# Kentucky Division for Air Quality

## *Fiscal Year 2012 Annual Report*

Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
**Division for Air Quality**

KENTUCKY DIVISION FOR AIR QUALITY

Kentucky UNBRIDLED SPIRIT

# FROM THE DIRECTOR

It is my pleasure to share with you the Kentucky Division for Air Quality's annual report for fiscal year 2012. This report identifies the division's goals and achievements over the past year, summarizes the current state of Kentucky's air quality, and highlights challenges that the agency will face in the next year and beyond.

Kentucky's air quality has improved significantly in 40 years since the Clean Air Act was passed. As air quality has improved, the economy has more than tripled – proof that environmental protection and economic development can go hand in hand. In a state that obtains nearly 96% of its electricity from coal, this is a remarkable achievement.

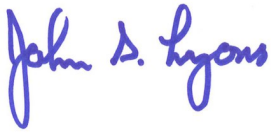
The United States Environmental Protection Agency reviews and revises the health-based National Ambient Air Quality Standards as necessary to reflect increased scientific understanding about the impacts of air quality on human health and the environment. Tighter standards for several criteria pollutants have been adopted or proposed in recent years, most recently for ozone and particulate matter. As a result, some areas in Kentucky will need to look for innovative ways to reduce air pollution locally. The Division for Air Quality will work closely with those counties to develop a maintenance plan that protects air quality for future generations to come.

Air may be invisible, but it touches every facet of our lives. Likewise, so much of what we do in our daily lives impacts the air we breathe. Conserving energy and making simple, sustainable choices as individuals can make a real difference collectively in keeping our air clean.

- Learn about air quality and the simple ways you can make a difference.
- Start by making one small change that reduces air pollution.
- Spread the word about what you are doing.
- Get involved locally to support clean air initiatives in your community.
- Report suspected air pollution concerns to your regional air quality office.

Every Kentuckian has a valuable role to play in protecting Kentucky's air. Remember, it all adds up to cleaner air!

Sincerely,



John S. Lyons, Director

# *Kentucky Division for Air Quality*
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# EXECUTIVE SUMMARY

The mission of the Division for Air Quality (DAQ) is to protect human health and the environment by achieving and maintaining acceptable air quality through:

- *Operation of a comprehensive air monitoring network;*
- *Creating effective partnerships with air pollution sources and the public;*
- *Timely dissemination of accurate and useful information;*
- *The judicious use of program resources; and*
- *Maintenance of a reasonable and effective compliance assurance program.*

The third largest division in the Department for Environmental Protection with 166 staff positions, DAQ oversees a diverse air quality program that encompasses monitoring, regulation development, compliance with federal air quality standards, permitting regulated facilities and environmental education.

**Selected achievements and challenges for Fiscal Year 2011**

- A broad assessment of statewide air quality over time (1981-2011) for six federally regulated air pollutants shows a trend of reduced air pollution (Figure 1). Better quality air in Kentucky is due to a combination of regulatory and voluntary programs put in place by local, state, and federal governments. These pollution reductions are wonderful news for public health.

- New rules being promulgated at the federal level will present challenges to Kentucky's counties and industries as they strive to attain these new standards. Several Kentucky counties will face nonattainment with the implementation of more stringent National Ambient Air Quality Standards (NAAQS), such as those for sulfur dioxide and ozone. In addition, Kentucky's electric generation sector will be challenged to meet new standards for mercury, air toxics, and greenhouse gases.

**Environmental Education**

DAQ's environmental education (EE) program has reached thousands of students, teachers, and citizens across the Commonwealth through a combination of presentations, exhibitions, and workshops, along with serving in a number of collaborative groups that work to improve air quality.

- Environmental education staff made direct

*"We face a new age in air quality. Greenhouse gas (GHG) emissions from automobiles and industry became regulated for the first time in 2011, and new rules have followed suit over the course of the past year. Most notably, these landmark rules include proposed GHG standards for new fossil-fuel fired power plants. Simultaneously, revised health-based standards for a number of criteria pollutants, including sulfur dioxide, ozone, and particulate matter, have been either proposed or promulgated at the federal level.*

*Despite the fact that our air quality is better than ever, the state will face new challenges in the years ahead to meet more stringent air quality rules. Industry may in many cases be required to install additional controls, and control of emissions from motor vehicles will likely increase. More counties than ever will be faced with the possibility of not meeting the revised national standards. As a result, counties may need to look for innovative ways to reduce air pollution locally.*

*The Division for Air Quality staff is happy to work with counties to help them find strategies to reduce local air emissions. Examples of voluntary reduction strategies include: utilizing alternative fueled vehicles and alternative fuels such as natural gas and electric; strengthening of bicycle, pedestrian and public transit networks; passing local burn bans; and installing solar panels. In addition to offering technical support, the division also has a free education and outreach program available to all audiences to help raise awareness of and participation in these kinds of programs."*

*John S. Lyons,*
*DAQ Director*

contact with more than 5200 Kentuckians in FY 2012, educating about a variety of air quality topics including open burning, air quality and health, and energy conservation.

- The EE program partnered with several agencies on a new campaign to reduce campfire trash burning in campgrounds across Kentucky. Environmental education staff also presented trainings on Kentucky's open burning regulation to more than 300 fire fighters during FY 2012.

**Field Operations**
The Field Operation Branch (FOB) continues to respond to the needs of the public and regulated community by investigating complaints and routinely inspecting facilities via the division's network of eight regional offices.

- The total number of inspections in calendar year 2011 (3701) were comparable to the number of inspections conducted in 2010 (3795.)

- FOB has continued to retain a high percentage of employees over the last year, resulting in an increase in their technical capabilities and experience.

**Permit Review**
One of the biggest challenges for the Permit Review Branch is to issue permits within the regulatory time frames set by state regulations and the EPA which incorporate increasingly complex regulations.

- The Permit Review Branch (PRB) has essentially eliminated the long-standing permit back log, dropping the number of applications that went beyond allotted Regulatory Time Frames (RTF) from a high of 524 in June 2006, to 23 at the close of FY 2012.

**Program Planning and Administration**
The Program Planning and Administration Branch (PPAB) continues to ensure counties attain the National Ambient Air Quality Standards established in the Clean Air Act, while simultaneously preparing for more stringent standards of ozone, particulate matter, and sulfur dioxide that will impact the ability of several counties to maintain compliance.

- On May 21, 2012, EPA published final designations of the 2008 8-hour ozone standard reducing the standard from 80 ppb to 75 ppb. As result, the northern Kentucky Counties of Boone, Campbell, and Kenton were designated as partial nonattainment for the 2008 8-hour ozone standard.

**Technical Services**
The Technical Services Branch (TSB) continues to successfully operate a network of 98 ambient air quality monitors and 12 meteorological data towers, report to the Air Quality Index, observe compliance demonstrations at permitted facilities, and collaborate with the EPA and the PPAB on exceptional event data.

- In FY 2012, the branch completed several important documents, including the revisions to the KDAQ Criteria Pollutant and NATTS Quality Assurance Project Plans. In addition, the TSB revised its lead monitoring Standard Operating Procedures (SOP).

- In October 2011, the TSB hosted its first-ever division-wide Source Sampling Workshop. The 3-day interactive training event brought together FOB inspectors, PRB permit writers, and TSB Source Sampling staff to discuss issues, methodologies, and SOPs relating to compliance demonstrations.

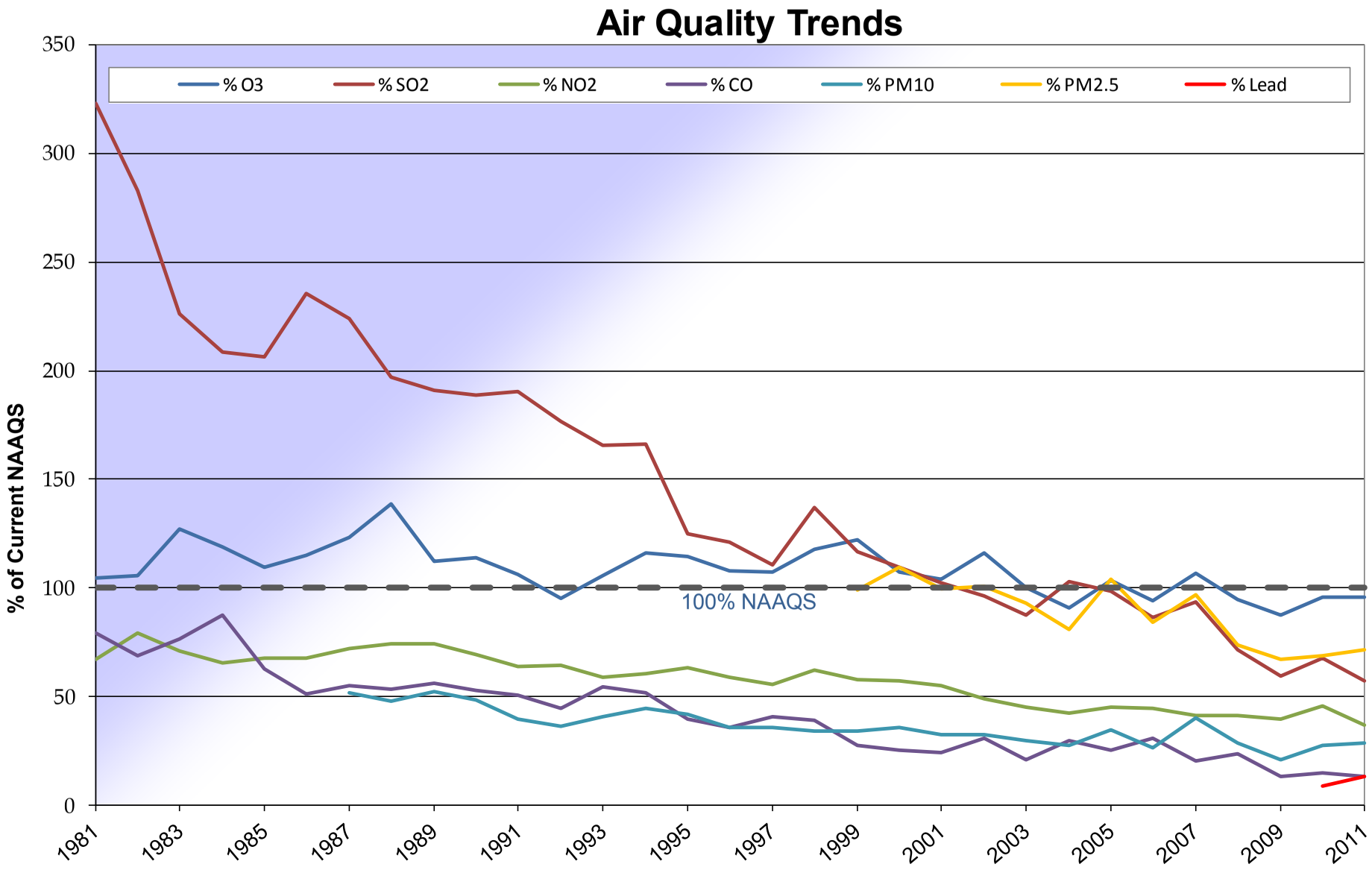



*Figure 1: Air Quality Trends from 1981-2010. This chart shows trends in individual pollution levels over time. While individual pollutants may spike in certain years, overall the trend shows a decline in pollution levels. The pollutants are shown in terms of percentage of the National Ambient Air Quality Standard (NAAQS) because the different pollutants are measured in different scales, which makes direct comparison difficult. For a key to pollution abbreviations, see the Glossary of Abbreviations on page 109.*

## Introduction

The Division for Air Quality is one of six divisions in the Department for Environmental Protection, which is housed in the Energy and Environment Cabinet. The cabinet has developed a set of objectives to be implemented by each department in Fiscal Year 2012 (FY 2012). The objectives and tactics relevant to DAQ are included in this section.

Creating effective partnerships with air pollution sources and the public enables DAQ to carry out its goal of protecting human health and the environment by achieving and maintaining acceptable air quality. DAQ strives to assist Kentucky's citizens and businesses in a satisfactory manner by responding to complaints, requests, and permit actions quickly and thoroughly. In addition to serving individuals and businesses, the division works to ensure that the federal Clean Air Act is met by working with county and city governments to ensure local compliance with (attainment of) the National Ambient Air Quality Standards (NAAQS), which are set by the EPA.

**Objective 1 – Issue technically sound and timely permit actions.**

**Tactic 1.1:** Continue issuing appropriate, lawful permits in a timely manner to reduce and eliminate excess air pollution.

**Measure:** The total number of permit applications received.
The total number of permits issued.
The total number of permits pending.
The total number of permits pending that exceed regulatory timeframes.
The percentage of permit reviews completed within regulatory timeframes.
The percentage of permit reviews completed that exceed regulatory timeframes.
The total number of other permit actions (i.e. registrations, off-permit changes, etc.) processed.

Originally operating out of the state health department, the Kentucky Air Pollution Control Commission was the state's first air pollution control program, in operation as early as the 1940s. Kentucky's environmental cabinet was first formed in the early 1970s, in part due to national legislation which brought the Environmental Protection Agency (and the Clean Air Act) into being. Today, as in its beginning, air pollution control is divided among a hierarchy of state, federal, and local programs.

### Federal Programs

The Clean Air Act (CAA) authorizes two permitting programs at the federal level. The New Source Review (NSR) program has been around since 1975 and requires extensive review of applications for major new or modified air contaminant sources prior to issuance of construction permits. Title V of the 1990 CAA Amendments authorized for the first time a federally enforceable operating permit program.

### Local Authority

KRS 224 recognizes the right of counties to develop their own air pollution control districts, if they wish. Jefferson County (Louisville Metro Air Pollution Control District) has maintained a local air pollution control program since the late 1940s, while activities in the rest of Kentucky counties are covered by DAQ. The Air Pollution Control District may choose to make subtle changes or be more stringent than state and federal regulations, but it must be at least as stringent as the state and federal programs.

**Objective 2 – Attain and maintain National Ambient Air Quality Standards (NAAQS).**

**Tactic 2.1:** Continue to implement measures contained in the June 2008 annual PM2.5 attainment demonstration State Implementation Plan (SIP).

**Measure:** The number of counties attaining the 2006 PM2.5 NAAQS.

**Tactic 2.2:** Develop recommendations and implement federal and state control strategies for areas of Kentucky that do not meet the 2011 8-hour ozone standard.

**Measure:** The number of counties attaining the 2011 8-hour ozone standard.

**Tactic 2.3:** Implement federal and state control strategies for areas of Kentucky that do not meet the 2010 SO2 standard.

**Measure:** The number of counties attaining the 2010 SO2 standard.

**Tactic 2.4:** Implement federal and state control strategies for 2010 NO2 standard.

**Measure:** The number of counties attaining the 2010 NO2 standard.

**Tactic 2.5:** Continue implementation of federal programs and requirements contained in the December 2007 Regional Haze SIP.

**Measure:** Improved visibility at Class I areas, including Mammoth Cave National Park.

**Objective 3 – Monitor ambient air quality.**

**Tactic 3.1:** Operate an extensive, statewide ambient air monitoring network in order to ascertain the status of Kentucky's ambient air quality.

**Measures:** Number of air monitors in network based on population estimates.
Number of locations selected to represent population exposure.
Number of locations selected to represent background concentration levels.
Number of locations selected to represent regional transport of ambient air pollution.
Number of monitors and locations to represent source impacts.
Hours of continuous ambient air monitoring data collected.
Number of particulate matter, lead, and air toxics samples collected.
Concentrations of pollutants for which national ambient air quality standards have been established.
Concentrations of pollutants for which health-based risk standards have been determined.

**Tactic 3.2:** Conduct quality measurement checks and data quality assessments on the ambient air monitoring network in order to ensure data accuracy & integrity.

**Measures:** Number of complete and current Quality Assurance Project Plans (QAPPs).
Number of complete and current standard operating procedures (SOPs).
Percentage of valid, quality-assured continuous ambient air monitoring data collected.
Percentage of valid, quality-assured particulate matter, lead, and air toxics samples collected.
Number of quality control checks performed on ambient air monitors.
Number of ambient air monitoring performance evaluations conducted.

**Objective 4 – Inspect sources of air pollution and enforce air quality regulations.**

**Tactic 4.1:** Assure compliance with air quality regulations and standards.

**Measures:** Number of major (Title V) stationary source inspections conducted.
Number of conditional major (FESOP) inspections conducted.
Number of High Priority Violations.
Number of days taken to initiate appropriate enforcement action on each High Priority Violation.
Number of violations documented.
Number of routine (non-complaint) asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP) inspections conducted.
Number of Asbestos Hazard Emergency Response Act (AHERA) inspections conducted.
Number of complaints received.
Number of complaint investigations conducted.
Number of NESHAP notifications received.
Number of asbestos NESHAP notification investigations.
Compliance rate of stationary source inspections.
Compliance rate with 401 KAR 63:005 (open burning), 63:010 (fugitive emissions and 401 KAR 53:010 (odor).
Compliance rate of NESHAP and AHERA-related inspections and investigations.

**Objective 5 – Track air quality related litigation**

**Tactic 5.1:** Provide support to the Office of General Counsel (OGC) regarding the Greenhouse Gas (GHG) Tailoring Rule litigation (United States Court of Appeals Case #10-1211).

**Measure:** Outcome of the litigation.

**Tactic 5.2:** Direct and participate in any legal challenges to air quality issues.

**Measure:** Outcome of the litigation.

**Regulating Greenhouse Gases: A Summary of Federal Actions to Date**

January 2011 marked the first time in history that greenhouse gases (GHGs) became regulated pollutants under the Clean Air Act (CAA). GHGs are gases that have the ability to trap heat in the atmosphere. Without greenhouse gases, the earth would be a spinning ball of ice. With a very thick layer of greenhouse gases, the earth would have a very hot climate, like Venus. While a number of gases have heat-trapping potential, six key gases, including carbon dioxide ($CO_2$), are considered to be well-mixed in the atmosphere and are the focus of climate science. Thus, greenhouse gases have been targeted for reductions by the federal Environmental Protection Agency (EPA) and other entities as one strategy to combat global climate change.

Greenhouse gases covered by Environmental Protection Agency rules are:

- Carbon dioxide ($CO_2$)
- Methane ($CH_4$)
- Nitrous Oxide ($N_2O$)
- Hydrofluorocarbons (HFC)
- Perfluorochemicals (PFC)
- Sulfur Hexafluoride ($SF_6$)

In light of Congress's inability to pass comprehensive climate change legislation, a series of recent and pending EPA rules have become the primary vehicle for regulation of GHG emissions. With the Light Duty Rule and Tailoring Rule going into effect in January 2011, GHG permitting became a requirement for Prevention of Significant Deterioration (PSD) and Title V air permits. EPA then took the first steps to set national limits on the amount of carbon pollution power plants can emit by proposing the first ever GHG New Source Performance Standards (NSPS) for these facilities in April 2012. Meanwhile, a series of legal and legislative measures that challenged EPA's right to regulate GHGs under the Clean Air Act were dismissed in a June 2012 landmark ruling by the U.S. Court of Appeals for the D.C. Circuit. This section summarizes federal actions chronologically through June 2012 that relate to the regulation of greenhouse gases.

***April 2007: Massachusetts v. EPA***

This case grew out of EPA's back and forth stance on greenhouse gas regulation. Under the Clinton administration, EPA had determined that it *does* have the authority to regulate GHGs under the Clean Air Act. But this decision was reversed by the Bush-era EPA, which held that authority for regulating GHGs should come from Congress, not the Clean Air Act. In 2003, EPA denied a petition to set limits on GHG emissions from new motor vehicles. Petitioners responded by filing a lawsuit against EPA for failing to regulate GHG emissions, and ultimately the case made its way to the Supreme Court.

Known as Massachusetts v. EPA, the lawsuit was led by coalition of 12 states along with several cities and non-governmental agencies. The case revolved around the meaning of the Clean Air Act and its definition of "air pollutant". Are GHGs pollutants as defined in the Clean Air Act? In a 5-4 decision, the Supreme Court decided *yes*.

On April 2, 2007 the Supreme Court found that greenhouse gases fit well within the CAA's definition of "air pollutant". Therefore, EPA does have the authority to regulate GHG emissions from new motor vehicles. The Act defines "air pollutant" as "any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive . . . . substance or matter which is emitted into or otherwise enters the ambient air". The Court held that EPA must justify its refusal to regulate greenhouse gases by determining whether these pollutants endanger public health or welfare.

***December 2008: The "Johnson Memo"***

EPA issued this Bush-era memorandum to clarify its position that $CO_2$ and other greenhouse gases were not considered pollutants "subject to regulation" under the Clean Air Act. In the memo, former EPA Administrator Stephen Johnson defined a "regulated pollutant" as one that is "subject to either a provision in the CAA or regulation adopted by EPA under the CAA that requires actual control of emissions of that pollutant". Because $CO_2$ and other greenhouse gases had no specific limits named in the Clean Air Act, the memo said, GHGs are not regulated pollutants.

Environmental groups mounted numerous legal challenges to this interpretation, arguing that if GHGs are considered pollutants under the Clean Air Act they therefore must be considered subject to regulation under the air permitting program. The Obama Administration EPA responded by reconsidering the Johnson Memo in 2009-2010, essentially agreeing with its basic premise that regulated pollutants are those whose emissions are specifically limited under the CAA or in regulation adopted by EPA under the CAA.

In the Reconsideration, EPA Administrator Lisa Jackson acknowledged the anticipated regulation of GHG emissions from new vehicles under Title II of the CAA, which was already in the works. Jackson noted that air permitting requirements for greenhouse gases would apply only when a regulatory requirement to control emissions of GHGs takes effect.

