Decision	Primary/ Secondary	Indicator	Averaging Time	Level	Form
1971 36 FR 8186 April 30, 1971	Primary and Secondary	Total photochemical oxidants	1 hour	0.08 ppm	Not to be exceeded more than one hour per year
1979 44 FR 8202 February 8, 1979	Primary and Secondary	O_3	1 hour	0.12 ppm	Number of days per calendar year with maximum hourly average concentration greater than 0.12 ppm is equal to or less than one
1993 58 FR 13008 March 9, 1993	USEPA decided that revisions to the standard were not warranted at the time.				
1997 62 FR 38856 Jul 18, 1997	Primary and Secondary	O_3	8 hours	0.08 ppm	Annual 4^{th} highest maximum 8-hr concentration, averaged over 3 years
2008 73 FR 16483 Mar 27, 2008	Primary and Secondary	O_3	8 hours	0.075 ppm	Annual 4^{th} highest maximum 8-hr concentration, averaged over 3 years
2015 8FR 65292 October 26, 2015	Primary and Secondary	O_3	8 hours	0.070 ppm	Annual 4^{th} highest maximum 8-hr concentration, averaged over 3 years

Particulate Matter (PM_{10})



Particulate matter (PM) consists of solid particles and liquid droplets found in the air. These particles and droplets come in a wide range of sizes. Individually, they are usually invisible to the naked eye. Collectively, however, the particles can appear as clouds or a fog-like haze. Particulates result from many different sources including wind-blown dust, wood-burning stoves, leaf burning, vehicle exhaust, electric power plants, incinerators, construction, vehicles traveling on paved and unpaved roads, materials handling and crushing, as well as aggregate grinding operations. Water sprays and other dust suppressants are often used to reduce PM emissions from stockpiles and haul roads.

The environmental and health effects of PM can vary depending on the size of the particles. Larger particles rapidly settle out of the air due to gravity and pose a limited health risk. Particles between 10 and 50 microns in diameter rarely penetrate deeply into the human respiratory system, but are trapped and removed by the body's natural defenses. Smaller particles are less heavy, stay in the air longer and travel farther, contributing to haze. These particles can also be inhaled more deeply into human lungs, increasing the potential for significant adverse health effects. In addition, smaller particles generally are comprised of more toxic substances than larger particles.

Because of these differences, the EPA maintains two separate National Ambient Air Quality Standards (NAAQS) for particulate matter. One standard addresses PM_{10} particles that are equal to or less than 10 microns in diameter. The other standard addresses levels of fine particulate matter (known as $PM_{2.5}$), which contains particles equal to or less than 2.5 microns in diameter. In comparison, a human hair is about 70 microns in diameter. Adverse health effects have been associated with exposures to PM_{10} over short periods (such as a day). Particles in the PM_{10} range are small enough to invade the body's natural defense systems and penetrate into the lungs, where tissue is damaged and the immune system is weakened. As a result of research on particulate matter, the EPA adopted a PM_{10} standard in 1987, replacing a previous total suspended particulate standard. In a 2006 revision, the EPA established

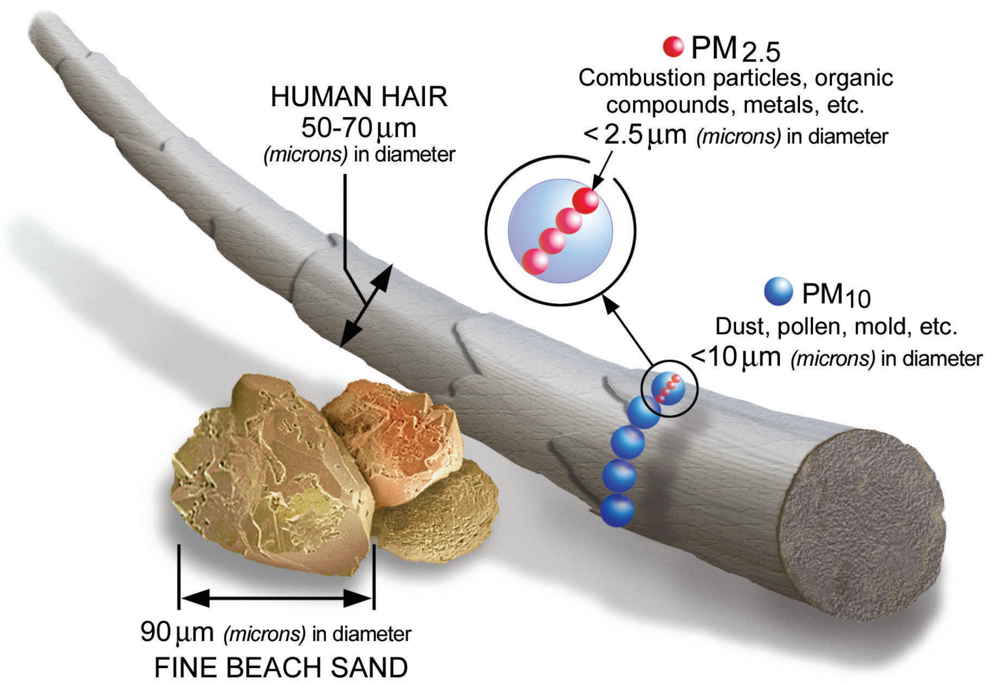


Image courtesy of the U.S. EPA

Particulate Matter (PM_{10})

the current 24-hour PM_{10} ambient air quality standard. However, the EPA revoked the annual standard, meaning the standard is no longer in effect. The federal agency has determined that the short-term 24-hour standard makes the annual standard unnecessary.