***September 2009: Mandatory Reporting Rule***

The Mandatory Reporting Rule does not regulate emissions of greenhouse gases. Rather, this rule requires entities emitting over 25,000 metric tons per year of carbon dioxide equivalent ($mtCO_2e$) to report those emissions to the federal government.

There are six greenhouse gases covered by the rule, and all have different levels of heat-trapping potential and life span. Carbon dioxide equivalency ($CO_{2e}$) provides a unit of common measure for

these different gases. The Mandatory Reporting Rule allows the EPA to begin gathering data on the quantity of emissions generated by many sectors of the U.S. economy. Reporters submit data directly to the EPA; the state is not involved in collecting reports or enforcing the rule. Entities covered under the rule – primarily fossil fuel suppliers, industrial gas suppliers, manufacturers of vehicles and engines outside of the light-duty sector, and certain large industrial facilities – were required to begin collecting data in January of 2010, and to submit their first report in March of 2011. The rule was made final on September 22, 2009 (*74 FR 56259*).

***December 2009: The "Endangerment" and "Cause or Contribute" Findings***

In response to the Supreme Court's ruling in *Massachusetts v. EPA,* EPA conducted a 40-month review of the scientific literature to determine whether GHG emissions from new vehicles cause or contribute to air pollution which could endanger public health and welfare, or whether the science is too uncertain to make a reasoned decision. In its review, EPA examined the observed and projected effects of greenhouse gases in the atmosphere, their effect on climate, and the public health and welfare risks and impacts associated with climate change. The investigation resulted in two distinct findings:

**2011 Kentucky GHG Emissions**

Although Kentucky and other states are not required to report GHG emissions on behalf of facilities, DAQ's Emissions Inventory section has collected GHG data when available through existing AP-42 emission factors. AP-42 emission factors are the numbers that industry and air quality agencies use to calculate emission rates in cases where other data are not available.

In calendar year 2011, data was collected for Kentucky emissions of carbon dioxide (115,580,038 tons annual emissions reported), methane (45,740 tons annual emissions reported), and nitrous oxide (4,128 tons annual emissions reported). In sum, there were 117,820,258 metric tons of $CO_{2e}$ reported in calendar year 2011.

- *The Endangerment Finding* states that the mix of atmospheric concentrations of six key greenhouse gases threatens both the public health and the public welfare of current and future generations.
- *The Cause or Contribute Finding* says that the combined greenhouse gas emissions from new motor vehicles and motor vehicle engines contribute to the atmospheric concentrations of the six greenhouse gases and therefore to climate change.

Finding that greenhouse gases threaten public health and welfare required EPA to take action. While the findings did not, in and of themselves, call for regulation, they did pave the way for it.

***July 2010: The Light Duty Vehicle Rule***

On July 6, 2010, the "Light Duty Vehicle Rule" established the nation's first standard for greenhouse gas emissions from light-duty or passenger vehicles. Focusing on $CO_2$, the primary GHG emitted in tailpipe exhaust, the rule set a $CO_2$ limit of 250 grams of $CO_2$ per vehicle mile traveled for model year 2016 vehicles. The rule also incrementally raises the fuel economy of new vehicles to 35.5 miles per gallon by 2016. Setting these standards under section 202(a) of the Clean Air Act meant that greenhouse gases became a regulated pollutant under the CAA for the first time. With the rule scheduled to go into effect on January 2, 2011, states would soon be required to regulate GHG emissions from stationary sources as well.

***December 2010: The "SIP Call"***

In December 2010, EPA finalized the SIP Call Rule, which found that the laws of 13 states did not authorize them to regulate GHG emissions as would be required as of January 2, 2011. The SIP Call required those states to change their laws to authorize GHG regulation and to submit these changes as a part of a revised State Implementation Plan (SIP) to EPA for review and approval. The 13 states were Arkansas, Arizona, parts of California, Connecticut, Florida, Idaho, Kansas,

Kentucky, Oregon, Nebraska, Nevada (Clark County), Texas, and Wyoming. Kentucky revised its SIP to include GHG permitting, and these revisions became effective on January 3, 2011.

### *2011-12: The Tailoring Rule*

With the Light Duty Rule now in effect, GHGs officially became regulated pollutants under the CAA. The goal of the Tailoring Rule was to "tailor" the emissions thresholds that are applicable to GHGs in air quality permits for stationary sources that pollute. These emissions thresholds determine when permits under the New Source Review Prevention of Significant Deterioration (PSD) and title V Operating Permit programs are required for new and existing industrial facilities. The threshold limits for the six criteria pollutants in the CAA are set at 100 or 250 tons per year per facility. Such thresholds work for pollutants like lead, sulfur dioxide, and particulate matter – but not for $CO_2$, which is emitted in far greater quantities.

If the current emission thresholds were applied to GHGs, millions of previously unpermitted facilities would be required to obtain air quality permits, overwhelming state permitting agencies across the country. The Tailoring Rule was created to address this issue by "tailoring" the thresholds that apply to greenhouse gases – in effect, raising those limits so that only the largest emitters of GHGs would be required to obtain air permits due to their GHG emissions.

**Phase I** of the Tailoring Rule took effect in January 2011. Under this step, PSD requirements applied to sources' GHG emissions *if* those sources were subject to PSD anyway, due to their non-GHG regulated air pollutants; *and if* those sources emitted or had the potential to emit at least 75,000 tpy $CO_{2e}$. Existing sources with, or new sources obtaining, title V permits were required to address GHG emissions in those permits as necessary. According to EPA, between the effective date of this first phase and June 30, 2013, some 550 sources would need to obtain operating permits for the first time because of their GHG emissions. An additional 900 new facilities and modifications of existing facilities per year would also face GHG requirements in their construction permits.

**Phase II** of the Tailoring Rule began in July 2011. Under this phase, all new facilities emitting GHGs in excess of 100,000 tons of per year (tpy) of $CO_{2e}$ and facilities making changes that would increase GHG emissions by at least 75,000 tpy $CO_{2e}$, *and* that also exceed 100/250 tpy of GHGs on a mass basis, must obtain permits that address GHG emissions. As a result of this rule, operating permits will now be needed by *all* sources that emit at least 100,000 tons of GHGs per year on a $CO_{2e}$ basis. Facilities that met these emissions thresholds were given one year from the date of implementation of Phase II, until July 1, 2012, to apply for a Title V operating permit.

**Phase III** of the Tailoring Rule has additionally been issued as of the time of this writing (July 12, 2012) and does not revise the GHG permitting thresholds that were established in Phase I and Phase II of the GHG Tailoring Rule. In this rulemaking, EPA determined that state permitting authorities have not had sufficient time to develop and increase their GHG permitting infrastructure, expertise, and capacity, and it was not yet appropriate to apply PSD and title V permitting requirements to additional, smaller sources of GHG emissions. EPA also finalized changes that would allow issuance of "plant-wide applicability limitations" (PALs) for GHG emissions to be established on either a mass basis or a $CO_{2e}$ basis. Such PALs could be used to determine whether a project would qualify as a major modification — one that subjects a facility's GHG emissions to regulation.

In addition, EPA took steps to defer GHG permitting requirements for $CO_2$ emissions from biomass-fired and other biogenic sources. EPA's rule to address this, proposed in March 2011 and finalized in July 2011, defers the application of stationary source PSD and Title V provisions to biogenic $CO_2$ emissions from bioenergy for the next three years. EPA plans to undertake a detailed examination of the science associated with biogenic $CO_2$ emissions from stationary sources during this three-year period.

***September 2011: The Heavy Duty Vehicle Rule***

Under a new rule finalized on September 15, 2011, the nation's fleet of medium- and heavy-duty trucks will be required to meet fuel efficiency and GHG emission standards for the first time ever beginning in 2014. The new program sets standards for three categories of model year 2014-2018 medium- and heavy-duty trucks: combination tractors, commonly known as big rigs or semi trucks; heavy-duty gasoline- and diesel-powered pickup trucks and vans; and vocational vehicles, such as delivery trucks, buses, and garbage trucks.

***December 2011: The Light Duty Vehicle Rule Extension***

This joint proposal with the Department of Transportation's National Highway Traffic Safety Administration builds upon the first phase of the Light Duty Vehicle Rule issued in July 2010. The extension would limit GHG emissions from mobile sources to further reduce greenhouse gas emissions and improve fuel economy for model year 2017 through 2025 light-duty vehicles. The standards proposed would apply to model year 2017-2025 passenger cars, light-duty trucks, and medium-duty passenger vehicles. Under this rule, the standards set a limit of 163 grams of $CO_2$ per vehicle mile traveled, which is equivalent to 54.5 miles per gallon.

***April 2012: GHG New Source Performance Standards***

On April 13, 2012, EPA took the first steps to set national limits on the amount of carbon pollution power plants can emit by proposing GHG New Source Performance Standards (NSPS) for new power plants. The proposed rule would apply only to **new** fossil-fuel-fired electric utility generating units (EGUs) and would not cover modifications or reconstructions of existing facilities, or new facilities that have permits and commence construction by April 13, 2013 ("transitional units"). EPA proposed that new power plants meet an output-based standard of 1,000 pounds of $CO_2$ per megawatt hour (lb $CO_2$/MWh gross). New natural gas combined cycle power plant units should be able to meet the proposed standard without add-on controls. New power plants that are designed to use coal or petroleum coke would have the option to incorporate technology to reduce $CO_2$ emissions to meet the standard, such as carbon capture and storage (CCS). The proposed standard provides flexibilities for new power plants that use CCS by allowing these facilities to use a 30-year average of $CO_2$ emissions to meet the proposed standard, rather than meeting the annual standard each year.

***June 2012: U.S. Court of Appeals Upholds GHG Rules***

Since their issuance, several key GHG rules became the focus of numerous lawsuits claiming the rules were in violation of the Clean Air Act. A number of groups — including the Commonwealth of Kentucky and other states across the U.S., as well as regulated industries — filed lawsuits for review of EPA's GHG regulations, contending that the agency misconstrued the CAA and otherwise acted arbitrarily and capriciously.

On June 26, 2012, after thorough review of the numerous petitions received, the U.S. Court of Appeals for the D.C. Circuit upheld EPA's landmark GHG regulations. The Court concluded:

- The Endangerment Finding and Light Duty Vehicle Rule were neither arbitrary nor capricious;
- EPA's interpretation of the governing CAA provisions was unambiguously correct; and
- No petitioner had standing to challenge the Timing and Tailoring Rules (the petitioners were not harmed by these rules).

The Court thus dismissed for lack of jurisdiction all petitions for review of the Timing and Tailoring Rules, and denied the remainder of the petitions. Through this rulemaking, EPA's GHG regulations were upheld and will continue to be enforced.

# ENVIRONMENTAL EDUCATION

Environmental education (EE) is an essential tool in promoting environmental stewardship. The division utilizes EE in numerous ways to increase awareness of air and its importance in our lives. DAQ's EE programs promote critical thinking skills that enable individuals to make informed decisions and understand the impact of those decisions on the air we breathe.

Air quality can be a challenging topic to teach. Air is invisible, and most air pollutants are invisible too. Air is constantly in motion; light a match and the smoke soon blows away and seems to disappear. DAQ's environmental education programs seek to make the invisible *visible*, emphasizing experiential, hands-on learning whenever possible.

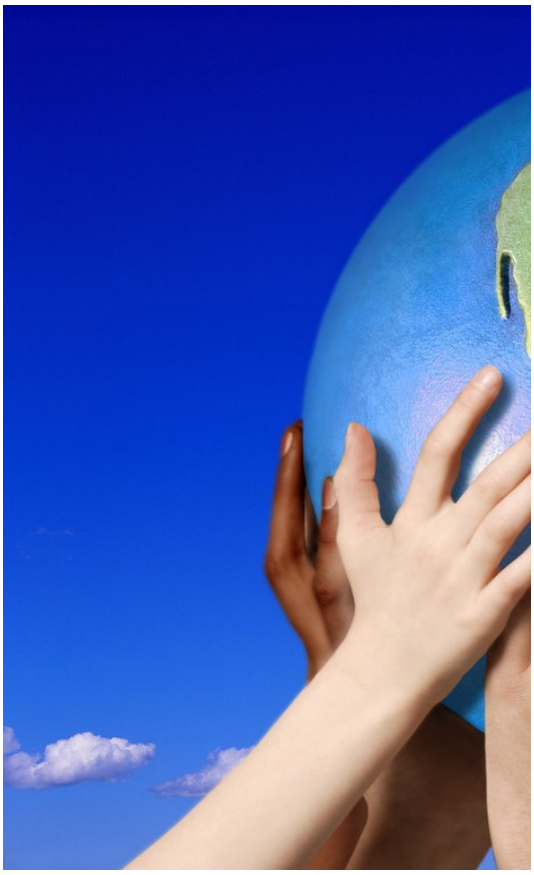
DAQ's EE program reaches a diverse audience across the Commonwealth including students, teachers, fire fighters, emergency management, asthma educators, businesses, and solid waste coordinators. In addition to the division's full-time EE Specialist, field office staff assists with regional outreach programs as requested. DAQ's air quality curriculum is correlated to state and national learning standards for grades 4 – 8.

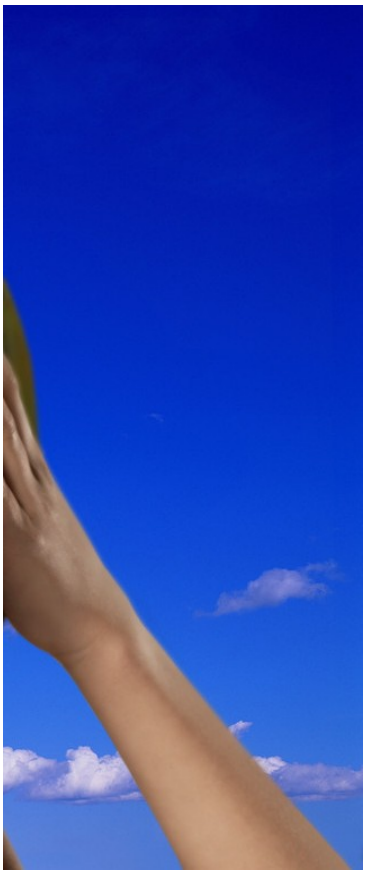
*The DAQ EE program includes:*

- Teacher training
- Classroom and camp programs
- Public events and festivals
- Fire fighter education
- School bus driver trainings (idle reduction)
- Community groups, forums, & conferences
- Media outreach

*Air Quality EE program topic areas include:*

- Air pollution sources & monitoring
- Open burning and waste reduction
- Indoor air quality
- Clean school buses (idle reduction, retrofit technology)
- Fuel economy and alternative fuels
- Energy conservation
- Alternative modes of transit
- Climate change





## Environmental Education Outreach in FY 2012

DAQ's Environmental Education program reached 5243 people in 30 counties during FY 2012. Figure 2 shows the audience and numbers for each category of outreach.

General public programs drew the largest numbers (2343 people) as DAQ staff participated in several large Earth Day festivals in April. Schools were the second-largest audience with 1630 students (primarily K-12) reached. Every student received direct, face-to-face contact with DAQ staff presenting educational programs about air quality issues. In addition to general air quality education, teachers requested programs on energy conservation, bioindicators, and indoor air quality. DAQ is a partner with the KY Green & Healthy Schools program to assist classrooms in completing the indoor air quality and transportation inventories, and several schools took advantage of this partnership in FY 2012.

DAQ also partnered with Fayette County's school district to pilot a student-led, voluntary idle reduction program for cars in the carpool lane at Rosa Parks Elementary. To measure success of the program, students gathered baseline data prior to the campaign by determining the number of idling vehicles in the carpool lane during drop-off and pick-up times. Next, students encouraged drivers to voluntarily turn the ignition off while waiting in line, thereby protecting air quality around the school while saving gas and money. Students measured a 21% decrease in idling after their educational campaign.

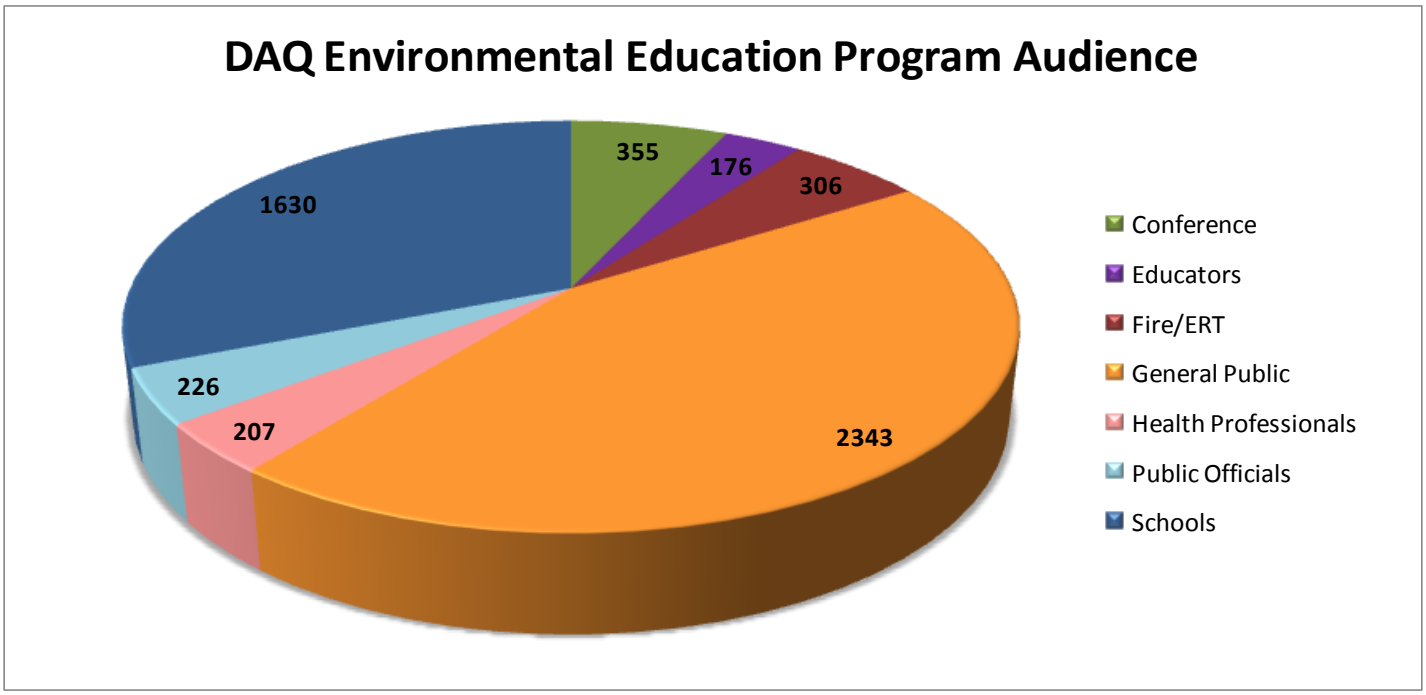



*Figure 2: The Division for Air Quality's Environmental Education programs reached more than 5200 people during FY 2012. Schools and public programs comprised more than three-quarters of the audience.*

## Open Burning Campaign

Each year in the spring, DAQ's EE program focuses on educating the public about open burning. Illegal open burning continues to be a serious concern in Kentucky; according to the EPA, backyard burning is now the leading quantified source of dioxins in the U.S.

DAQ's primary educational tool for open burning awareness is a brochure that summarizes Kentucky's open burning regulation by listing legal and illegal burning activities, as well as alternatives to open burning. DAQ distributes thousands of these brochures each year to private citizens, public officials, and fire fighters.

Citizens often call local fire stations to enquire about local burning ordinances or to register for burn permits. Educating these first responders about Kentucky's open burning regulation is a big part of DAQ's annual open burning awareness campaign. More than 300 firefighters and Emergency Response Team (ERT) members attended trainings during FY 2012.

DAQ also developed a new public awareness campaign targeting campfire trash burning. The practice of campfire trash burning poses a threat to human health and the environment, particularly when campers cook over the very fires in which they burn trash. The goal of the campfire trash burning campaign is to educate campers about the dangers of trash burning, to eliminate this practice at Kentucky's campgrounds, and to reduce backyard trash burning when campers return home.

*A new poster educates campers about the hazards of campfire trash burning.*

The campaign consists of educational posters and brochures that were developed in collaboration with KY State Parks, KY Division of Forestry, U.S. Forest Service, and Army Corps of Engineers. Each of these agencies has agreed to distribute the materials to campgrounds across Kentucky. Posters will be placed in highly visible areas in each campground and registered campers will receive brochures in their registration packets. The poster, brochure, and other educational materials may be viewed on the division's open burning webpage at http://air.ky.gov/Pages/OpenBurning.aspx .

**Storm Debris Awareness**

The historic tornado outbreaks in the spring of 2012 resulted in widespread devastation in several Kentucky communities, most notably West Liberty and East Bernstadt. Due to concerns about possible asbestos-contaminated storm debris, DAQ staff worked closely with waste and emergency management officials to ensure safe handling of the debris until it could be safely disposed in a landfill. In the weeks following the tornado outbreak, the division released numerous press releases about safe storm debris handling to encourage citizens to consider alternatives to burning.

**Southeast Diesel Collaborative**

The Southeast Diesel Collaborative (SEDC) is a regional organization that brings together partners from federal, state and local government, non-governmental organizations, and business to reduce emissions from diesel engines. A wide variety of strategies are utilized by SEDC partners to achieve these reductions, including idle reduction, alternative fuels, and engine retrofits, replacements and repowers. Federal funds, authorized by the Diesel Emissions Reduction Act (DERA), help SEDC partners employ the above strategies in the multiple diesel sectors involved.