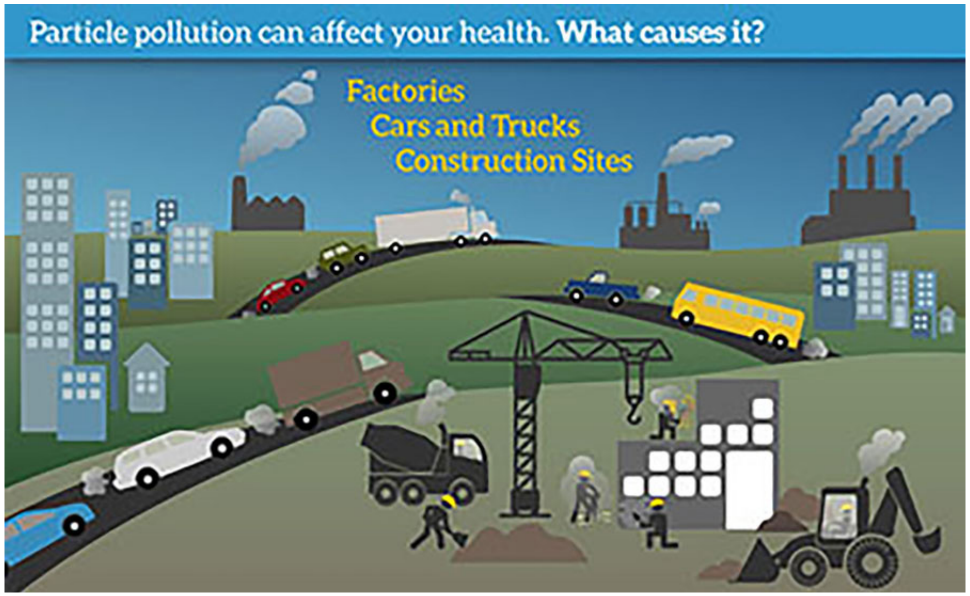
The DAQ's monitoring network measures PM_{10} at three sites in two counties in the Northern Panhandle of West Virginia. Data from these monitoring sites have shown consistent averaged values that are well below the current 24-hour and the former annual NAAQS.

Nationally, PM_{10} concentrations have decreased 39 percent between 1990 and 2016. Programs aimed at reducing direct emissions of particles have played an important role in reducing PM_{10} concentrations. Some examples of PM_{10} controls include paving previously unpaved roads, replacing wood and coal with cleaner-burning fuels, such as natural gas, and using best management practices for dust sources at material handling and agricultural facilities.

Additionally, the EPA's Acid Rain Program has substantially reduced SO_2 emissions from power plants since 1995 in the eastern United States, contributing to lower PM concentrations. Direct emissions of PM_{10} have decreased approximately 18 percent nationally between 1990 and 2016.

Particulate Matter ($PM_{2.5}$)

Medical and scientific research on the health effects of PM continued after the implementation of the PM_{10} standard. As a result of further research, it was determined that very fine particles in the 2.5 microns diameter and less size range ($PM_{2.5}$) have the most adverse effects on human health. Discussion of $PM_{2.5}$ standards may sometimes be confusing because separate but overlapping sets of standards were adopted in 1997, 2006 and 2012. Each set has an annual standard and a 24-hour standard. After each standard was established, the EPA designated areas as meeting (attainment) or not meeting (nonattainment) the standard. Therefore, each area could be designated as nonattainment for the 1997 standard but designated as attainment for the 2006 standard. The 2012 standard is the most stringent and all monitored areas in West Virginia are meeting that standard. $PM_{2.5}$ monitoring sites are operated across West Virginia. A special filter-weighing laboratory is used to analyze filters from these monitors.



In April 2005, based on 2002-2004 data, EPA designated the areas shown in the chart on page 34 as nonattainment with the 1997 annual $PM_{2.5}$ standard of 15 µg/m^3. The rest of the state was considered to be in attainment for the annual $PM_{2.5}$ standard. The DAQ successfully redesignated the Huntington area to attainment in December 2012. Parkersburg and Wheeling were redesignated to attainment in September 2013. In 2015, Charleston and Weirton were redesignated to attainment in March and Martinsburg in November, 2015.

In December 2006, the EPA strengthened the 24-hour $PM_{2.5}$ standard from the 1997 level of 65 µg/m^3 to 35 µg/m^3, and retained the annual $PM_{2.5}$ standard at 15 µg/m^3. The EPA issued final designations in November 2009. Except for the Charleston and Weirton areas, the entire state was designated attainment/unclassifiable. Both areas later monitored compliance with the 24-hour standard and were redesignated to attainment in March 2015.

In December 2012, the EPA again tightened the annual standard to 12 µg/m^3. Although the standard is significantly more stringent than the previous one in December 2014, the EPA designated the entire state attainment/unclassifiable based on monitoring data for 2011-2013.

The DAQ continues to operate two $PM_{2.5}$ speciation monitors to help determine the chemical makeup of fine particles. The monitors are located in Charleston and Moundsville in the Northern Panhandle. Samples collected by these monitors are analyzed for anions (particulate sulfate and nitrate), cations (particulate ammonium, sodium and potassium), trace elements and organic elemental carbon.

Particulate Matter

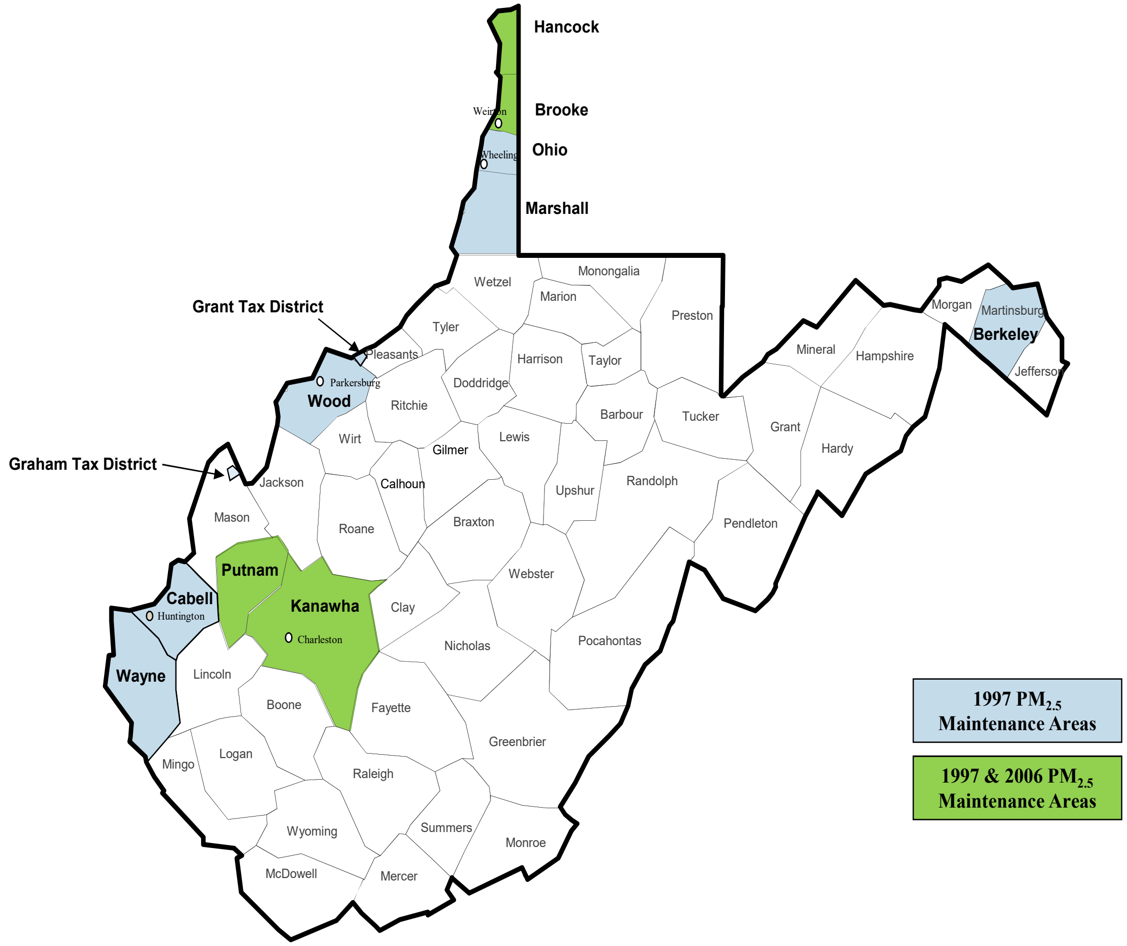
History of the Particulate Matter (PM) NAAQS