DAQ staff maintain an active presence in the SEDC. This year, DAQ Internal Policy Analyst Shea Hogan continued to work in her capacity as an EPA-appointed member of the SEDC Strategic Planning Committee. The Strategic Planning Committee is responsible for developing the overarching goals and priorities for the SEDC, as well as providing support for the completion of the actions needed to achieve these goals and priorities.

## Kentucky Clean Diesel Grant Program

DAQ's Kentucky Clean Diesel Grant Program, a program funded with allocations from the EPA's DERA grant program, has awarded 29 grants totaling nearly $2.5 million to date. Over $1.5 million of this funding was awarded to 26 school districts across the state to help reduce emissions from their school buses by retrofitting these buses with emission control devices and instituting idle reduction policies within their fleets. A total of 748 school buses have been retrofitted, resulting in a lifetime reduction of 9.3 tons of particulate matter (PM), 43.8 tons of hydrocarbons (HC), and 130.5 tons of carbon monoxide (CO).


*The Lexington-Fayette Urban County Government utilized Clean Diesel Grant Program funding to retrofit 12 garbage trucks with diesel particulate filters. Louisville Metro Government completed similar retrofits of 20 garbage trucks using grant funding through DAQ's Clean Diesel program.*

In FY2012, the division worked in partnership with Lexington-Fayette Urban County Government (LFUCG) and Louisville Metro Government (LMG) to utilize Kentucky Clean Diesel Grant Program funding to implement retrofit programs within their respective refuse hauler fleets. LFUCG's 12-vehicle $202,640 project was successfully completed during this time and will result in a lifetime reduction of 1.1 tons PM, 1.1 tons HC, and 5.0 tons CO in Fayette County. LMG's project, utilizing $425,880 in funding and anticipated to result in the retrofit of 20 refuse haulers, was initiated during this fiscal year with the preliminary vehicle and equipment testing phase. Project completion for LMG is expected by September 30, 2012.

In addition, the division worked to procure additional DERA funds by submitting a Notice of Intent to Participate and subsequent Work Plan to EPA outlining the division's plan for utilizing FY12 DERA funds. These funds, if awarded, will be made available to the division on October 1, 2012.

## Kentucky Clean Fuels Coalition

In 2010, the Kentucky Clean Fuels Coalition (KCFC), with support from DAQ, the Kentucky Department for Energy Development and Independence, and numerous other stakeholders, wrote and received a grant from the U.S. Department of Energy to bring the largest hybrid school bus fleet in the nation to Kentucky. During FY12, project implementation continued on this $13 million grant, as school districts across the Commonwealth continued to make progress towards purchasing the 213 hybrid school buses that will eventually comprise the state's hybrid bus fleet.

## Green Fleets of the Bluegrass

In July 2011, the division spearheaded the Department for Environmental Protection's (DEP) participation in the KCFC's Green Fleets of the Bluegrass program. Green Fleets is a voluntary program of the KCFC that aims to improve the environmental performance of public and private vehicle fleets across Kentucky by reducing petroleum fuel use. Participating fleets are evaluated on an annual basis on seven criteria: Vehicles, Fuel, Maintenance, Operation, Partnerships, Strategy, & Transparency.

GREEN FLEETS
OF THE BLUEGRASS

DEP participation in Green Fleets supported the Governor's 2007 Energy Plan, which called for a 30% improvement in the fuel economy of the state vehicle fleet by 2015 and a 50% improvement by 2025. In the first year of the program, the department was able to make significant progress towards achieving these goals through several targeted efforts. These efforts included downsizing fleet vehicles to the smallest class possible and purchasing the most fuel-efficient vehicles that would still meet the transportation needs of the agency.

*DAQ's Shea Hogan and John Lyons receive the Green Fleets Improvement Award on behalf of DEP from Tracey Thurman, KCFC Board President.*

Participation in the inaugural year of the Green Fleets program earned DEP the status as a "Pioneer" member of the program. More significantly, the department's considerable efforts in 5 of the 7 criteria categories earned DEP the additional rating of "Improving", which was formally recognized and rewarded during a December 2012 Green Fleets awards ceremony.

Actions such as these will not only substantially cut fuel costs for the Department for Environmental Protection, but they will additionally have a significant impact on public health and the environment, as transportation accounts for 30% of all air pollution nationwide.

**Kentucky Association for Environmental Education**

DAQ is an active member of the Kentucky Association for Environmental Education (KAEE), sponsoring the organization's annual conference in September. This year, DAQ Environmental Education Specialist Roberta Burnes served as Vice-President of KAEE. DAQ also presented at KAEE's annual conference and at the annual meeting of the North American Association for Environmental Education.

# FIELD OPERATIONS

The Field Operations Branch (FOB) is the largest branch of the division and is currently staffed by 69 employees that include supervisors, administrative staff, air source inspectors, asbestos inspectors, field support staff, and air monitoring specialists. The majority of FOB field staff are located in eight regional offices, and have the following primary duties:

1) Complete unannounced inspections to ensure that permitted facilities and non-permitted entities maintain compliance with federal and/or state air quality regulations;

2) Operate and maintain 109 air monitoring units located at 34 stations scattered throughout the state to measure ambient air quality and determine whether pollutant concentrations remain within EPA established limits; and

3) Investigate air quality complaints received from the general public and other sources each year.

*"The Field Operations Branch continues to retain a high percentage of staff, resulting in a continuing increase of their technical knowledge and capabilities. Regional office staff continue to maintain a high level of productivity and meet federal EPA inspection commitments."*

*Kevin Flowers*
*Field Operations*
*Branch Manager*

## Inspections

One of the primary duties of the Field Operations Branch is to inspect sources of air pollution for compliance with air quality regulations and if applicable, permit conditions. The measures for the success of FOB's compliance-monitoring program are:

- Number of major stationary source inspections conducted (Figure 4);
- Number of minor stationary source inspections conducted (Figure 5);
- Number of asbestos inspections conducted (Figure 14);
- Compliance rate of stationary source inspections (Figure 6);
- Rate of compliance with 401 KAR 63:005 - open burning (Figures 8 & 9);
- Rate of compliance with 401 KAR 63:010 - fugitive emissions (Figures 10 & 11); and
- Rate of compliance with 401 KAR 53:010 - odor (Figures 12 & 13).

In calendar year 2011, FOB staff completed 3701 compliance inspections of various types at either non-permitted or permitted sources (major Title V, minor). Types of inspections included full compliance evaluations, partial compliance evaluations, records reviews, compliance demonstrations (stack tests), asbestos inspections, follow-up inspections of documented violations, and self-initiated inspections of suspected violators.

The regional offices with more inspections for major facilities (Figure 4) are located in areas of the state with a higher number of major permitted facilities, which include power plants, manufacturing facilities and chemical processing plants. The regional offices with more inspections for minor sources tend to be located in areas of the state with a smaller population base, leading to more minor pollution sources, such as auto body/paint shops, dry cleaners, non-coal mineral processing facilities, and coal-mining related activities (Figure 5).

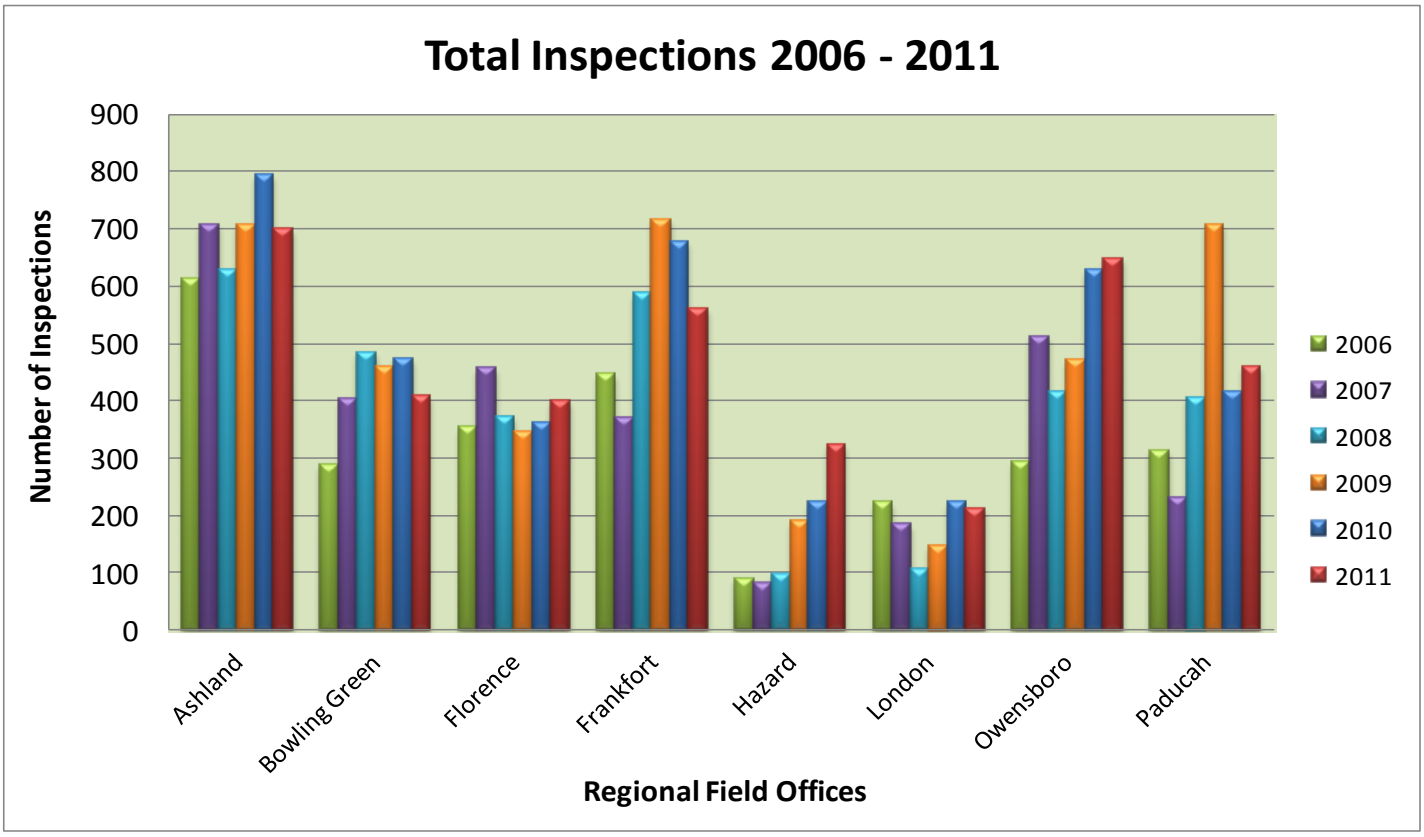



*Figure 3: The total number of inspections at regulated facilities may vary based on vacancies in staffing or staff tenure in a particular office.*

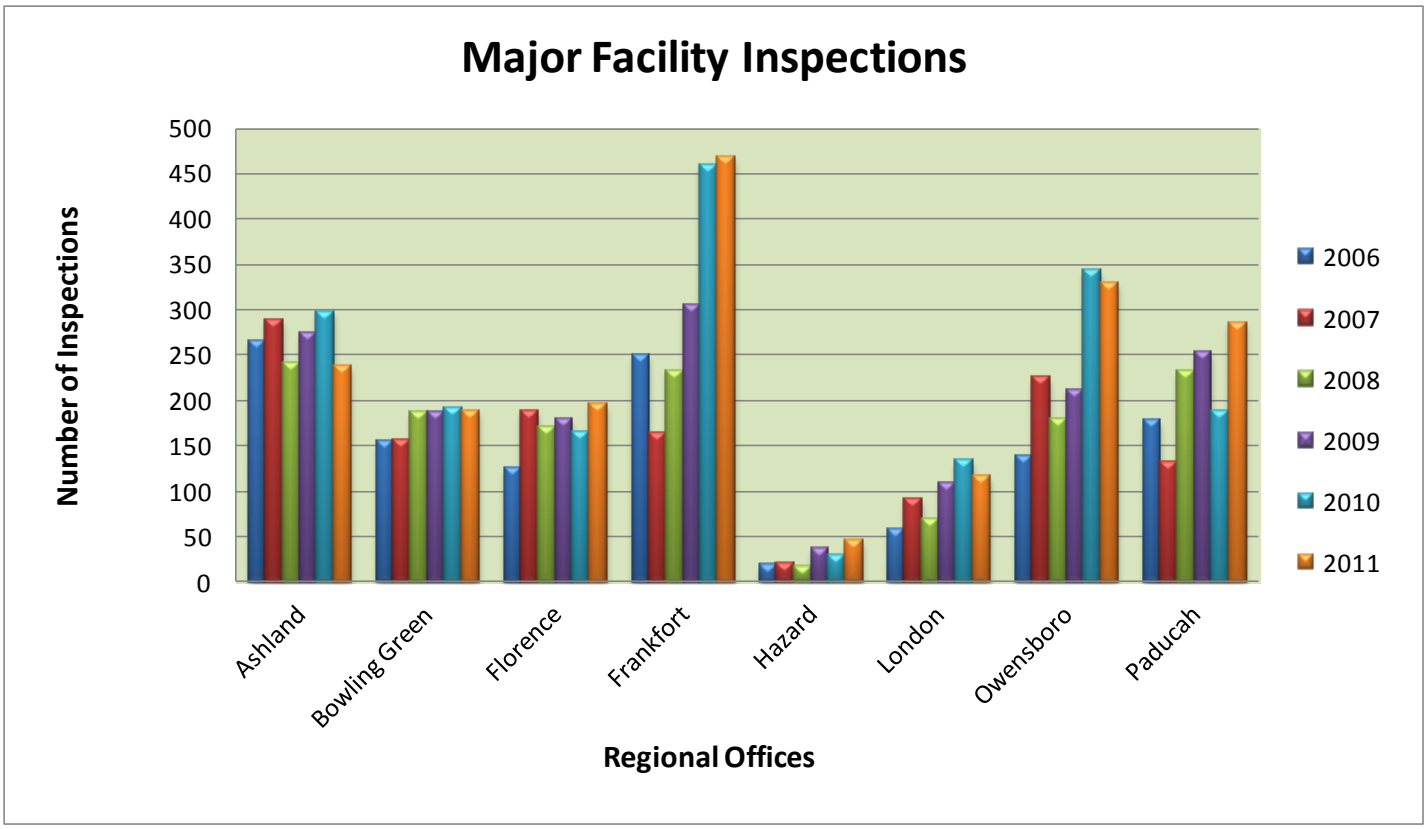



*Figure 4: Number of major stationary facility inspections in Kentucky. The regional offices with more inspections are located in areas of the state with more major permitted facilities. Major permitted facilities include power plants, manufacturing facilities and chemical processing plants.*

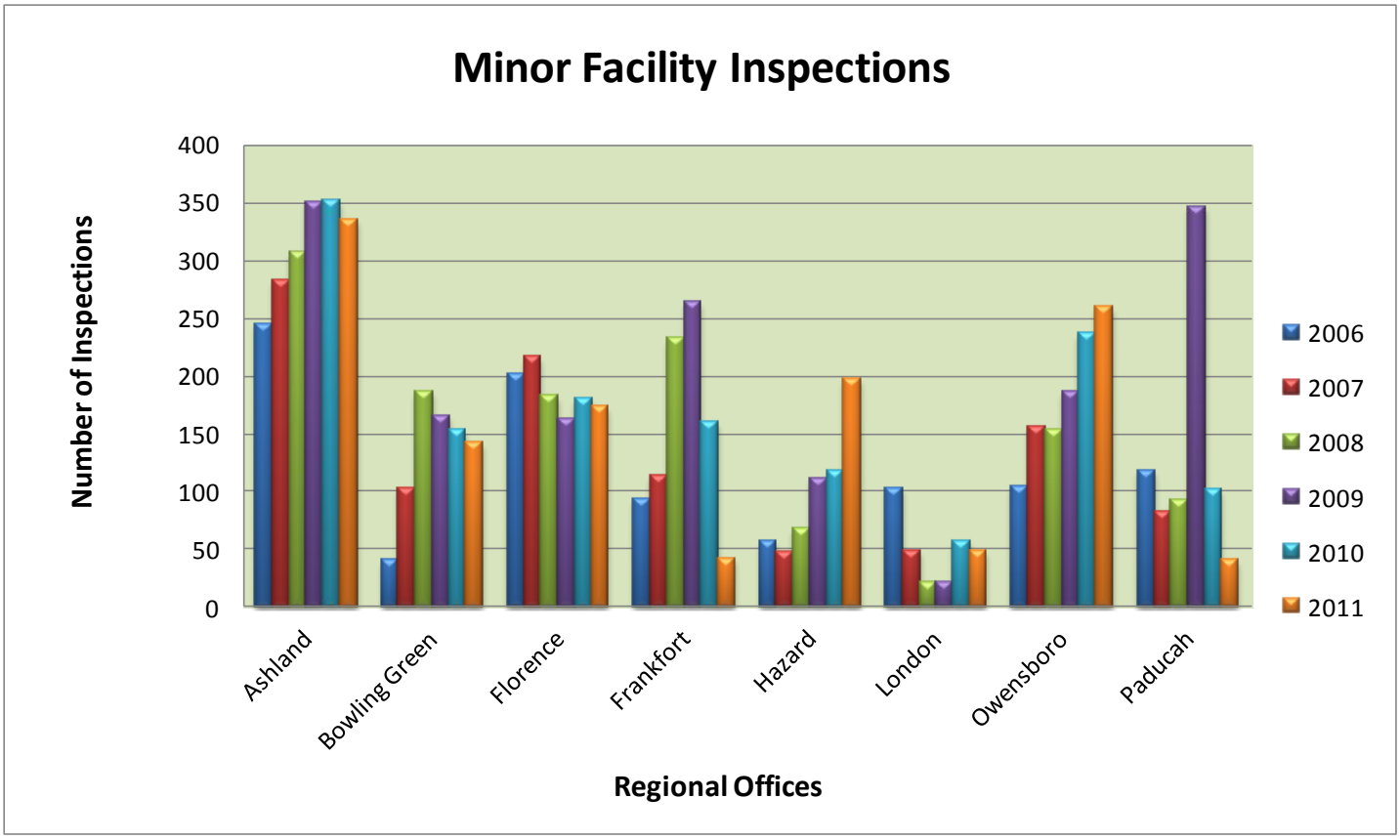



*Figure 5: Number of minor stationary source inspections, 2006-2011. Minor pollution sources include auto body paint shops, dry cleaners, and non-coal mineral processing facilities.*

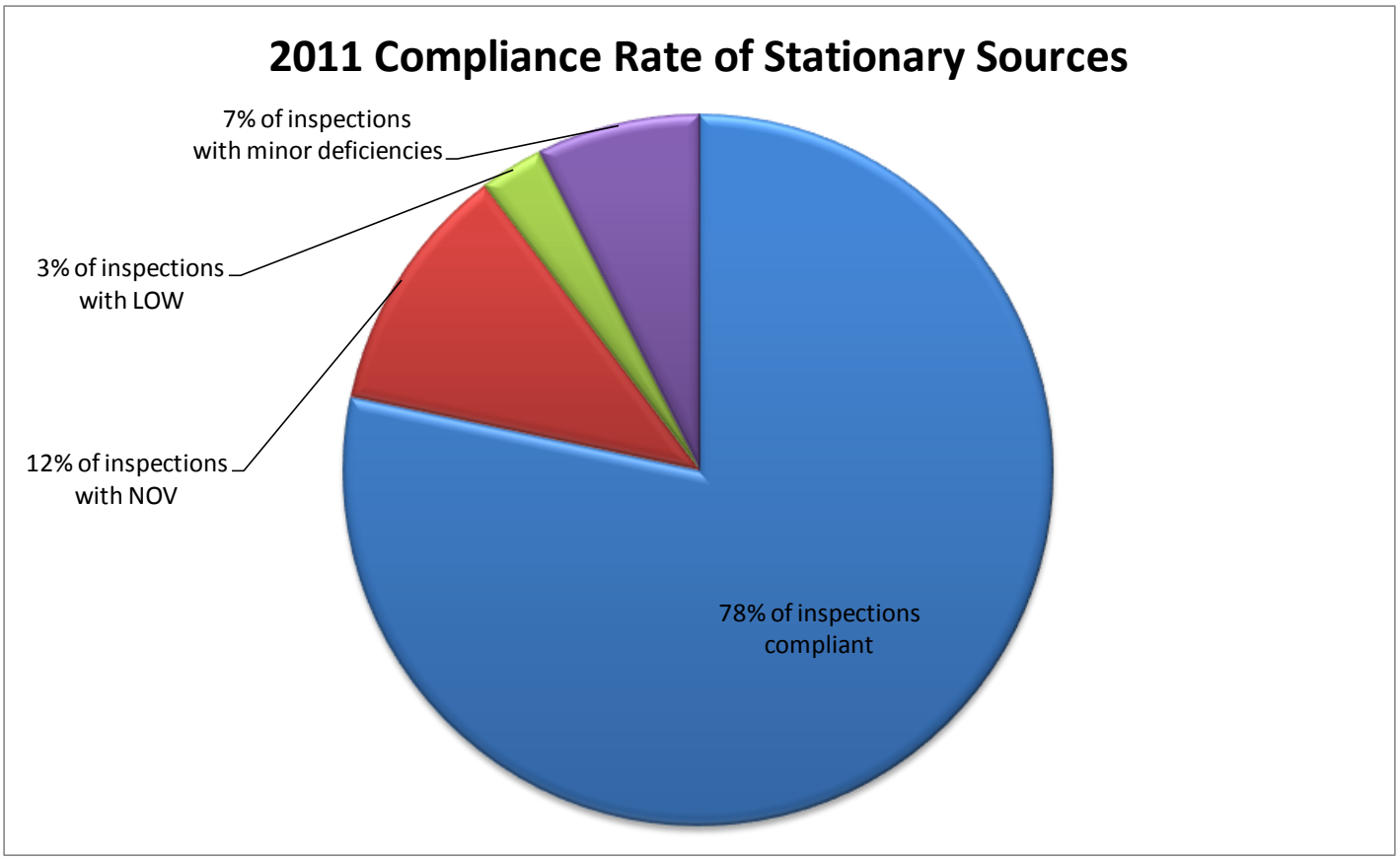



*Figure 6: The compliance rate of regulated stationary sources inspected by field office staff in 2011 was 78%. Notices of Violation were issued to 12% of Kentucky's stationary sources, while about 3% received Letters of Warning. About 7% of violations were considered non-recurrent minor violations or violations that were quickly corrected, eliminating the need for any formal enforcement action.*