Final Rule/ Decision	Primary/ Secondary	Indicator	Averaging Time	Level	Form
1971 36 FR 8186 April 30, 1971	Primary	TSP	24-hour	260 µg/m³	Not to be exceeded more than once per year
			Annual	75 µg/m³	Annual geometric mean
	Secondary		24-hour	150 µg/m³	Not to be exceeded more than once per year
			Annual	60 µg/m³	Annual geometric mean
1987 52 FR 24634 July 1, 1987	Primary and Secondary	PM_{10}	24-hour	150 µg/m³	Not to be exceeded once per year on average over a 3-year period
			Annual	50 µg/m³	Annual arithmetic mean, averaged over 3 years
1997 62 FR 38652 July 18, 1997	Primary and Secondary	$PM_{2.5}$	24-hour	65 µg/m³	98th percentile, averaged over 3 years
			Annual	15.0 µg/m³	Annual arithmetic mean, averaged over 3 years
	Primary and Secondary	PM_{10}	24-hour	150 µg/m³	Initially promulgated 99th percentile, averaged over 3 years; when 1997 standards for PM_{10} were vacated, the form of 1987 standards remained in place (not to be exceeded more than once per year on average over a 3-year period)
			Annual	50 µg/m³	Annual arithmetic mean, averaged over 3 years
2006 71 FR 61144 October 17, 2006	Primary and Secondary	$PM_{2.5}$	Annual	15.0 µg/m³	Annual arithmetic mean, averaged over 3 years
	Primary and Secondary	PM_{10}	24-hour	150 µg/m³	Not to be exceeded more than once per year on average over a 3-year period
2012 78 FR 3085 January 15, 2013	Primary	$PM_{2.5}$	Annual	12.0 µg/m³	Annual arithmetic mean, averaged over 3 years
	Secondary		Annual	15.0 µg/m³	Annual arithmetic mean, averaged over 3 years
	Primary and Secondary		24-hour	35 µg/m³	98th percentile, averaged over 3 years
	Primary and Secondary	PM_{10}	24-hour	150 µg/m³	Not to be exceeded more than once per year on average over a 3-year period

Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ Maintenance Areas

These areas are considered attainment with federally-approved Maintenance Plans.



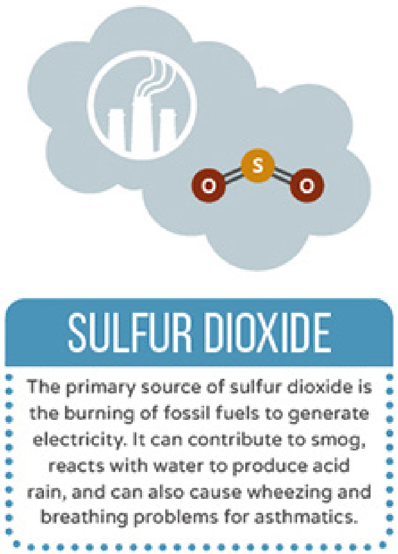
1997 $PM_{2.5}$ Maintenance Areas

Charleston (Kanawha and Putnam counties)
Huntington (Cabell and Wayne counties, Graham Tax District in Mason county)
Parkersburg (Wood county, Grant Tax District in Pleasants county)
Martinsburg (Berkeley county)
Weirton (Brooke and Hancock counties)
Wheeling (Marshall and Ohio counties)

2006 $PM_{2.5}$ Maintenance Areas

Charleston (Kanawha and Putnam counties)
Weirton (Brooke and Hancock counties)

Sulfur Dioxide (SO_2)



Sulfur dioxide (SO_2)) is a colorless gas that has a pungent odor. SO_2 can bind to dust particles and aerosols in the atmosphere, traveling long distances on prevailing winds. It can also combine with moisture in the atmosphere to form sulfuric acid (H_2SO_4), which is a component of acid precipitation (also known as acid rain) that causes acidification of soil and water, and the erosion of building surfaces. Sulfuric compounds contribute to visibility degradation in many areas and can damage the foliage of trees and agricultural crops.

SO_2 is primarily emitted from the combustion of coal and oil at power plants and other industrial facilities, such as refineries and smelters. Nationally in 2000, power plants accounted for 70 percent of all SO_2 emissions and 88 percent of West Virginia SO_2 emissions. By 2016, power plants accounted for only 43 percent of national SO_2 emissions and 64 percent of West Virginia SO_2 emissions.

In June 2010, the EPA revised the primary SO_2 standard, designed to protect public health, to 75 parts per billion (PPB) measured over a one-hour period. The previous primary standards of 140 PPB measured over 24 hours and 30 PPB averaged over an entire year were revoked. The EPA also adopted a new “form” of the standard (based on the three-year average of the 99th percentile) to determine compliance with the new NAAQS. Current scientific evidence links health effects with short-term exposure to SO_2 ranging five minutes to 24 hours. Adverse respiratory effects include narrowing of the airways which can cause difficulty breathing (bronchoconstriction) and asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g. while exercising or playing). Studies also show an association between short-term SO_2 exposure and increased emergency rooms and hospital admissions for respiratory illnesses, particularly in at-risk populations including, children, the elderly and asthmatics.

SO_2 can also react with other compounds in the atmosphere to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increase hospital admissions and premature death.

In 2012, the EPA finalized action to retain the current secondary standard for SO_2. All of West Virginia’s SO_2 monitored values are well below the secondary standard of 0.50 PPM (three-hour concentration not to be exceeded more than once per year).

In July 2013, the EPA designated the Cross Creek Tax District in Brooke County and the Clay, Franklin and Washington Tax Districts in Marshall County as nonattainment with 2010 primary one-hour SO_2 standard based on 2009-2011 design values. Both areas have subsequently monitored attainment of the standard based on 2013-2015, and 2014-2016 design values.