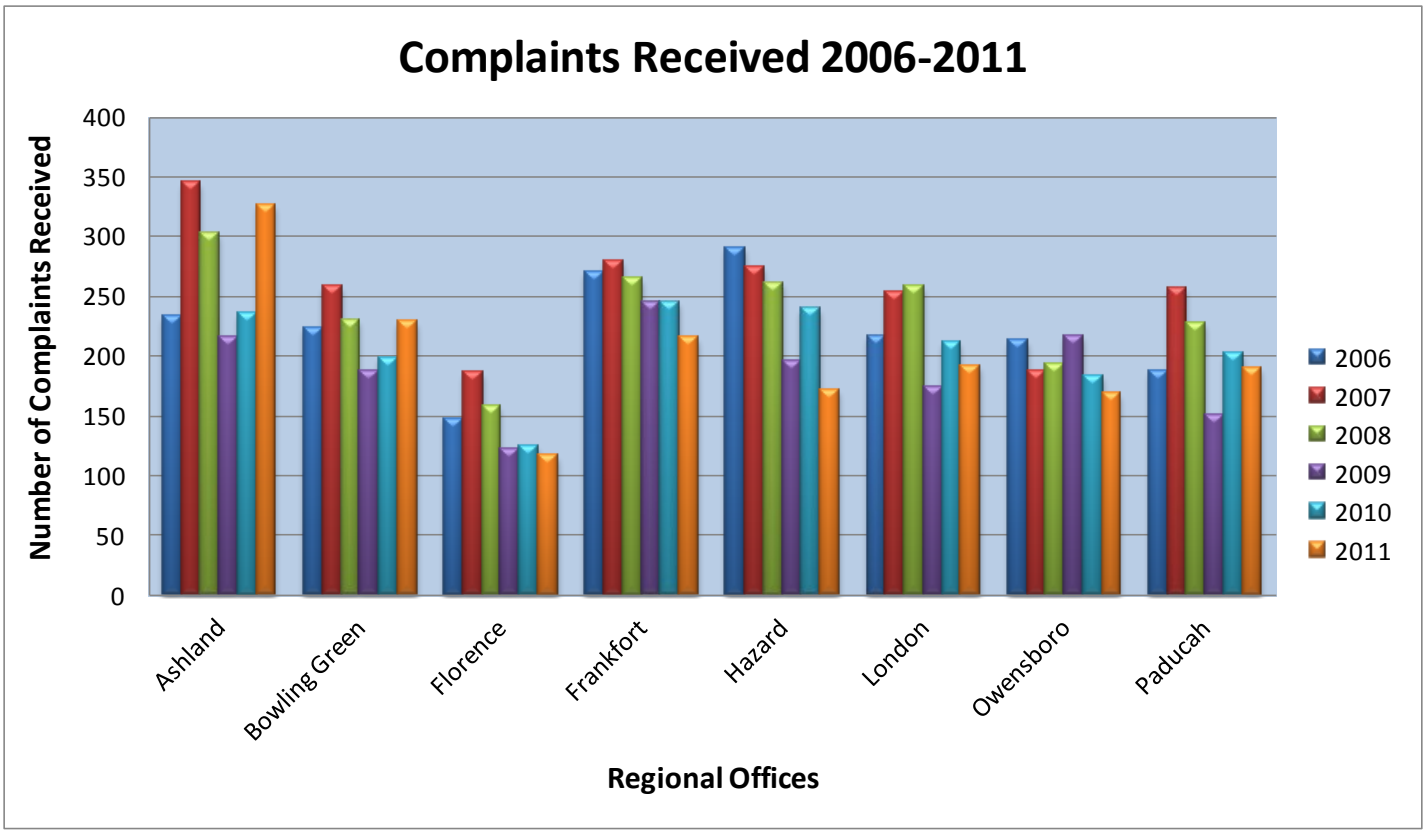



*Figure 7: The numbers of complaints received during the last six years, not including asbestos complaints.*

## Complaint Investigations

Investigating complaints continues to consume a significant portion of field office staff time. In 2011, field office inspectors received a total of 1583 complaints resulting in 1436 field investigations.

The 1436 complaint investigations combined with the 3701 facility inspections resulted in the issuance of 481 Notices of Violation and 65 referrals to the Division of Enforcement for additional enforcement action. Data on the rates of violations resulting from investigations are included in figures 9, 11, & 13. The violation rates for illegal open burning continue to be high, since staff only respond to citizen complaints of open burning or as we discover them in the course of other duties. Kentucky does not have a statewide open burn permit program, so total number of actual open burns is unknown. In 2011, 50% of 693 open burning complaints resulted in citations for illegal open burning.

Fugitive emissions complaints and violations are closely related to yearly precipitation patterns. During periods of prolonged drought periods, both the number of complaints and violations increases. For example, as observed in Figures 10 & 11, the highest number of fugitive emissions complaints (434) and greatest percentage of violations (15%) occurred in 2007 during which a very prolonged drought occurred and annual average precipitation in the state was 43.42 inches. During 2011, the average annual precipitation total of over 63 inches was most likely the cause of the lowest percentage (2.3%) of fugitive emissions violations in the last six years.

Odor complaints continue to vary through the years, with the number of odor complaints peaking in 2008 (492) as compared to 331 complaints in 2011 (Figure 12). The rate of violations per odor complaint received peaked in 2007 at 5.0% as compared to 4.23% in 2011.

*An example of an illegal open burn. Smoke from tire burning releases toxic chemicals and particulate matter into the air, and can also pollute the groundwater. Open burning is a serious health issue in Kentucky and is the focus of ongoing education and outreach campaigns in the Division for Air Quality. Photo: Division for Air Quality.*

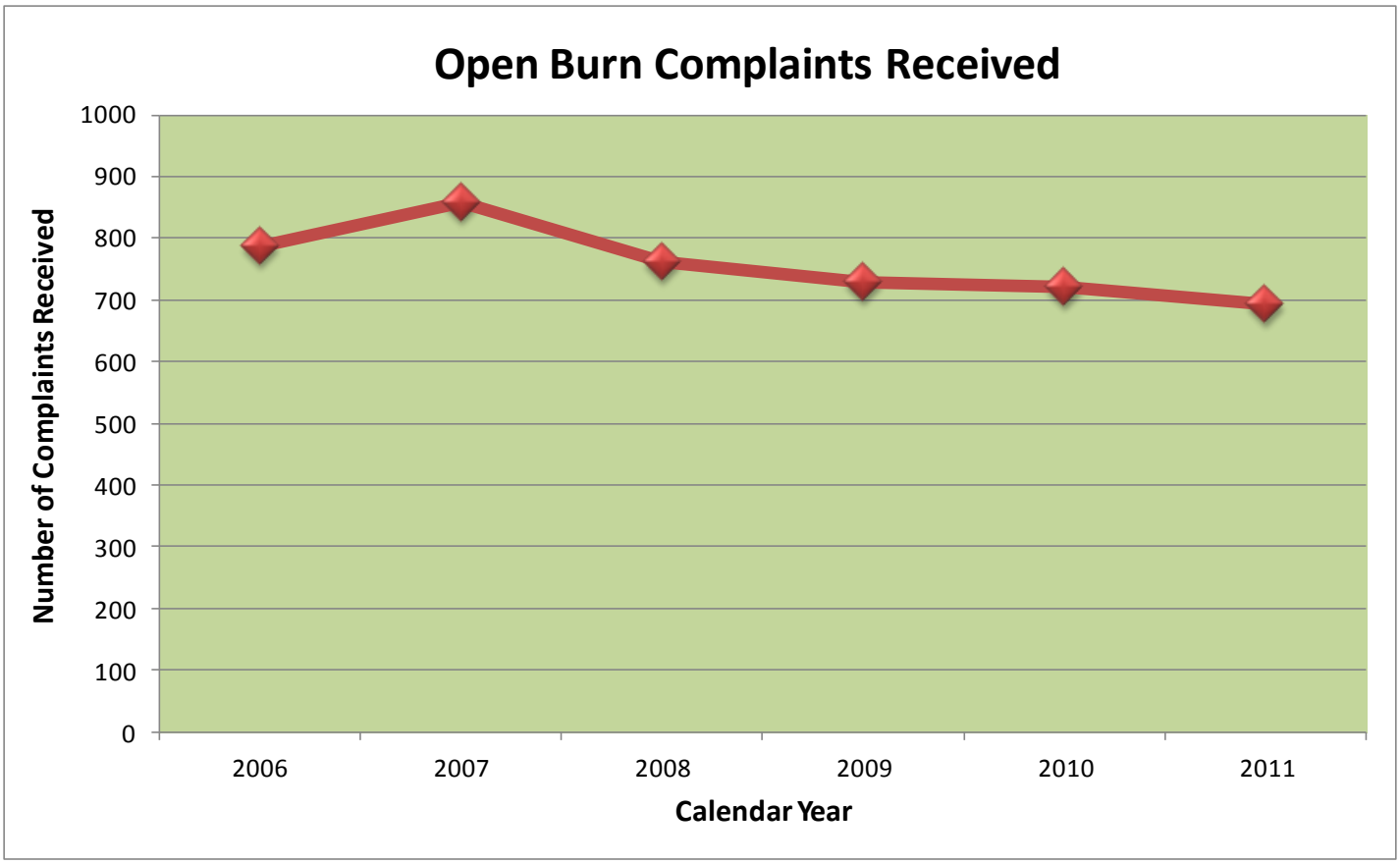



*Figure 8: Complaints received about open burning. Education and outreach campaigns targeting illegal open burning may be responsible for the decrease in open burning complaints.*

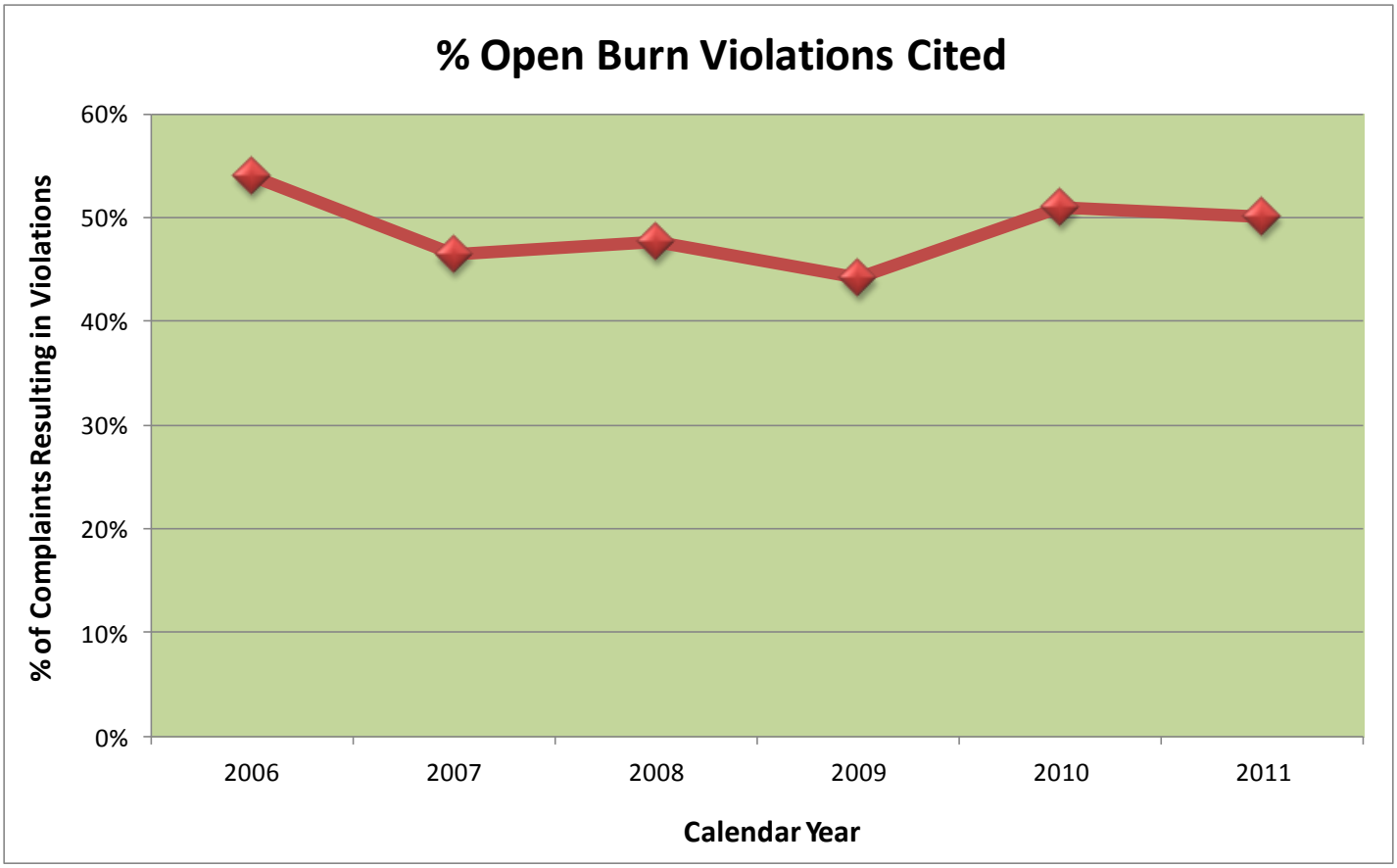



*Figure 9: Non-compliance with the open burn regulation. While the number of open burn complaints has been decreasing since 2007, the percentage of violations cited has remained fairly constant.*

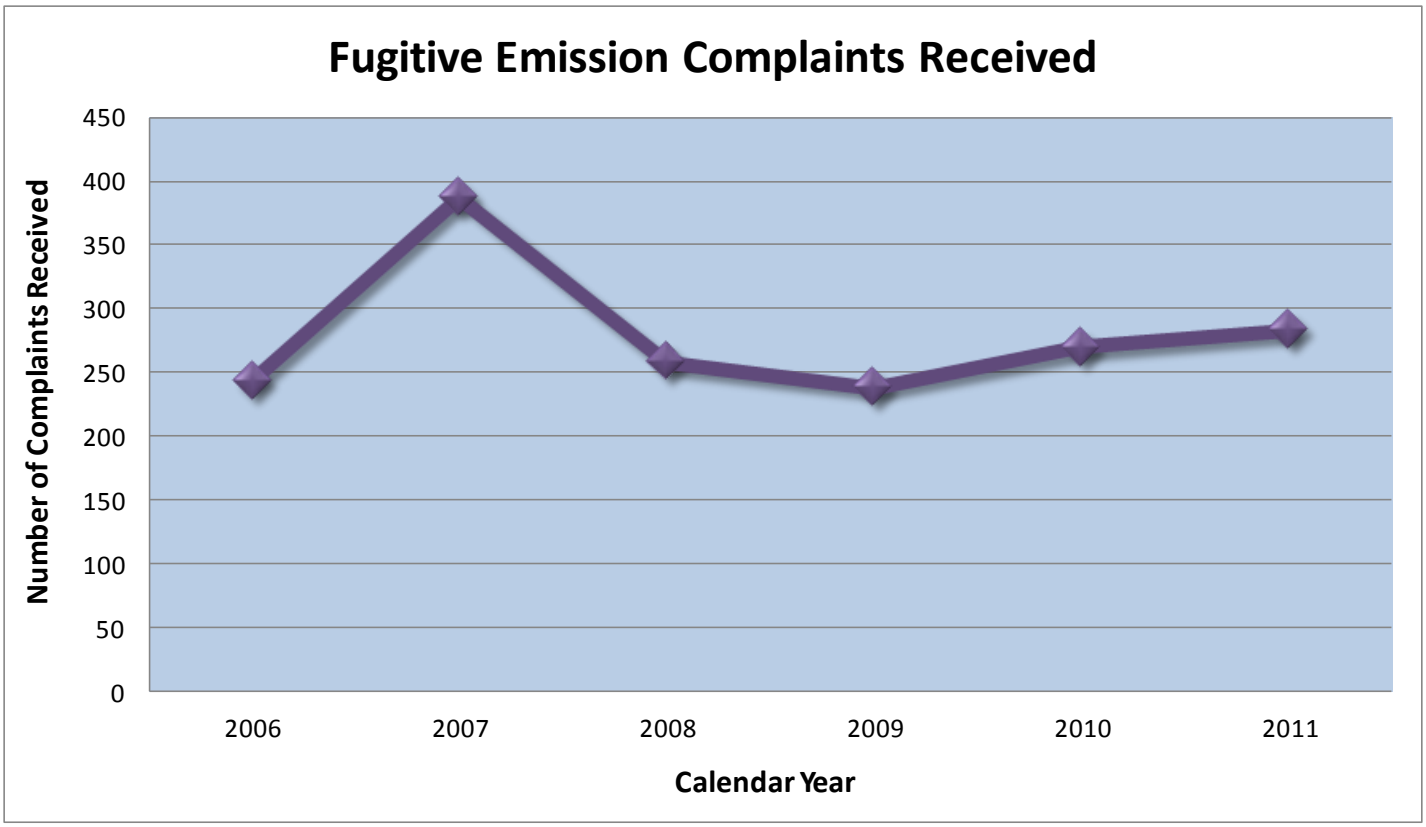



*Figure 10: Complaints received about fugitive emissions. Fugitive emissions are those that do not come from a stack. Common fugitive emissions are dust from haul roads, quarries, conveyor systems, etc. The spike in 2007 is attributed to a significant drought that occurred during that year.*

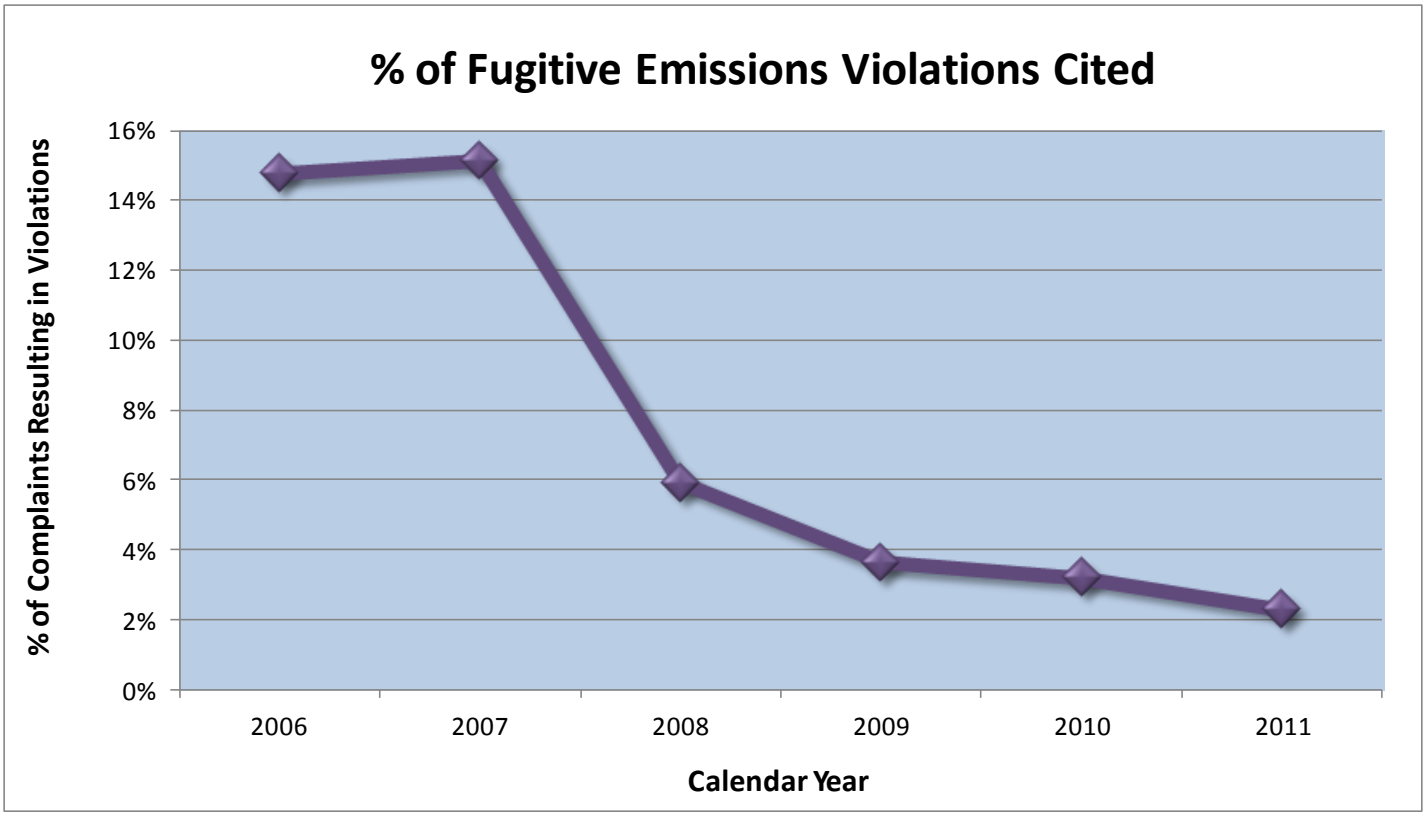



*Figure 11: The percentage of fugitive emission violations vs. the total number of source inspections peaked in 2007 and has fallen since then. The drought of 2007 may have contributed to the spike in fugitive emission complaints & violations received in that year. Dry conditions contribute to the formation of fugitive dust.*