West Virginia has made significant reductions in SO_2 emissions from power plants. Through implementation of the federal Acid Rain Program, the regional Clean Air Interstate Rule (CAIR), and the Cross-State Air Pollution Rule (CSAPR), SO_2 emissions have plummeted about 92 percent, from 539,858 tons in calendar year 2003 to 43,693 tons in calendar year 2016. Several large power plants in the state have invested in very efficient control technologies such as flue-gas desulfurization (FGD). The sharp decrease in emissions after calendar year 2008 is largely due to the application of this technology.

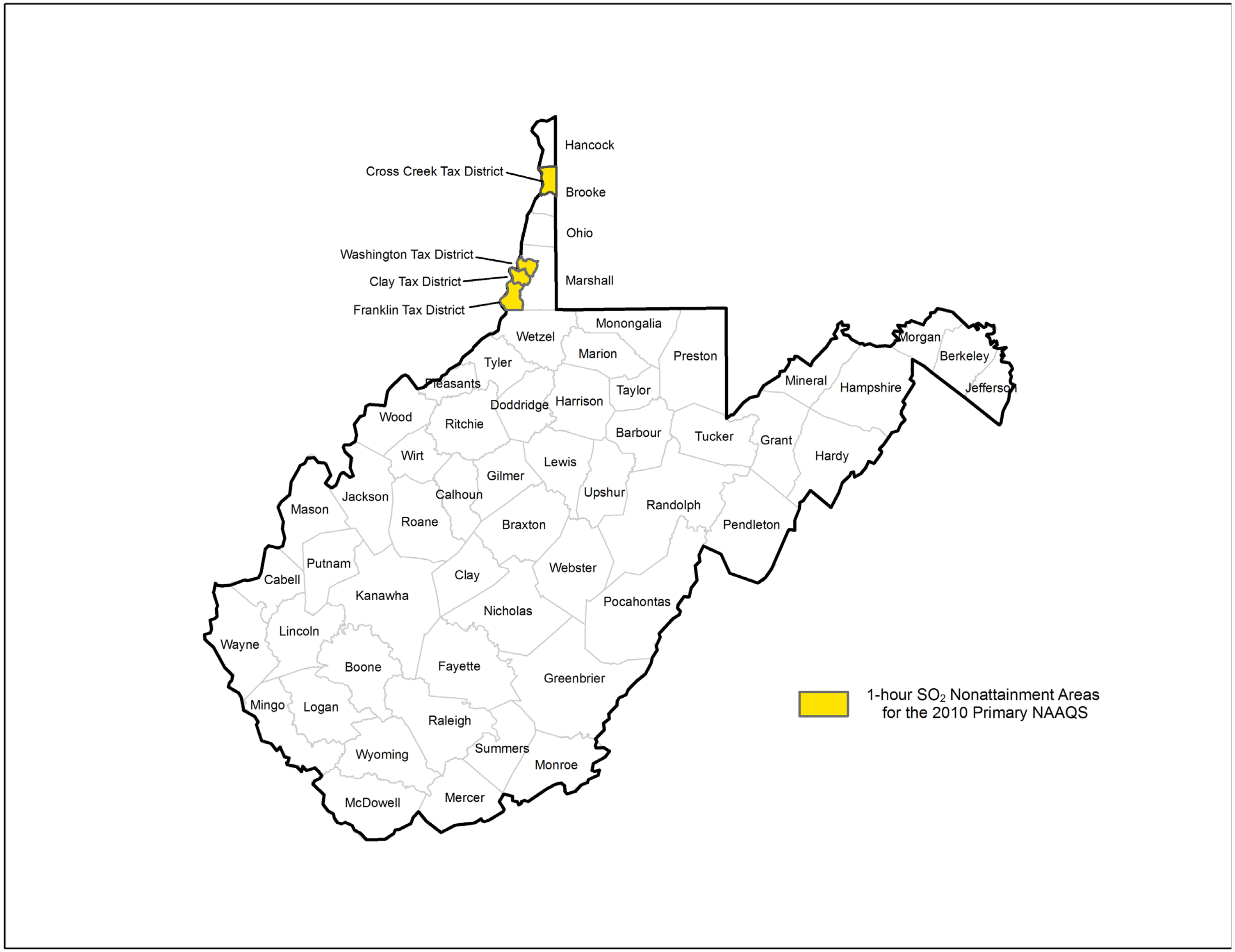
Like many environmental issues, power plant emissions are affected by the cumulative actions of millions of individual people. Individuals can contribute directly by conserving energy, since energy production is closely related to SO_2 emissions.