*An example of fugitive dust emissions on a construction site. State regulation requires control measures such as spraying with water to reduce fugitive emissions and their impact on air quality. Photo: KY Department for Environmental Protection.*

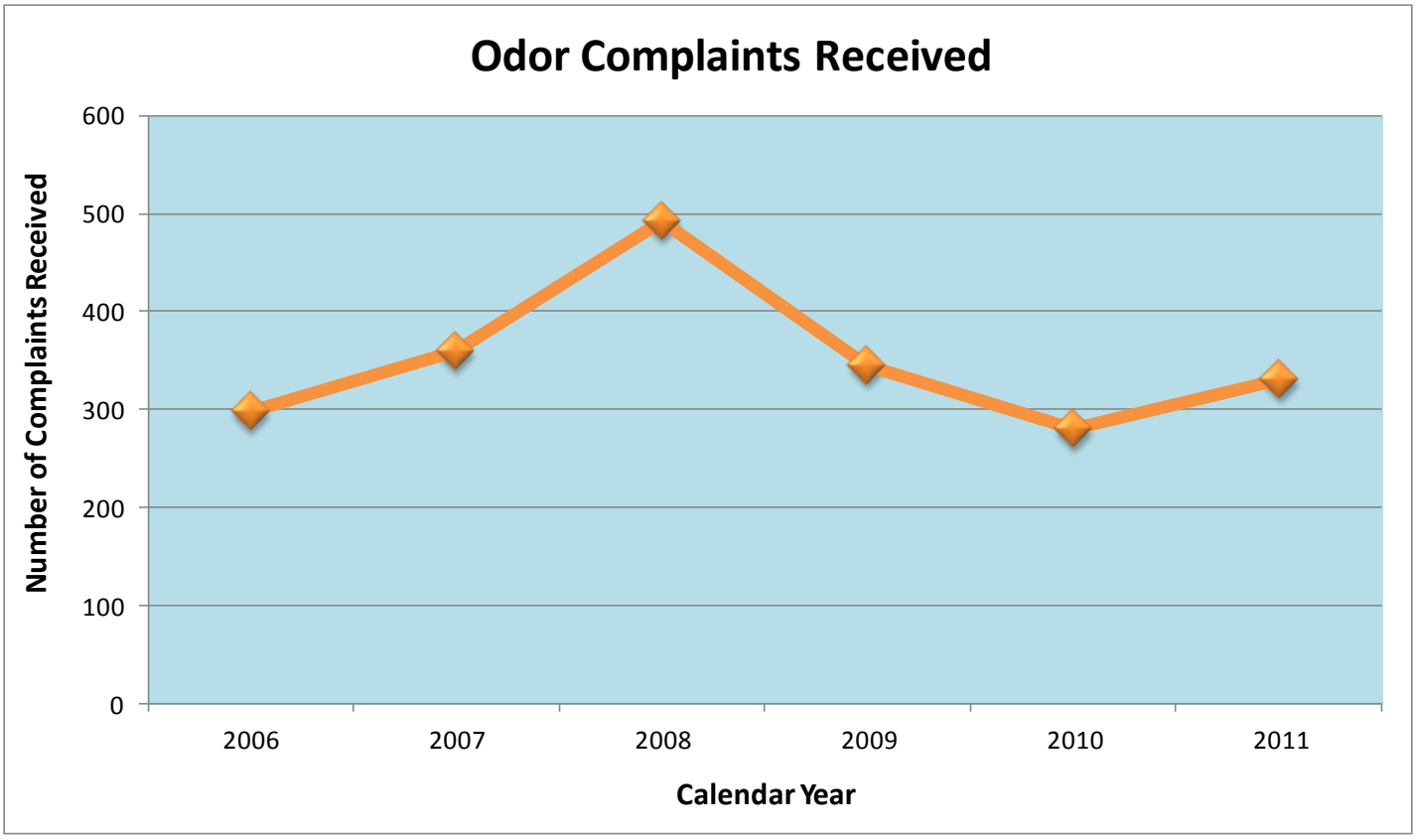



*Figure 12: The number of odor complaints have varied throughout the years, with a peak experienced in 2008. Odor violations occur when an inspector can smell the odor through a "scentometer," which dilutes the ambient air at a ratio of seven to one.*

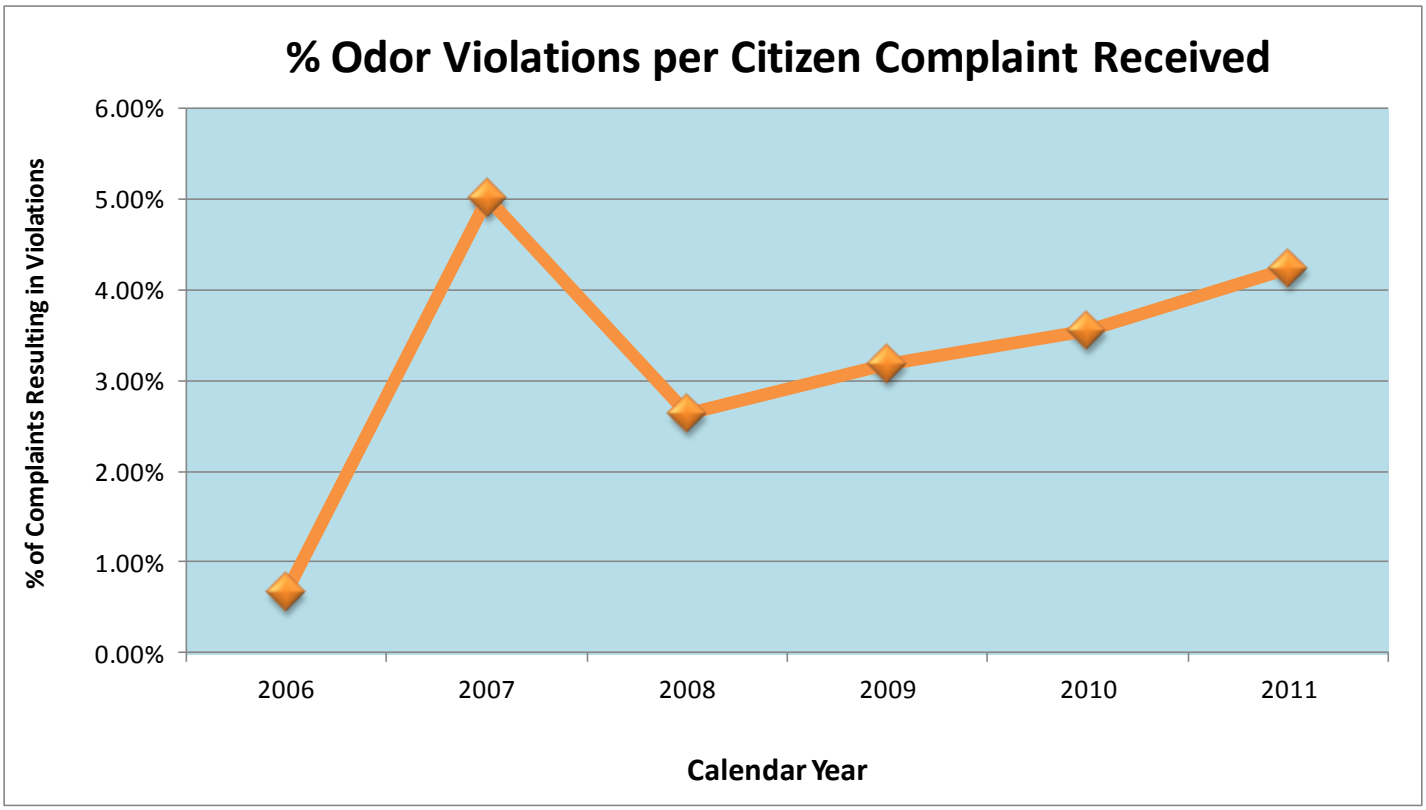



*Figure 13: Though no steady trend is notable, the overall violation rate is very low. Strong and steady odors are often required to document a violation of the Kentucky odor standard. Many odors not rising to the level of a violation are, nevertheless, corrected through cooperative efforts between the inspector and responsible party.*

## Asbestos

Asbestos is a mineral fiber that is used in thousands of consumer products, many of them building materials. Breathing asbestos fibers can cause lung cancer and other respiratory diseases. The EPA has banned some uses of asbestos but has been unsuccessful in its efforts to expand the ban to most other asbestos-containing products.

Without proper precautions, renovations, demolitions, and even routine maintenance can cause asbestos-containing materials to release microscopic asbestos fibers into the air we breathe. Undisturbed asbestos materials can be safely maintained if they are kept in good condition. Before renovating or demolishing a structure, it should be checked for asbestos by a qualified professional. If at least 160 square, 260 linear, or 35 cubic feet of friable asbestos will be removed over a year's time, the removal must be done by a certified contractor using state-of-the-art work practices.

Asbestos removals associated with renovations and demolitions are regulated by the division under the National Emission Standards for Hazardous Air Pollutants (NESHAP). Division regulations also require schools to have their buildings thoroughly checked for asbestos under the Asbestos Hazard Emergency Response Act (AHERA). The surveyed results must be documented in a management plan that describes how all asbestos materials in the school's buildings will be managed safely. Compliance with the asbestos regulations is overseen by the Field Support Section and inspectors from the regional offices.

Measures tracked by the division to evaluate the asbestos program's success are as follows:

- Number of asbestos NESHAP and AHERA inspections conducted;
- Number of NESHAP, non-NESHAP and AHERA complaint investigations conducted; and
- Compliance rate of NESHAP and AHERA related inspections and investigations.

The above measures are reflected in Figure 14. In that figure, "Other NESHAP Investigations" refers to inspections of asbestos-related activities that are covered by state rule 401 KAR 58:040 and are otherwise exempt from the federal NESHAP program due to the relatively small quantity of asbestos involved. The state rule addresses smaller operations that may still pose a risk to the public even though they are exempt under federal regulations.

In the case of AHERA inspections, the division's compliance oversight strategy has evolved from a records review approach to an actual site inspection/records verification process. NESHAP inspections have grown due to a combination of increased renovation/demolition projects and increased awareness. Awareness has increased within the regulated community with respect to notifying the division about asbestos removals that need to be inspected, and within the general public, who file complaints about potential violations of the regulatory program. In 2011, the compliance rate for NESHAP was 77% (Figure 15) while the compliance rate for AHERA was 61% (Figure 16).

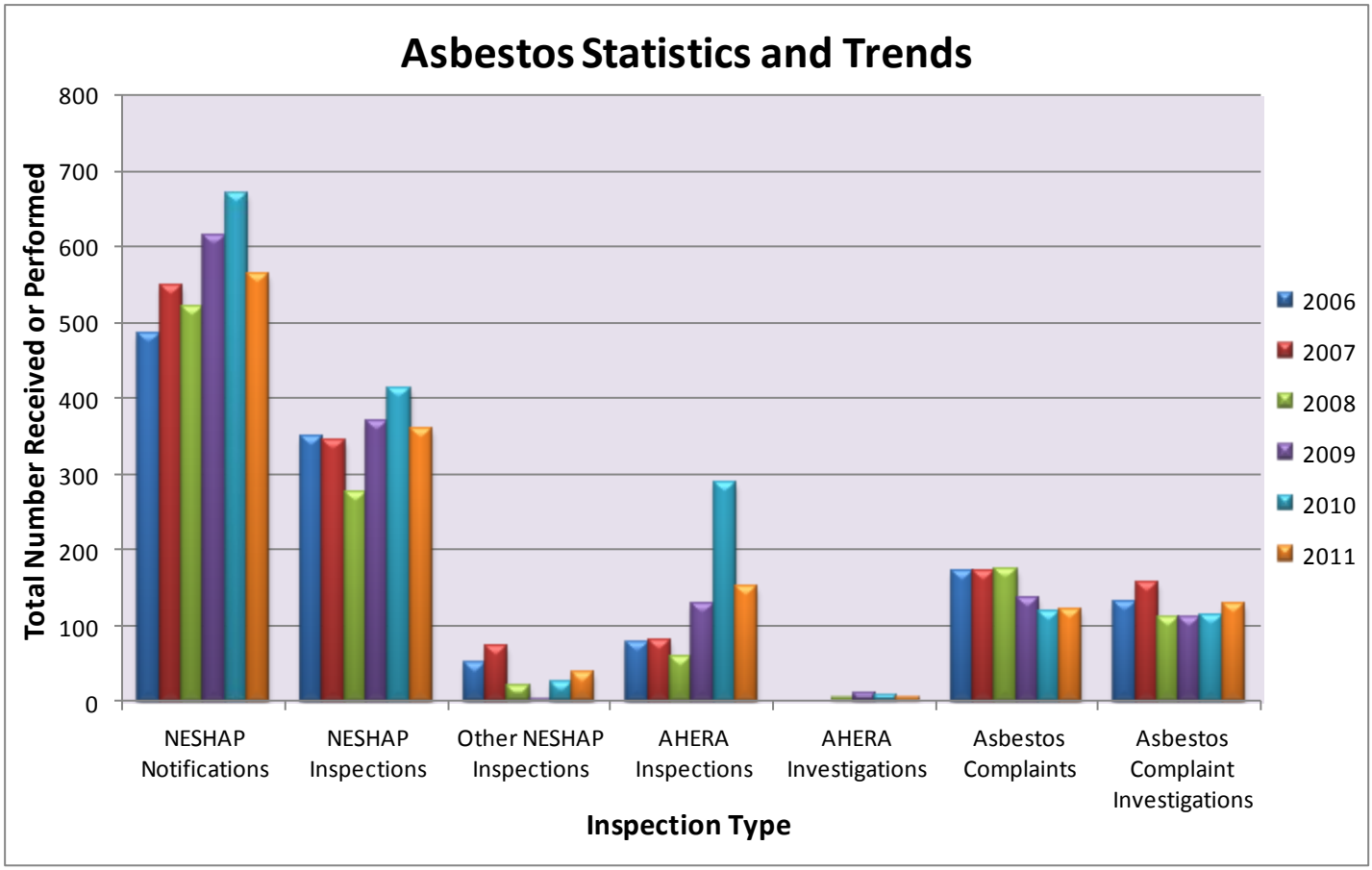



*Figure 14: From 2006 to 2011, the average number of NESHAP inspections remained fairly consistent. However, the reduced numbers in 2008 are due to staff vacancies while the slight drop in 2009 was attributed to an increased emphasis on AHERA inspections. NESHAP investigation numbers may fluctuate based on the number of demolition/renovation notifications received by the regional offices. While AHERA investigations resulting from complaints are a measure for the program, AHERA-related complaints are rare, averaging one to two per year.*

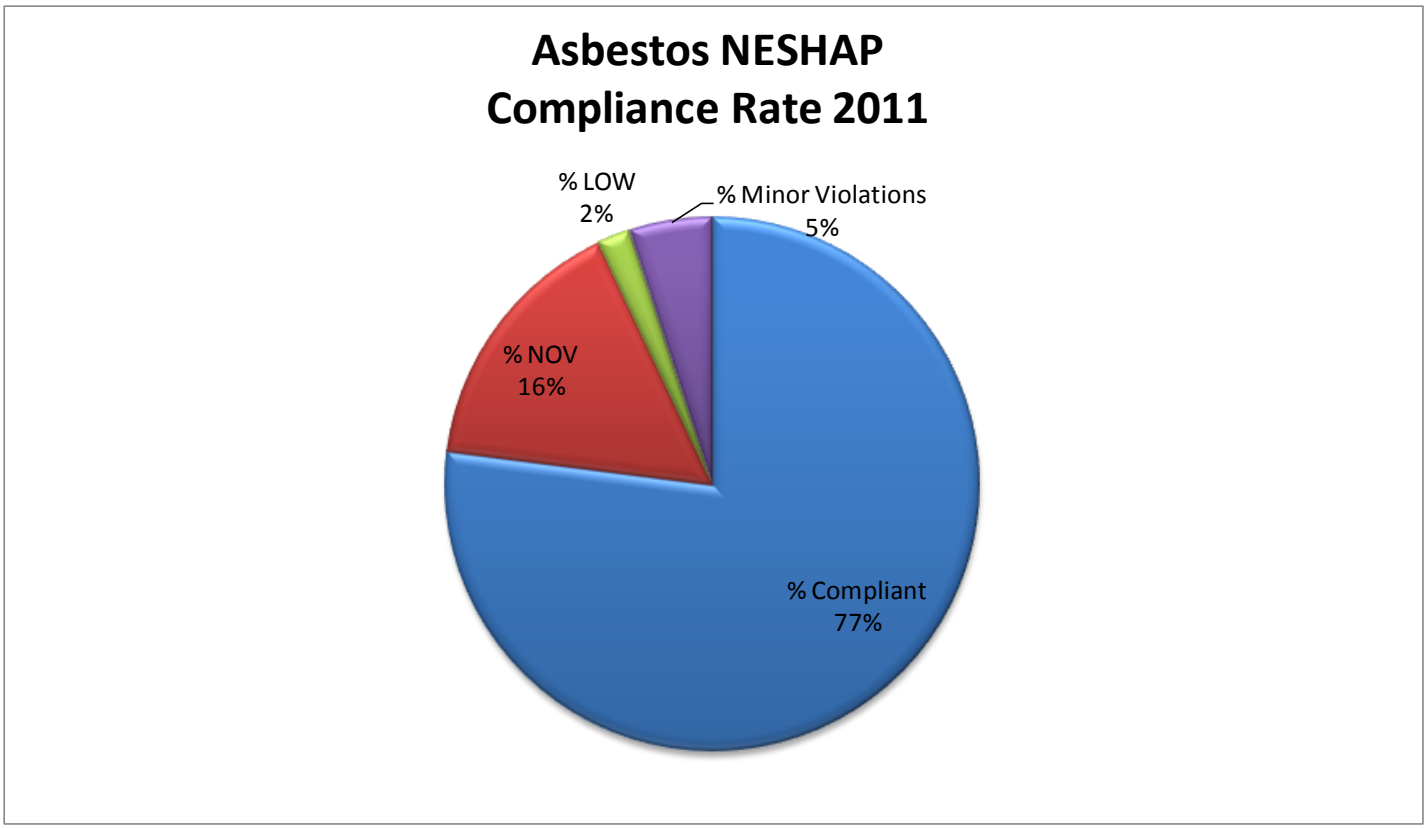



*Figure 15: Compliance rate of asbestos removal and/or demolition operations regulated under the National Emission Standards for Hazardous Air Pollutants (NESHAP).*

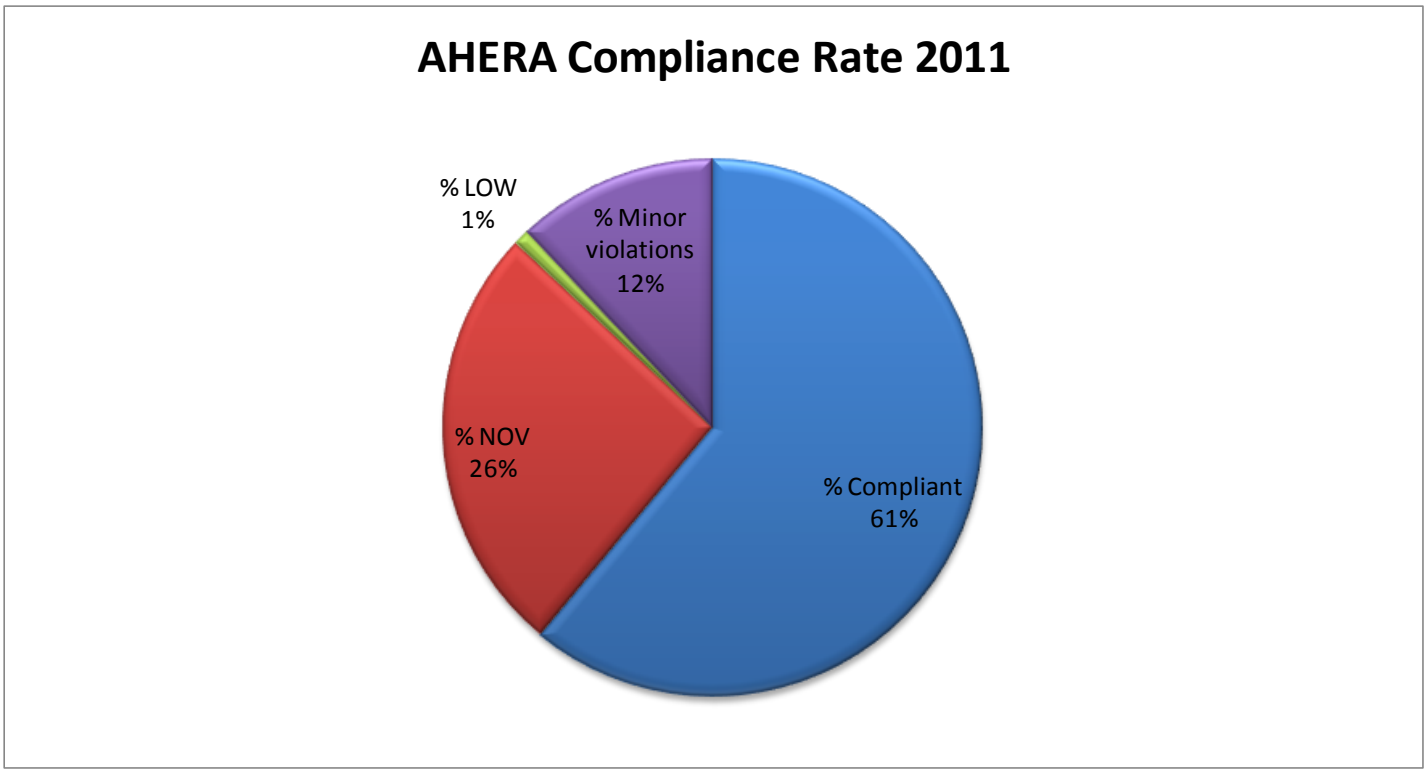



*Figure 16: Compliance rate of school inspections for asbestos under the Asbestos Hazard Emergency Response Act (AHERA). The lower percentage of compliance with the AHERA program (61%) as compared to the NESHAP (77%) is possibly due to lack of AHERA training for school staff or frequent turnover of staff responsible for implementing the program. The is one reason the division has increased its inspection over-sight in an effort to improve the compliance rate.*

The Permit Review Branch is divided into several specialized sections:

*Chemical Section* - Chemical Plants (Organic and Inorganic), Petroleum Refineries, Coal to Liquids, Bulk Terminals, Brake Manufacturing, Plastic Products and Resins, Paper Mills/Pulp Mills, Electronic Components, Nonwoven Fabrics, Rubber Products, Paperboard Mills, Pharmaceuticals, Paint and Allied Products, Carbon and Graphite Products, and Battery Manufacturers.

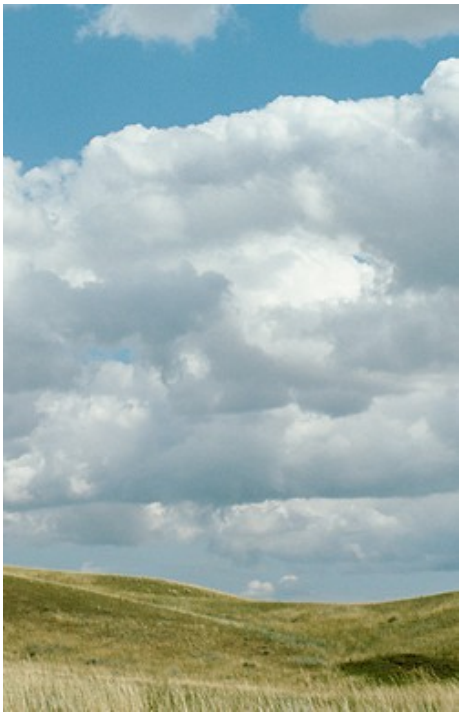
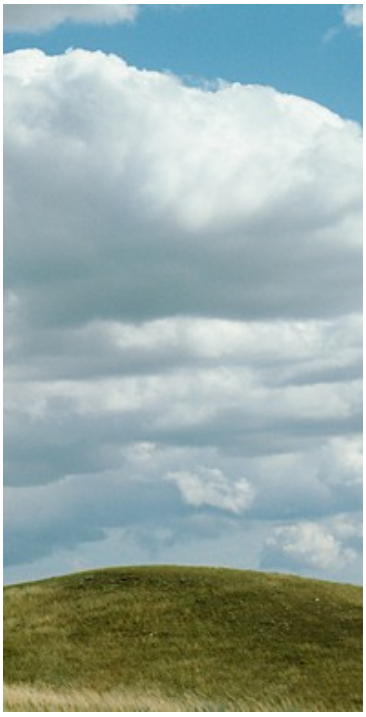
***"Since 2006, DAQ's Permit Review Branch has greatly reduced the air permit processing time while issuing accurate and easily understood permits to the regulated community."***

***Rick Shewekah,***
***Permit Review***
***Branch Manager***

*Combustion Section* - Brick and Tile Manufacturing, Charcoal Manufacturing, Combustion (Boilers), Distilleries, Glass Manufacturing, Incineration, Natural Gas Transmission Stations, Power Plants, Sawmills, Soil Remediation Units, Tobacco Processing Plants, Electric Utilities.

*Minerals Section* - Asphalt Plants (Portable and Stationary), Cement Storage Operations, Chicken Feed Manufacturing Plants, Coal Preparation Plants (Portable and Stationary), Coal Tipples (Portable and Stationary), Coal Terminals, Concrete Block Plants, Edible Oil Plants, Fertilizer Operations (Including Blending), Flour Mills, Grain Elevators, Lime Manufacturing Plants, Limestone Crushing Operations (Portable and Stationary), Limestone Terminals, Pet Food Manufacturers, Pre-stress Concrete Plants, Ready Mix Concrete Plants, Sandstone Crushing Operations, Sand and Gravel Operations (Portable and Stationary), Slag Coal Operations, Soybean Extraction Plants.

*Surface Coating Section* - Automobile and Light-Duty Trucks, Beverage Cans, Fabric, Vinyl and Paper, Flat Wood Paneling, Flexible Vinyl and Urethane, Large Appliances, Magnet Wire, Magnetic Tape, Metal Coil, Metal Furniture, Miscellaneous Metal Parts and Products, Plastic Parts for Business Machines, Polymeric Coating, Pressure Sensitive Tape and Labels, Publication Rotogravure and Flexography Printing.

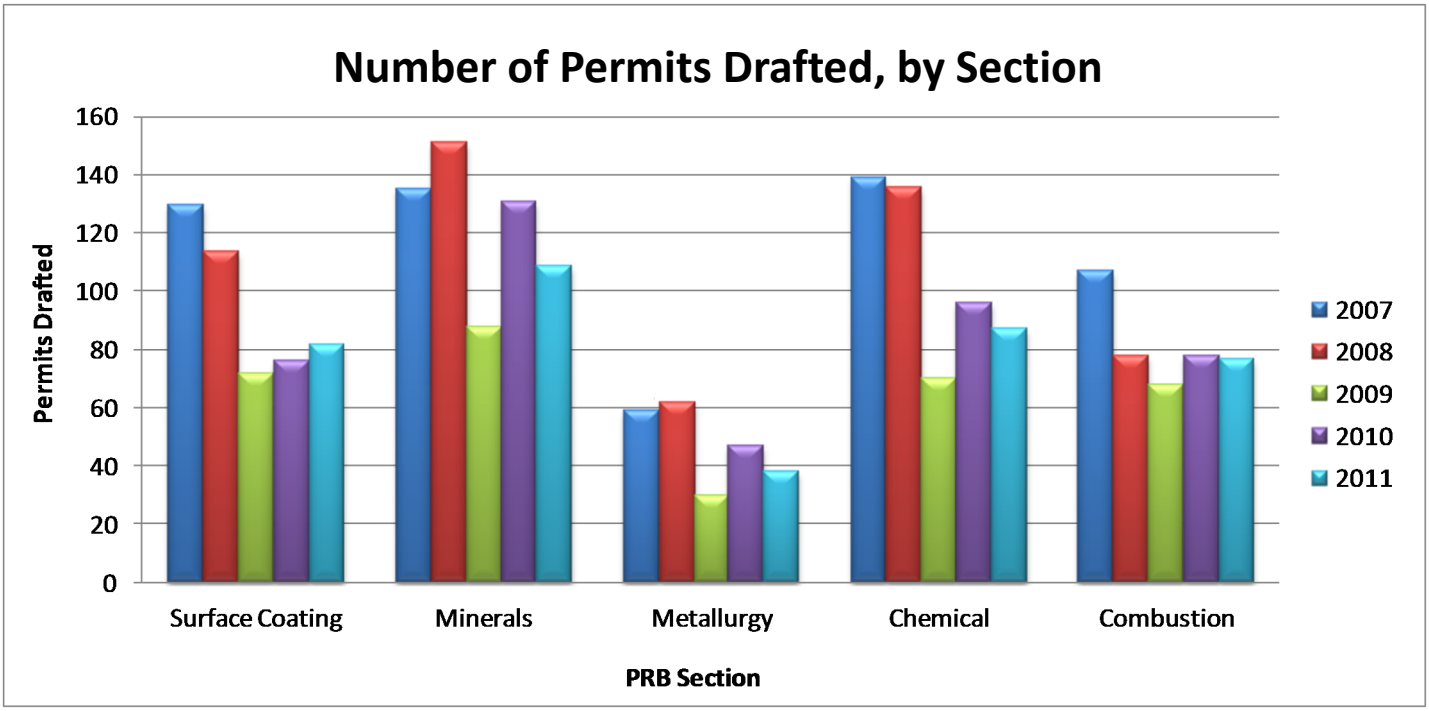



*Figure 17: In calendar year 2011, the division drafted 393 permits, depicted here by section category. The minerals section issued the highest number of permits followed by chemical and surface coating sections.*

*Metallurgy Section* - Primary Steel and Aluminum Producers, Mini-Steel Mills, Secondary Metal Plants, and Various Surface Treatments Of Metals

*Air Toxics Section* - Any industry that has an air toxics component.

**PRB Goals and Objectives**

In order to achieve the cabinet objective of improving regulatory procedures and implementation, and making Kentucky's regulatory program rational, reasonable and user-friendly, the division has successfully implemented the permit backlog reduction plan originally established on June 15, 2006. To date, the backlog of permits beyond the regulatory time frame (RTF) is at an all-time low.

At the close of Fiscal Year 2012, PRB had 201 pending applications in-house. 23 of the applications were beyond regulatory time frames (RTF). It is projected that the majority of the remaining applications beyond RTF will be issued by December 2012.

Figure 18 depicts DAQ's accomplishment in reducing the backlog since June 2006, at which time the division had 716 applications in house. The current number of pending applications represents a 72% reduction since that time.

The following charts highlight DAQ success in the following measures for permit backlogs:

- The total number of permits pending (Figure 18).
- The total number of permits pending that exceed RTF (Figure 18).
- A comparison between the numbers of new applications versus completed reviews (Figure 19).
- The on-going percentage of permit reviews that exceed and are within RTF exceed regulatory time frames (Figure 20).

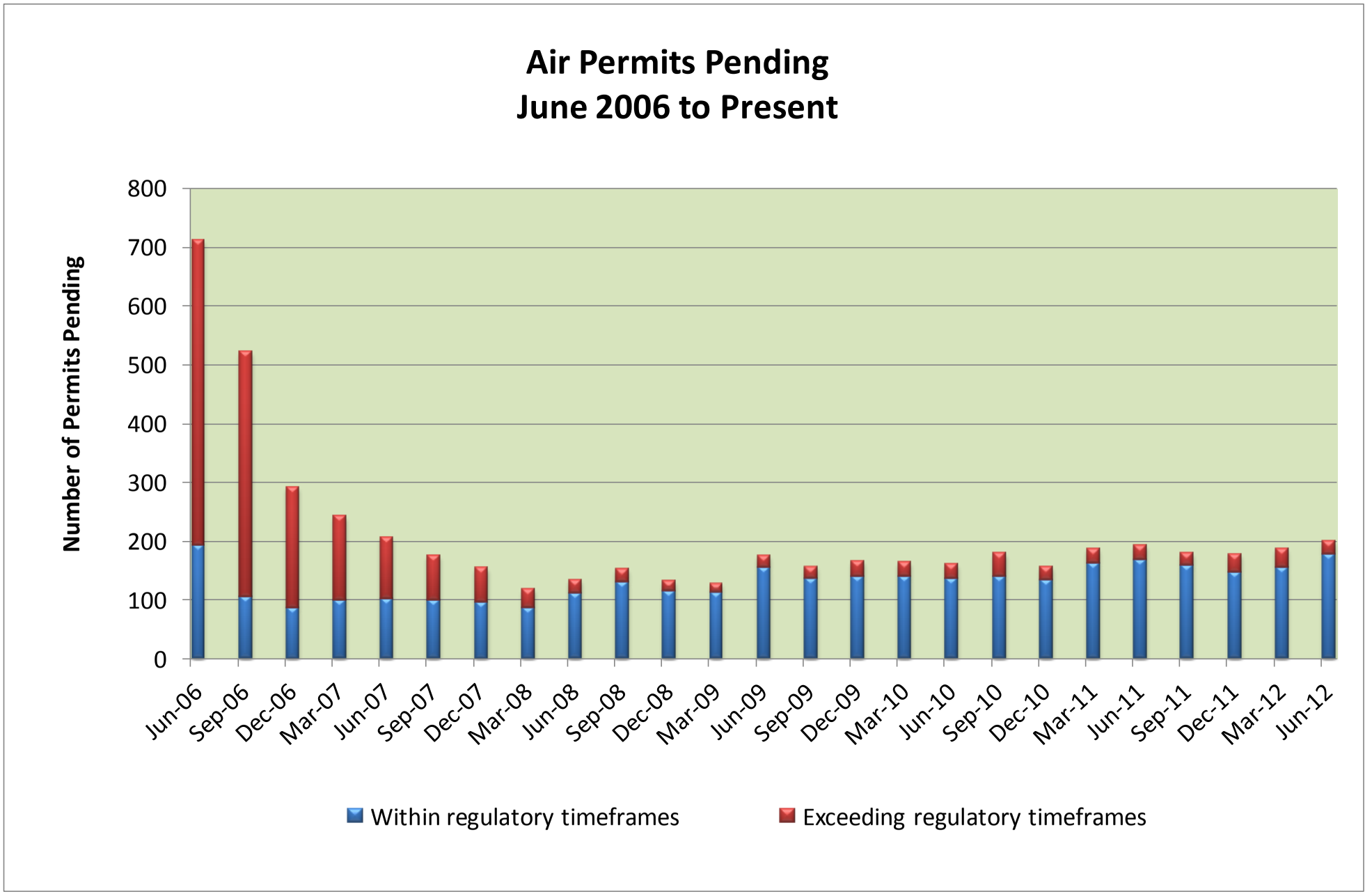



*Figure 18: From June 2006 to June 2012, the Permit Review Branch has greatly reduced the amount of permit applications pending a final permit issuance as well as the percent of air permit applications that are beyond the Regulatory Time Frame (RTF), the allotted time for the complete permitting process. In June 2006, 521 of 716 pending permits were beyond the RTF. By June of 2012, only 23 of the 201 pending permit applications were beyond RTF.*

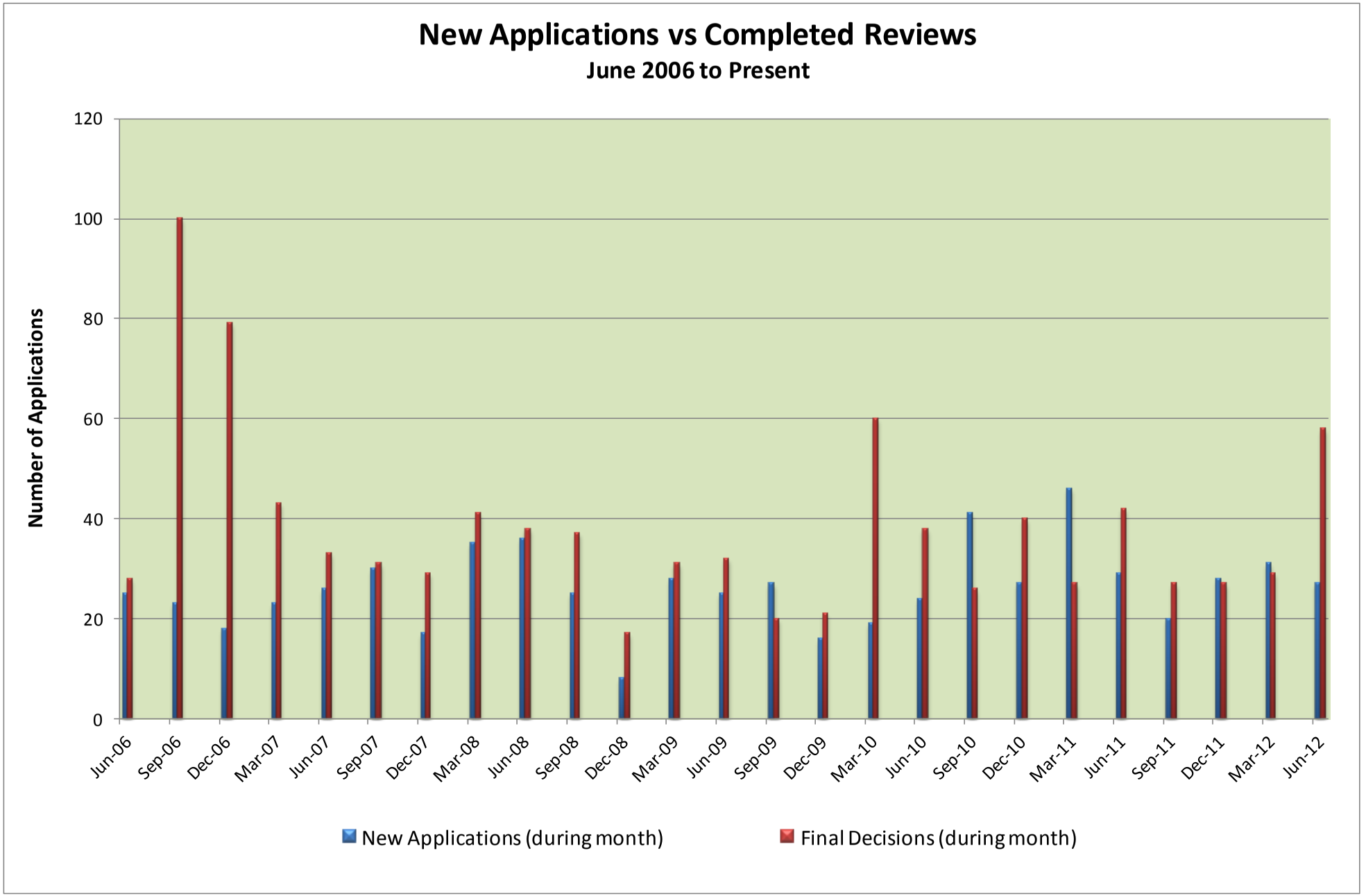



*Figure 19: Over the past six years the number of completed reviews have exceeded the number of new applications received by the division. Consistent efficiency has led to a dramatic reduction in the backlog.*

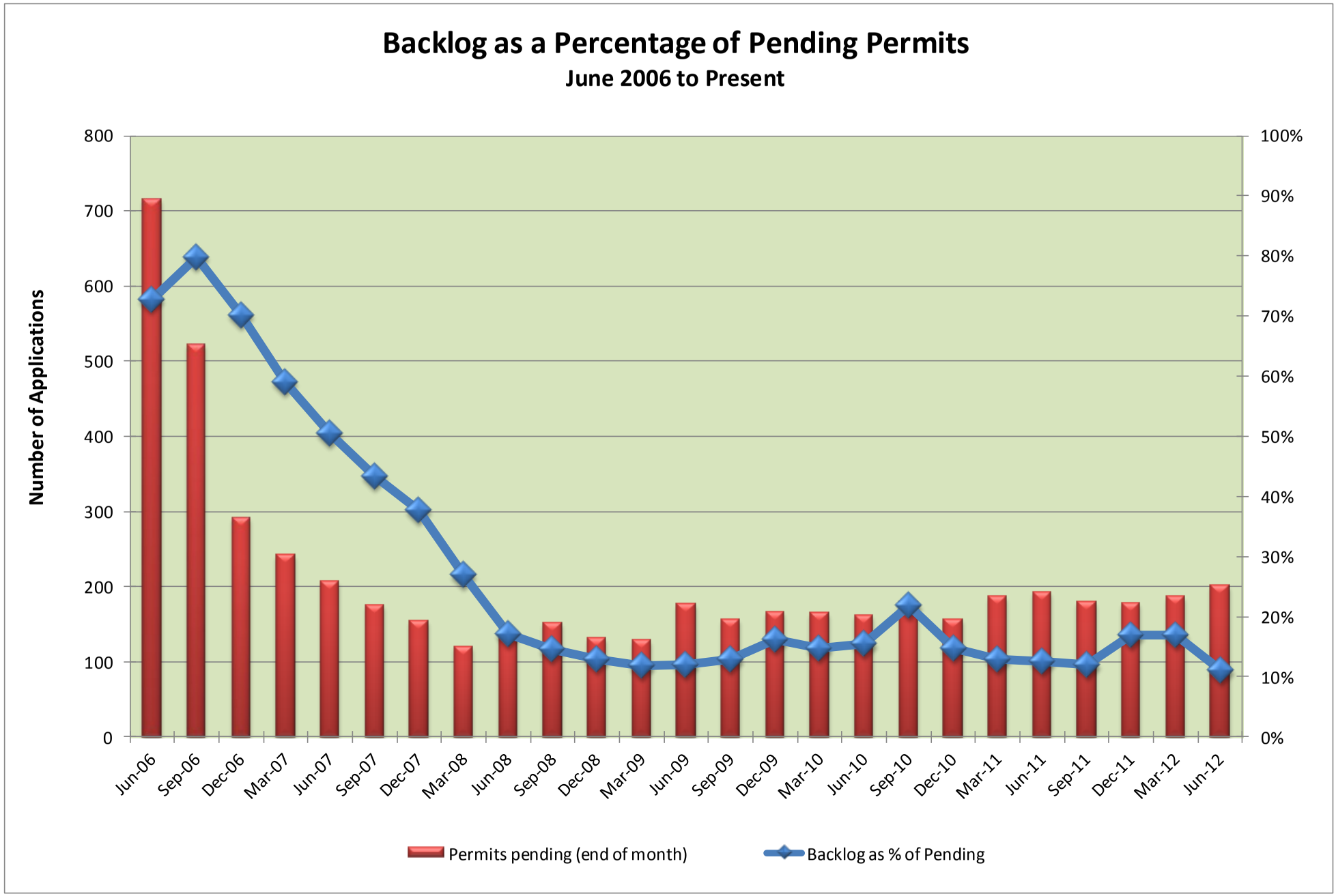



*Figure 20: In June 2006, 73% of the pending permits were beyond the Regulatory Time Frame (RTF). By June of 2012, only 12% of pending permit applications were beyond RTF.*

## Air Toxics Program

The Division for Air Quality established the Air Toxics Section in FY 2008. The section's main objective is to provide the division with expertise in airborne toxic pollutants, by means of risk assessment, ambient air monitoring, and air dispersion modeling.