Sulfur Dioxide (SO_2)

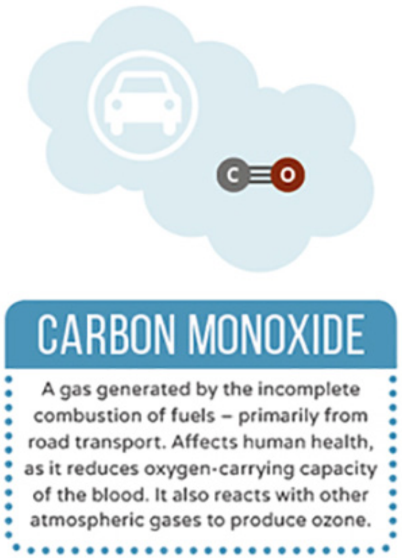
History of the Sulfur Dioxide (SO_2) NAAQS

<table>
<tr><th>Final Rule/ Decision</th><th>Primary/ Secondary</th><th>Indicator</th><th>Averaging Time</th><th>Level</th><th>Form</th></tr>
<tr><td rowspan="4">1971
36 FR 8186
April 30, 1971</td><td rowspan="2">Primary</td><td rowspan="4">SO_2</td><td>24-hour</td><td>0.14 ppm</td><td>Not to be exceeded more than once per year</td></tr>
<tr><td>Annual</td><td>0.03 ppm</td><td>Annual arithmetic average</td></tr>
<tr><td rowspan="2">Secondary</td><td>3-hour</td><td>0.5 ppm</td><td>Not to be exceeded more than once per year</td></tr>
<tr><td>Annual</td><td>0.02 ppm</td><td>Annual arithmetic average</td></tr>
<tr><td>1973
38 FR 25678
Sept 14, 1973</td><td>Secondary</td><td colspan="4">Secondary 3-hour SO_2 standard retained, without revision; secondary annual SO_2 standard revoked.</td></tr>
<tr><td>1996
61 FR 25566
May 22, 1996</td><td>Primary</td><td colspan="4">Existing primary SO_2 standards retained, without revision.</td></tr>
<tr><td rowspan="2">2010
75 FR 35520
June 22, 2010</td><td rowspan="2">Primary</td><td>SO_2</td><td>1-hour</td><td>75 ppb</td><td>99th percentile, averaged over 3 years</td></tr>
<tr><td colspan="4">Primary annual and 24-hour SO_2 standards revoked.</td></tr>
<tr><td>2012
77 FR 20218
April 3, 2012</td><td>Secondary</td><td colspan="4">Existing secondary SO_2 standard (3-hour average) retained, without revision.</td></tr>
</table>

Sulfur Dioxide (SO_2)



Carbon Monoxide (CO)



Carbon monoxide (CO) is an odorless, colorless, poisonous gas produced by incomplete combustion of fuels. The primary source of carbon monoxide is the exhaust from motor vehicles, which includes highway vehicles, as well as non-road vehicles, such as construction equipment. Concentrations are usually highest along heavily traveled highways, but industrial sources can also cause levels to rise. Other sources include incinerators, kerosene and wood stoves, furnaces and some industrial processes.

The main health effect of CO is its tendency to reduce the oxygen carrying-capacity of the blood. Depending on the level of exposure, CO can cause fatigue, headaches, and impaired vision and reflexes at moderate concentrations. Unconsciousness and even death may occur at high concentrations. The severity of the effects is related to the length of exposure and concentration of CO.

In August 2011, the EPA issued a decision to retain the existing NAAQS for CO. The EPA affirmed that the current standards provide the required level of public health protection, including protection for people with heart disease, who are especially susceptible to health problems associated with exposures to CO in ambient air. There are no secondary (welfare-based) NAAQS for CO due to a lack of evidence of direct effects on public welfare at ambient concentrations.

The EPA revised minimum requirements for CO monitoring by requiring monitors to be sited near roads in certain urban areas. Specifically, the EPA required the co-location of one CO monitor with a “near-road” nitrogen dioxide monitor in urban areas having populations of 1 million or more. Also, the EPA specified that monitors required in Core Based Statistical Areas (CBSAs) of 2.5 million or more people be operational by January 1, 2015. Monitors required in CBSAs having 1 million or more people are required to be operational by January 1, 2017. West Virginia does not have any areas that trigger these “near-road” monitoring requirements. West Virginia is required to monitor trace level CO at its NCore site. This specialized monitor is capable of sampling ultra-low levels of CO.

Many strategies for reducing CO emissions from energy usage are cross-cutting and apply to homes, businesses, industry, and transportation. Make sure appliances are installed and operated according to the manufacturer’s instructions and local building codes. Most appliances should be installed by qualified professionals. Have your heating system professionally inspected and serviced annually to ensure proper operation. The inspector should also check chimneys and flues for blockages, corrosion, partial and complete disconnections, and loose connections.

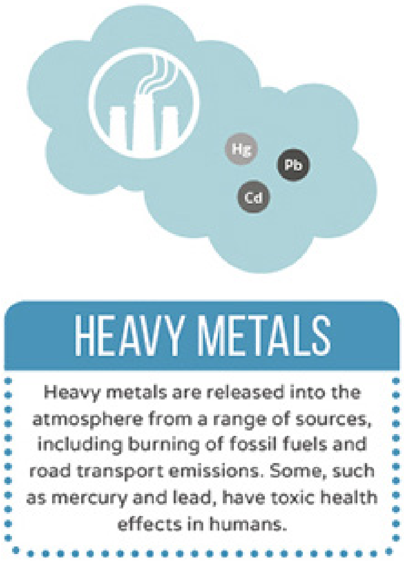
In addition to CO in the ambient air outside of the home, CO levels in the home are of concern. Dangerous levels of CO in your home can be caused by improper installation and maintenance of fuel burning appliances.