Air toxics are chemicals emitted from industry and transportation sources such as cars, trucks, and buses. The Clean Air Act lists 187 of these pollutants (also known as Hazardous Air Pollutants, or HAPS), which have the potential to harm human health over long-term exposure, and have been linked to increased risk of cancer along with other effects including respiratory and neurological effects. Risk levels for these pollutants are based on health impacts over 70 years of continuous exposure.

On the national scale, from 1990 to 2005, levels of toxic air emissions declined by 41%. While this decline is demonstrative of the work of state and federal agencies, levels of air toxics in a local area can vary due to weather patterns and proximity to sources of the pollutants.

Exercising the authority granted under KRS 224 and operating within the scope of 401 KAR 63:020, the Air Toxics Section is specifically charged with identifying air emissions which pose an unacceptable risk to human health and the environment. The regulatory authority primarily relied on by the air toxics section is found in 401 KAR 63:020, which states that "No owner or operator shall allow any

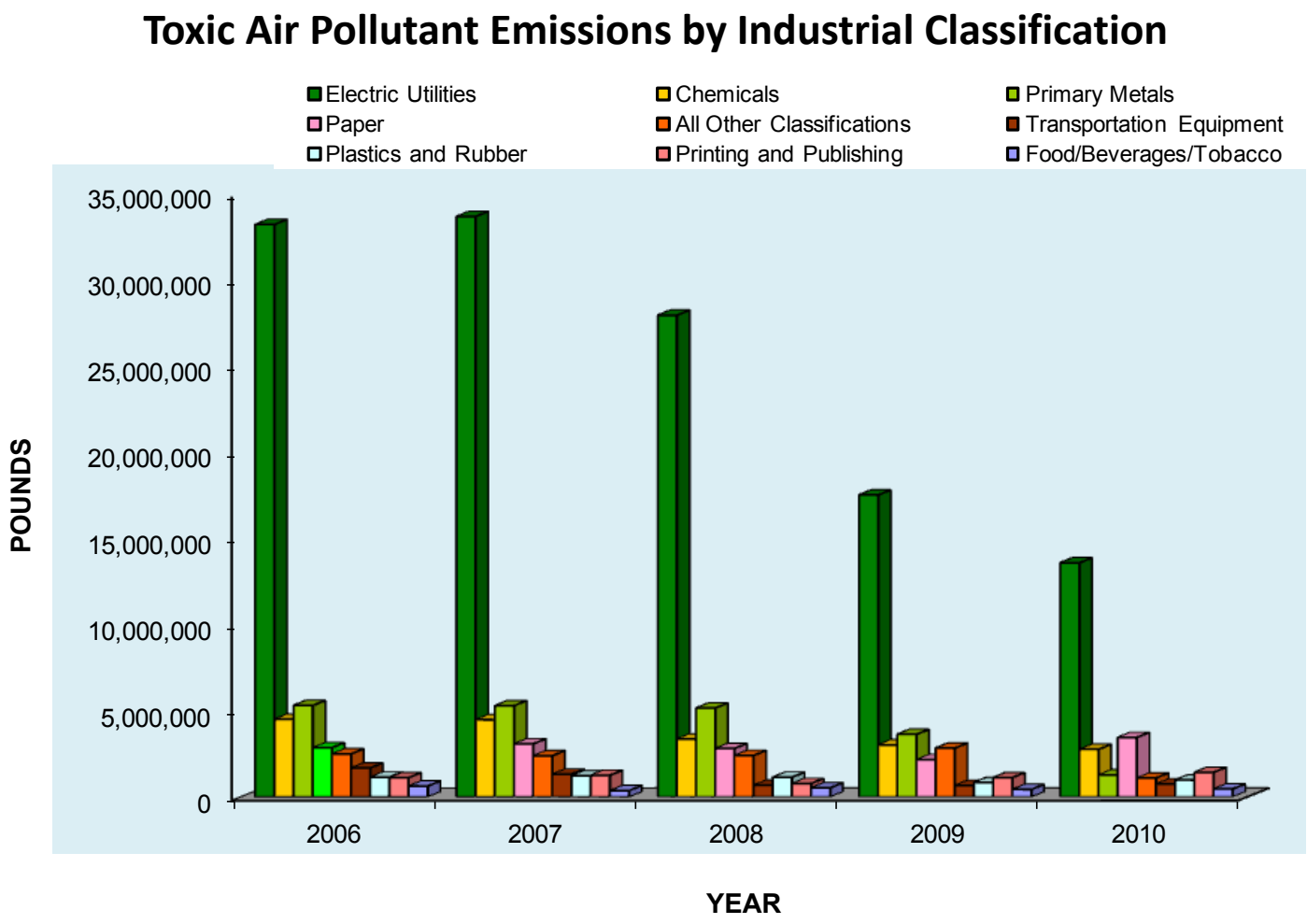



*Figure 21: Toxic emissions in Kentucky from 2006 through 2010 by industrial classification.*

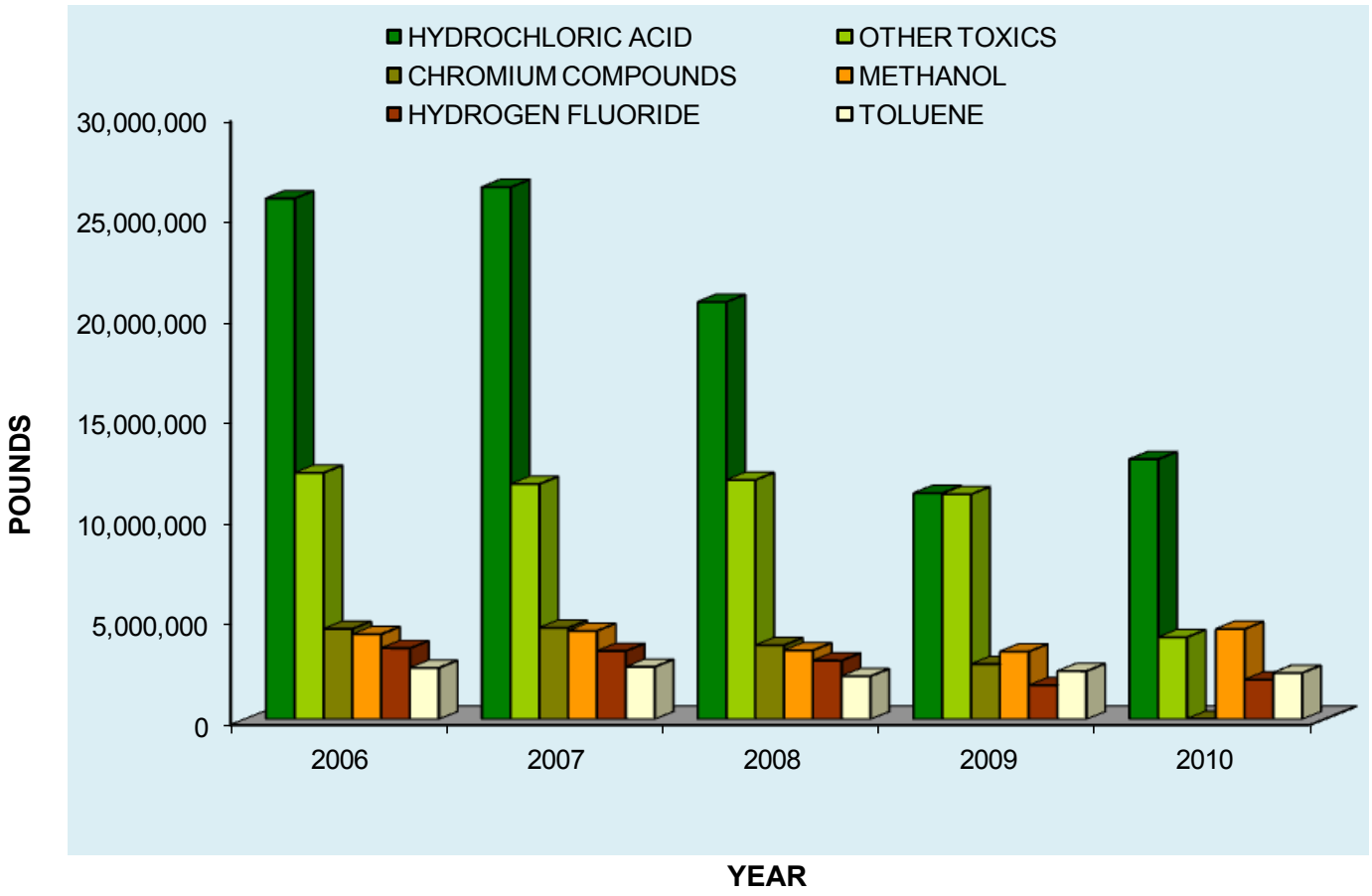



*Figure 22: Emissions for selected individual chemicals. Data source: EPA Toxic Release Inventory.*

affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants." Risk assessment and risk-based analysis are the standard means by which the section quantifies how harmful a toxic substance may be and the associated impact to human health.

The EPA's Toxic Release Inventory database provides a means of tracking emissions of toxics, including HAPs. Figures 21-22 represent the trends in hazardous air pollutant emissions over the 2006-2010 period. Figure 23 shows the total statewide HAP releases in Kentucky from 2006 through 2010. More information can be found at http://www.epa.gov/TRI/.

In FY 2012, the Air Toxics Section completed 87 air toxics assessments and 6 HAP - related complaint investigations. The section is capable of sampling both for volatile and semi-volatile organic compounds. The data collected from these sampling events has been used to verify modeled impacts on human health, make permitting recommendations, and in some cases, trigger enforcement actions. Further, the section frequently uses modeling to refine the initial estimates from screening analyses performed by the permit review branch. These refined modeling runs have yielded data which has been used to verify, adjust or establish limits in permits, justify permit conditions, and improve public health and air quality.

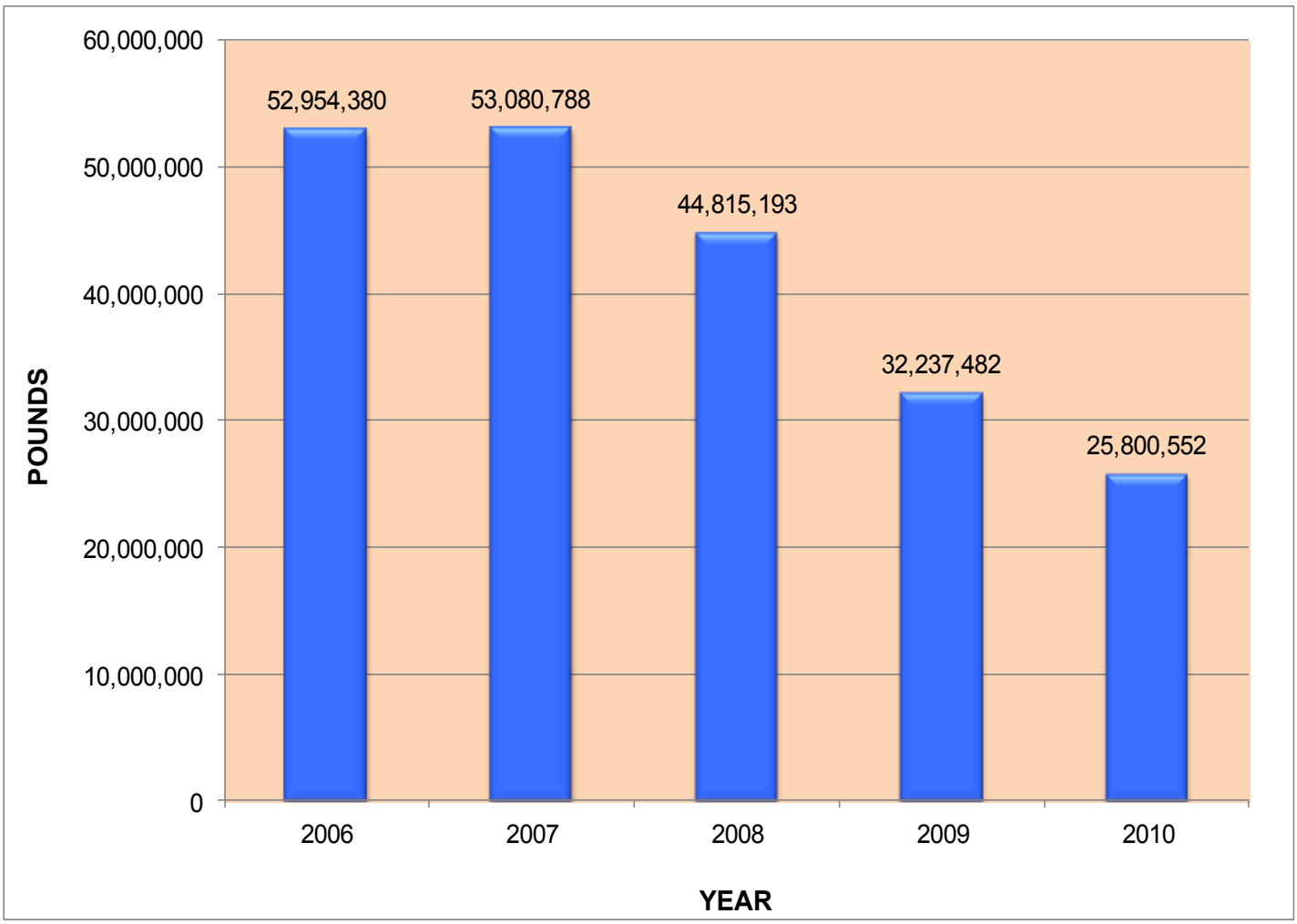



*Figure 23: Total HAP releases in Kentucky, 2006-2010. In comparison to 2007 data, the values reported for the past three years are drastically lower. This is partially due to the metric used in calculating emissions prior to 2008, which included sulfuric acid along with the HAPs in the toxic section. Sulfuric acid is not considered a HAP under the Clean Air Act and is no longer included as a HAP in emissions data. Data Source: EPA Toxic Release Inventory.*

### Air Toxics and Kentucky Schools

In January 2009, the EPA announced a list of 62 schools in 22 states across the country to be monitored for air toxics in the coming months. These schools were chosen based on information that included the mix of pollution sources in the area, scientific information about certain pollutants and their health effects, results of computer modeling, stories from the newspaper series that looked at outdoor air surrounding schools, and information from the Kentucky Division for Air Quality. Monitoring the air outside these schools and measuring the actual concentrations of these pollutants would help the DAQ and the EPA understand if health could be impacted in these areas.

DAQ staff placed monitors at three Kentucky schools during the summer of 2009. DAQ completed its final round of sampling in April 2010. Meteorological monitors continued to collect weather data at these three schools for a short period of time following the completion of the toxics sampling. All sites were officially shutdown and equipment removed by November 2010.

EPA issued its final report on Kentucky's schools in the fall of 2011. Data indicates that pollution levels do not pose a health concern and additional monitoring will not be required. Throughout the Schools Air Toxics study, EPA posted results of the air quality monitoring on its website at www.epa.gov/schoolair. The technical report for each of the Kentucky schools, as well as a brief summary of the study, can be found at the following sites:

http://www.epa.gov/schoolair/CrabbeScho.html
http://www.epa.gov/schoolair/CharlesRus.html
http://www.epa.gov/schoolair/HatcherSch.html

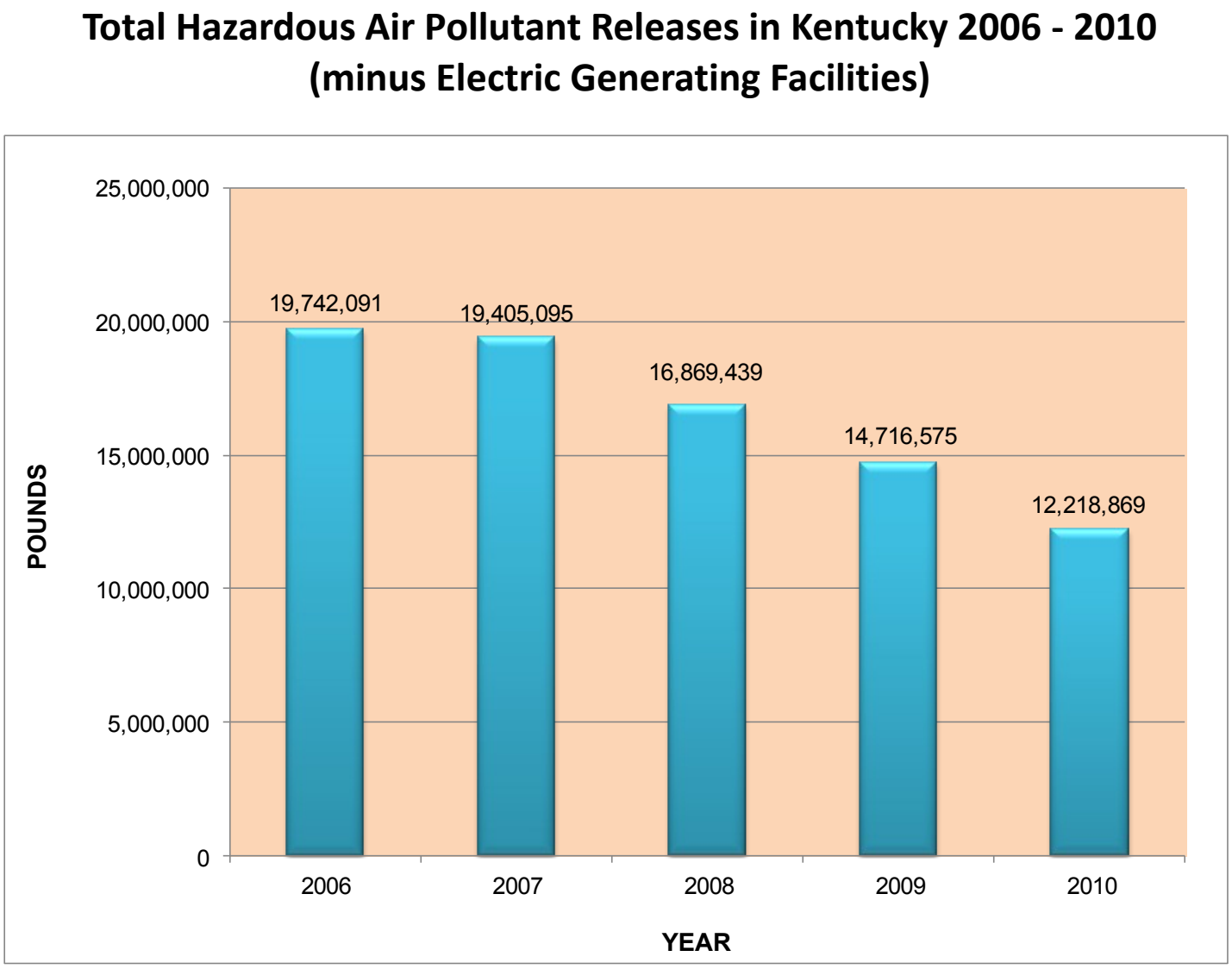



*Figure 24: With the influence of the electric generation facilities removed, a downward trend in emissions from all other HAP emitting sectors is clearly evident, dropping from over 25 million pounds in 2001 to less than 13 million pounds in 2010. Data Source: EPA Toxic Release Inventory.*

# PROGRAM PLANNING and ADMINISTRATION

The Program Planning and Administration Branch (PPAB) is the planning and implementation cornerstone of the Division for Air Quality. This branch has the responsibility of ensuring that:

***"The Division for Air Quality's fiscal year 2012 operating budget was structured to cover cost for personnel, operating, and equipment purchases. Throughout the year we evaluated expenditures and reduced cost in specific categories in an effort to achieve an overall savings at the end of the fiscal year. I am happy to say that we succeeded in that goal!"***

*-Nina Hockensmith,*
*Administration Section Supervisor*

- The agency has adequate budget and staffing resources to meet federal and state requirements for the operation of an air quality control program;

- A comprehensive emissions inventory is performed annually on sources within Kentucky, both to ensure the best information is used to develop and evaluate air quality plans and for use in determining air emission fees required under the federal Clean Air Act;

- Appropriate regulations are researched and promulgated within Kentucky to meet federal and state mandates to control air pollution; and

- Comprehensive plans to attain and maintain the National Ambient Air Quality Standards (NAAQS) are developed and submitted to the EPA for approval. These plans are part of Kentucky's State Implementation Plan (SIP).



**Fiscal Management**

The Division for Air Quality operates primarily on Title V emissions fees and federal grant funds.

Funding under the Title V program (mandated by the 1990 Clean Air Act Amendments) is through air pollutant emission fees assessed to air pollution sources in the state that meet specific criteria. Further authorized in Kentucky by state statute in KRS 224.20-050, and 401 KAR 50:038, the division is mandated to charge fees sufficient to cover the cost of implementing and carrying out the requirements of the Title V program.