Carbon Monoxide (CO)

History of the Carbon Monoxide (CO) NAAQS

Final Rule/Decision	Primary/ Secondary	Indicator	Averaging Time	Level	Form
1971 36 FR 8186 April 30, 1971	Primary and Secondary	CO	1-hour	35 ppm	Maximum, not to be exceeded more than once in a year
			8-hour	9 ppm	Maximum, not to be exceeded more than once in a year
1985 50 FR 37484 September 13, 1985	Primary standards retained, without revision; secondary standards revoked.				
1994 59 FR 38906 August 1, 1994	Primary standards retained, without revision.				
2011 76 FR 54294 August 31, 2011	Primary standards retained, without revision.				

Lead (Pb)



Prior to 1996, lead additives in gasoline burned in automobile engines was a significant source of the lead emissions found in ambient air. Under the CAA Amendments of 1990, lead in gasoline was required to be eliminated by January 1, 1996, and replaced with unleaded gasoline. The DAQ lead monitoring network in place at that time began recording much lower lead values as a result of the switch. As monitored lead concentrations in the ambient air dropped significantly and the national emphasis on lead monitoring diminished, these monitors were removed and the resources reallocated to other monitoring initiatives, such as for particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$).

Based on new health studies, the EPA tightened the lead standard in 2008, making it 10 times more stringent than the previous standard. The agency revised the primary standard from 1.5 micrograms per cubic meter ($\mu g/m^3$) to 0.15 $\mu g/m^3$.

In December 2010, the EPA changed the emission threshold that state monitoring agencies must use to determine if an air quality monitor should be placed near an industrial facility that emits lead. The new emission threshold is 0.5 tons per year (tpy), reduced from the previous threshold of 1.0 tpy. As a result of this change, the DAQ installed a lead monitor at an existing monitoring site in Huntington, and began collecting data on February 3, 2012.

The EPA changed the calculation method for the averaging time to use a “rolling” three-month period with a maximum (not-to-be-exceeded) form, evaluated over a three-year period. This replaces the current approach of using calendar quarters. A rolling three-month average yields 12 three-month periods associated with a given year, not just the four calendar quarters within that year.

Between 2012 and 2016, the highest measured rolling three-month average was 0.014 ug/m^3. This value is below the lead standard by approximately 90 percent.

Lead (Pb)

History of the Lead (Pb) NAAQS

Final Rule/Decision	Primary/ Secondary	Indicator	Averaging Time	Level	Form
1978 43 FR 46246 October 2, 1978	Primary and Secondary	Pb-TSP	Calendar Quarter	1.5 μg/m^3	Not to be exceeded
1991	United States Environmental Protection Agency (USEPA) released multimedia “Strategy for Reducing Lead Exposures”				
2008 73 FR 66964 November 12, 2008	Primary and Secondary	Pb-TSP	3-month period	0.15 μg/m^3	Not to be exceeded
2016 81 FR 71906 October 18, 2016	Primary and secondary standards retained, without revision.				

Definitions & Contact Information

Definitions

Acid precipitation or acid rain
Water falling in drops condensed from vapor in the atmosphere with acidic qualities. Principal components typically include nitric and sulfuric acid with water vapor.

Air pollutants
Solids, liquids, or gases which, if discharged into the air, may result in statutory air pollution.

Air pollution
Statutory air pollution has the meaning ascribed to it in West Virginia Code §22-5-2.

Air toxics
Term generally referring to hazardous air pollutants, and used in the context of implementation of a program to address such emissions and their impacts.

Ambient air
Generally, the atmosphere; outdoors.

Annual arithmetic mean
The numerical average of the data for the year.

AQI
Air Quality Index.

Attainment
EPA designation that an area meets the National Ambient Air Quality Standards.

24-hour average
The average concentration for a 24-hour period.

CAA
Clean Air Act.

CAIR
Clear Air Interstate Rule.

CFR
Code of Federal Regulations

CO
Carbon monoxide.

CSR
Code of State Regulations

Criteria pollutant
An air pollutant for which certain levels of exposure have been determined to injure health, harm the environment and cause property damage. EPA-developed National Ambient Air Quality Standards, using science-based guidelines as the basis for setting acceptable levels.

DAQ
Division of Air Quality. Department of Environmental Protection office that administers West Virginia's air quality management program for the protection of public health, welfare, and the environment.

DEP
Department of Environmental Protection. West Virginia's regulatory agency charged with protecting and promoting a healthy environment.

De minimis
Refers to a level which is considered to be insignificant.

Elements
Chemicals, such as hydrogen, iron, sodium, carbon, nitrogen, or oxygen, whose distinctly different atoms serve as the basic building blocks of all matter. There are 92 naturally-occurring elements. Another 15 have been made in laboratories. Two or more elements combine to form compounds that make up most of the world's matter.

Emissions
Air pollutants exhausted from a unit or source into the atmosphere.

Exceedance
An incident occurring when the concentration of a pollutant in the ambient air is higher than the National Ambient Air Quality Standards.

EPA or U.S. EPA
Environmental Protection Agency. Federal agency that oversees the protection of the environment.

Fossil fuels
Natural gas, petroleum, coal or any form of solid, liquid or gaseous fuel derived from such material.

Greenhouse gas
The gaseous compounds: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF_6). These gases absorb infrared radiation and trap heat in the atmosphere.

HAP
Hazardous Air Pollutant.

MACT
Maximum Achievable Control Technology.

Mercury
A naturally-occurring element that is found in air, water and soil. It exists in several forms, elemental or metallic mercury, inorganic mercury compounds, and organic mercury compounds. Elemental or metallic mercury is a shiny, silver-white metal and **is** liquid at room temperature.

Definitions

MSA
Metropolitan Statistical Area.

NAAQS
National Ambient Air Quality Standards. Set by EPA to protect human health and welfare.

NCore
A multi-pollutant network that integrates several advanced measurement systems for particles, pollutant gases and meteorology.

Nonattainment
EPA designation that an area does not meet the National Ambient Air Quality Standards.

NO_x or NO_2
Nitrogen oxides.

O_3
Ozone.

OSHA Carcinogen
A chemical that is a known or suspected carcinogen by the Occupational Safety and Health Administration by virtue of appearing in one of three sources: 1. National Toxicology Program (NTP), “Annual Report on Carcinogens” (Latest Editions); 2. International Agency for Research on Cancer (IARC) “Monographs” (Latest Editions); or 3. 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration.

Ozone season
Varies geographically but for West Virginia it is the period beginning April 1 and ending on October 31 of the same year.

Pb
Lead.

PM
Particulate Matter.

$PM_{2.5}$
Particles that are 2.5 micrometers or less in size. These fine particles can be easily inhaled deep into the lungs where they can accumulate, react, be cleared or absorbed. These particles are about 30 times smaller than the diameter of a human hair.

PM_{10}
Particles that are 10 micrometers in size or less. This includes both fine particles (2.5 micrometers or less) and inhalable coarse particles having diameters larger than 2.5 micrometers and smaller than 10 micrometers.

PPB
Parts per billion by volume.

PPM
Parts per million by volume.

Precursor
A substance that is the source of, or aids in the formation of, another substance.

Regulated air pollutant
Any air pollutant subject to a standard or other requirement promulgated under section 112 of the Clean Air Act, or any air pollutant for which a National Ambient Air Quality Standard has been promulgated including particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead or lead compounds.

Sinks
Any process, activity or mechanism which removes a greenhouse gas from the atmosphere. Forests are considered sinks because they remove carbon dioxide through photosynthesis.

SIP
State Implementation Plan. Plan to attain and maintain the National Ambient Air Quality Standards for criteria pollutants.

SO_2
Sulfur dioxide.

Source or stationary source
Any governmental, institutional, commercial or industrial structure, installation, plant, building or facility that emits or has the potential to emit any regulated air pollutant under the Clean Air Act.

Statutory Air Pollution
The discharge into the air by the act of man, of substances (liquid, solid, gaseous, organic or inorganic) in a locality, manner and amount as to be injurious to human health or welfare, animal or plant life, or property, or which would interfere with the enjoyment of life or property.

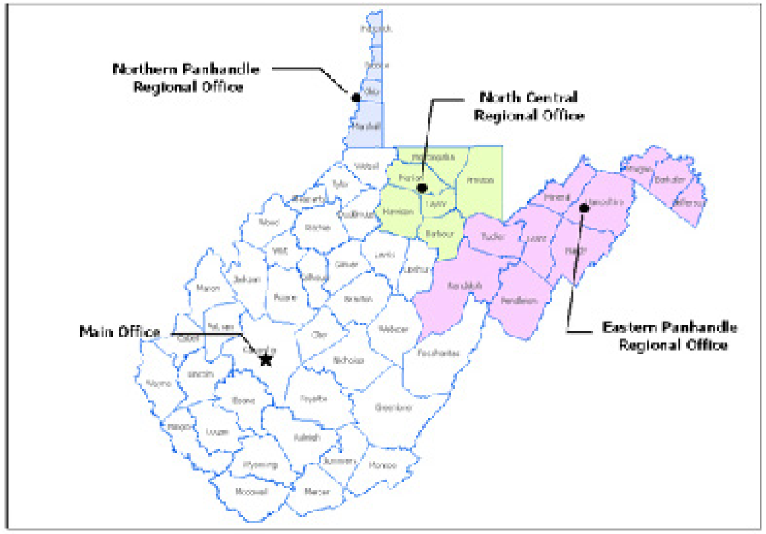
$\mu g/m^3$
Micrograms per cubic meter.

VISTAS
Visibility Improvement - State and Tribal Association of the Southeast.

VOC
Volatile organic compound.

Contact Information

DEP - Division of Air Quality Offices



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