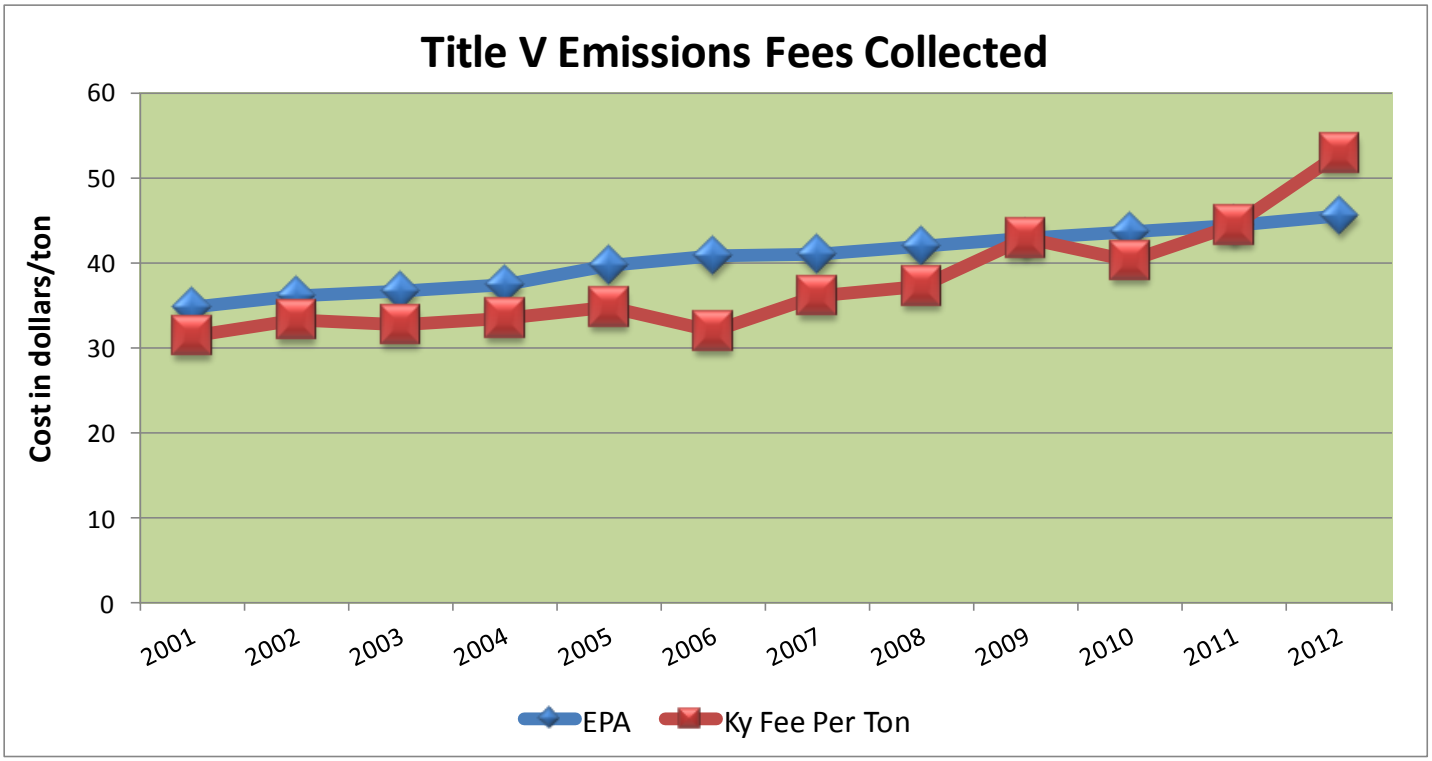



*Figure 25: Title V Emission Fees Collected. DAQ surveys regulated entities to determine actual tons emitted by those sources, and charges them a standard cost per ton, according to Clean Air Act and state statute protocol. This chart compares Kentucky's actual fees with EPA's "Presumptive Minimum", which is a suggested minimum fee per ton that states should charge.*

The division surveys permitted sources subject to the Title V fee program each year. Once the agency has determined the overall cost of the program for the fiscal year, the number of tons of pollutants that will be emitted in Kentucky will be divided into the projected operating costs to develop a per ton cost. Each source within the Title V program will then be issued a bill based on that per ton cost. Concurrently, EPA determines a minimum costs per ton of pollutant that an agency should charge to fund the Title V permitting program. This is referred to as the presumptive minimum, or the minimum fee, that an agency should charge to fully fund the Title V program. Figure 25 shows the comparison between the EPA presumptive minimum and the actual cost per ton that the division has charged.

The agency also receives federal grants in support of the air quality program. The "general" air quality grant, known as the 105 grant, is in support of the general air quality program and covers such activities as minor (or smaller emitting) source inspections and permitting. It also covers such vital activities as public outreach and transportation coordination in relation to air quality issues. Additionally, the agency also receives specific grants for the operation of the $PM_{2.5}$ monitoring network (103 grant) and asbestos activities (Asbestos Hazard Emergency Response Act) within the state.

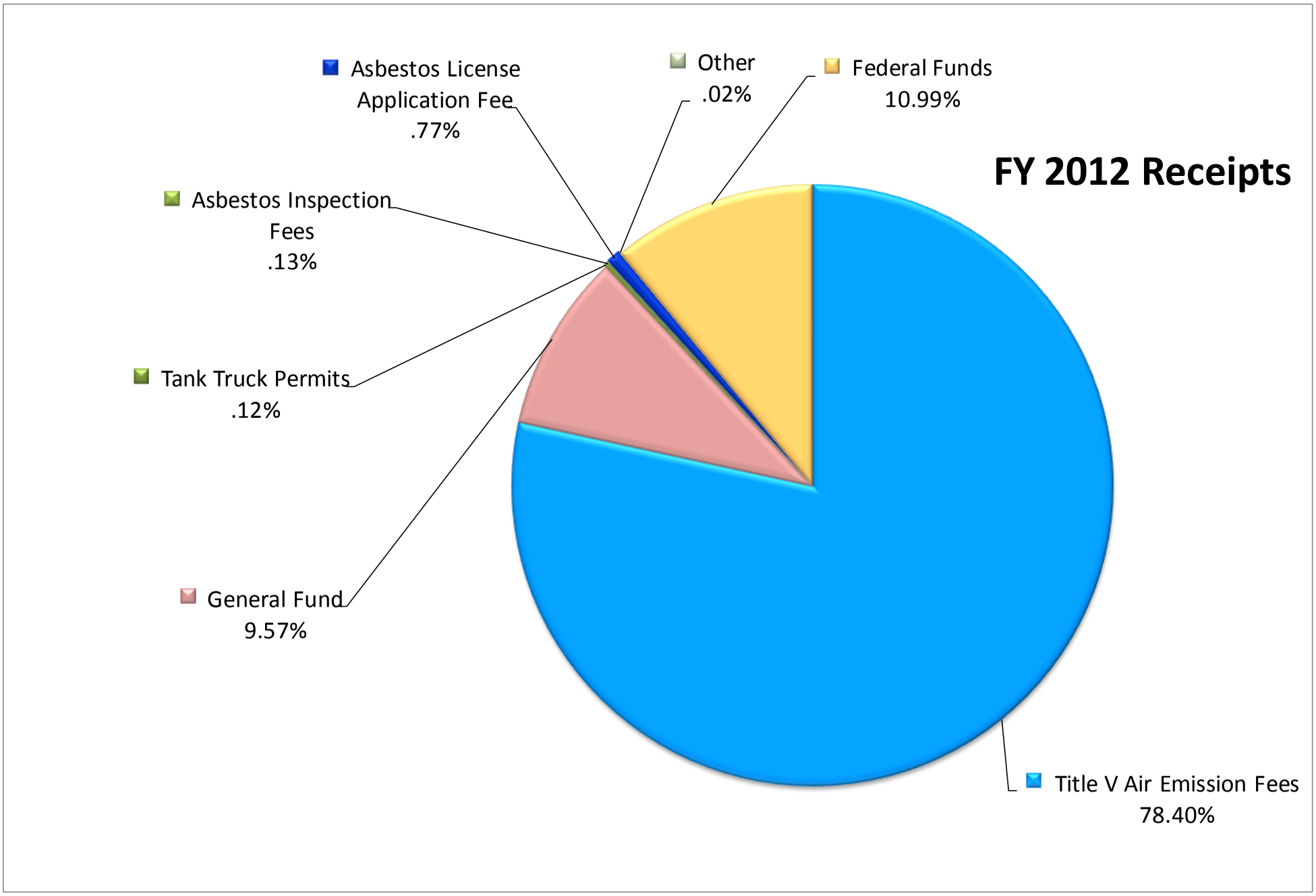



*Figure 26: DAQ Fiscal Year 2012 Receipts. The division operates primarily on Title V emission fees and federal grant funds. Other funds are derived from non-state insurance recovery, proceeds from recyclable sales, and proceeds from asset sales.*

A smaller portion of the agency's funding comes from direct fees used to offset the cost of specific agency activities. The agency collects a fee for the issuance of gasoline tank truck stickers, to ensure that gasoline delivery tanks meet vapor tightness and do not leak harmful gasoline vapors. Asbestos fees are assessed for the review of asbestos abatement plans in our schools and to certify and accredit asbestos contractors and professionals who remove asbestos in the state. A breakdown of the division's revenue for FY 2012 is provided in Figure 26.

During FY 2012, the Division for Air Quality continued to ensure that state and federal program mandates were met and our level of customer service was maintained, even though we operated with less personnel staffing and resources. In FY 2013 Title V emission fees are projected to exceed the federal presumptive amount for the second year in a row in order to meet costs associated with maintaining that program and a high level of customer service.

**Emissions Inventory**

The ambient air monitoring program is designed to measure the quality of the air our citizens breathe, and use it to gauge whether that air meets the federal standards. The emissions inventory systems are designed to document and track actual and potential air pollutant emissions. These data are then used to develop air quality improvement programs when necessary.

In its most basic form, an emissions inventory is a list of sources of air pollutants, and for each source, or source type, the amount of each pollutant emitted, or has the potential to be emitted. Kentucky's emissions inventory is maintained in three parts:

- The **point source inventory** includes all actual and potential emissions from industrial sources at fixed locations;

***"DAQ receives inventory emission data at the beginning of each calendar year, and it takes approximately nine months to verify and complete the inventory. For 2011, 1191 facilities were surveyed using the on-line web survey system."***

***-Melissa Duff,***
***Emissions Inventory Section Supervisor***

- The **area source inventory** includes information on other pollution causing activities in a given area and documents the contribution of emissions from numerous small entities, or human activities. These include activities such as home heating, small print shops, agricultural activities, structure fires, road striping, and consumer products consumption;

- The third sector of the emissions inventory includes information on **emissions from mobile sources**. This sector is then broken down even further by estimating the contributions by on-highway vehicles and off-highway mobile sources such as construction equipment, lawn equipment, airplanes and locomotives.

The point source emissions inventory is performed and maintained by the Emissions Inventory Section. The main function of this section is to continue to improve the comprehensiveness and accuracy of point source emissions information and ensure the information is up to date and useable by the Administration Section for billing calculations; the Program Evaluation Section for developing and evaluating control programs; and the Permit Review Branch for permitting additional large sources within a given geographic area.

Point sources in Kentucky are surveyed annually to determine actual air pollutant emissions for the previous year (Figure 27). This process begins in January and continues through October. The emissions inventory section surveys nearly 1200 plants per year using the following survey criteria to determine the sources that are surveyed in the state:

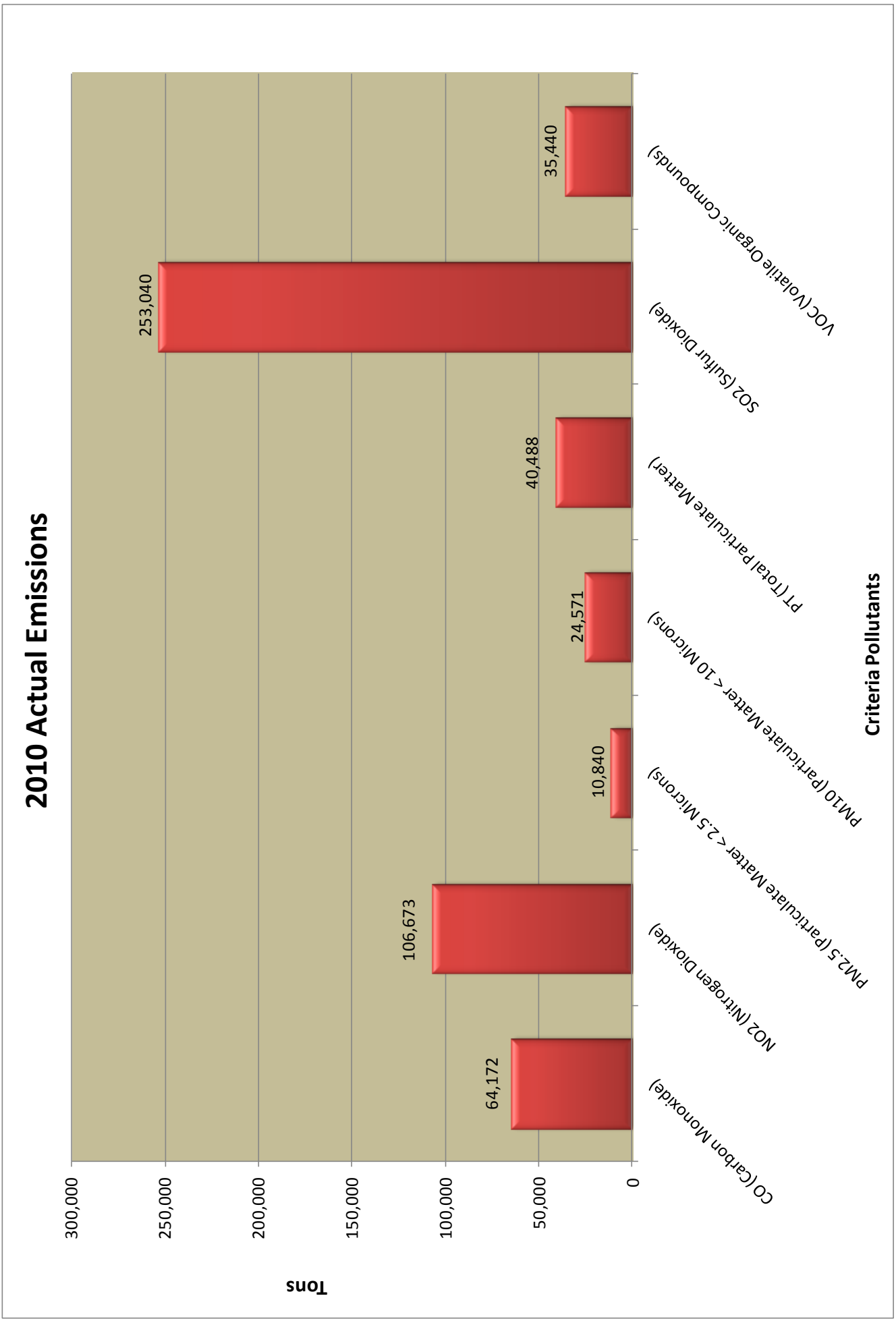
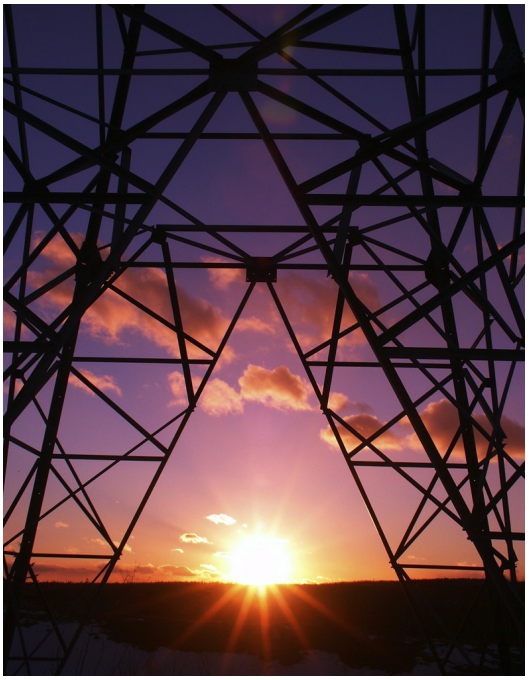



*Figure 27: Actual tons of pollutants emitted by surveyed, regulated entities in Kentucky for the calendar year 2010. Although DAQ receives inventory emission data at the beginning of each calendar year, it takes approximately nine months to verify and complete the inventory.*

- Any major source (potential to emit 100 tons or more of a criteria pollutant which includes CO, $NO_2$, PM, $SO_2$, and VOC as a precursor for ozone);
- Any conditional major source (a source that has taken permitted limits to keep it below the 100 tons potential noted above);
- Any source subject to a federal regulation such as a New Source Performance Standard (NSPS), National Emissions Standards for Hazardous Air Pollutants (NESHAP), or Maximum Achievable Control Technology (MACT) for hazardous air pollutants;
- Sources of Nitrogen Dioxide ($NO_2$) or Volatile Organic Compounds (VOCs) greater than 25 tons in areas of the state not meeting the federal ozone standards or that had previously been designated as not meeting those standards. (Boone, Boyd, Campbell, Christian, Daviess, Edmonson, Fayette, Greenup, Hancock, Kenton, Livingston, Marshall, or Scott);
- All sources where the actual or potential emissions of an individual hazardous air pollutant is equal to or greater than 10 tons per year; and
- All sources where the actual or potential emissions of combined hazardous air pollutants are equal to or greater than 25 tons per year.



The responsibility for assembling the other portions of the emission inventory for specific areas falls to the Evaluation Section.

These inventories are typically performed for areas that are not meeting a federal air quality standard for a particular pollutant or when a control program has been put in place for a particular pollutant and the overall effectiveness of that control program is being evaluated.

For area sources (those smaller businesses or human activities), federally-supplied emissions factors are used and adjusted based on population data for a given area.

For mobile source related emissions, mathematical models are used to determine emissions contributions. For on-road mobile emissions, data gathered by the Kentucky Transportation Cabinet is used to determine "vehicle miles traveled" for a given area. This information is used in conjunction with any mobile controls, such as fuel programs, or gasoline pump controls to determine the mobile source contribution in an area. For off-highway mobile emissions such as airplanes, another mathematical model is used, with flight landing and take-off data used to calculate emissions.

**Regulation Development**

The Regulation Development Section drafts and adopts regulations to control air pollution in the state. This section is responsible for reviewing federally adopted regulations and recommending whether or not to adopt and/or request delegation of those regulations in Kentucky.

Regulations can either be drafted in response to:
- Federal mandates to control air pollution or specific air pollution sources;
- A state mandate made by either the governor or the legislature to control air pollution within the Commonwealth; or
- An action identified by the cabinet as necessary to protect human health and the environment.

Regulations can be adopted for specific controls to address specific air quality concerns within the

state. While the agency receives its authority to draft and adopt air quality regulations under KRS Chapter 224, it is also governed on the drafting of those regulations by KRS 13A, which specifies regulatory drafting procedures as well as public participation in the regulatory promulgation process.

After the need for a new regulation or a regulatory amendment has been identified, it becomes the responsibility of the Regulation Development Section to compile all input and policy decisions into a regulatory draft and guide the process through promulgation. The promulgation process could include gaining inter-agency and EPA input into the regulation content, advertising the regulation or regulatory amendment for public comment, responding to those comments and making any subsequent changes found necessary, and tracking the regulation through final legislative approval.

Several regulations were adopted or revised in Kentucky from July 2011 through June 2012:

401 KAR 51:052, Review of new sources in or impacting upon non-attainment areas.

DAQ filed an amendment to 401 KAR 51:052 on March 14, 2011. The previous regulation only allowed for emission offset credits if a permit application is received before the source shutdown or curtailment of another facility. The amendment allows emissions resulting from shutdown or curtailment to be eligible for offset credits whether a permit application is submitted before or after the closure or curtailment. The public hearing for the Ordinary amendment (which will replace the Emergency amendment) was held on April 26, 2011, and an Amended After Comments version was filed on June 9, 2011. The regulation became effective in Kentucky on August 4, 2011.

401 KAR 51:001, Definitions for 401 KAR Chapter 51, 51:017, Prevention of significant deterioration of air quality, and 51:052, Review of new sources in or impacting upon nonattainment areas.

The amendments to these regulations adopt revisions to the New Source Review (NSR) program at the federal level to implement the $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS). The amendments include the tools and mechanisms necessary to determine whether a construction project's emissions will cause or contribute to a violation of the $PM_{2.5}$ NAAQS. These regulatory actions establish significant impact levels, significant monitoring concentrations, and baseline dates for the $PM_{2.5}$ NAAQS. The amendments adopt the significant emissions rates to determine NSR applicability for $PM_{2.5}$ and $PM_{2.5}$ precursors. Also, the definition of "Regulated NSR pollutant" has been amended for consistency with the corresponding federal definition.

**State Implementation Plan**

The State Implementation Plan (SIP) is a state-specific plan to ensure attainment and maintenance of the various National Ambient Air Quality Standards (NAAQS) within a state or region. Once regulations or programs are adopted into the SIP, they become federally-enforceable. This means that if for some reason a state cannot or will not enforce the regulations included in a respective SIP, the EPA can step in and enforce those provisions.

***"The State Implementation Plan (SIP) is a state-specific mechanism for air resource management. The components of the SIP are designed to ensure that states move forward in achieving and maintaining air quality that meets national standards."***

***Andrea Smith***
***Program Planning & Administration***
***Branch Manager***

Overall, the framework and components of the SIP are designed to ensure that states continue to move forward in achieving air quality that meets the national standards, and once achieved, that air quality continues to maintain those standards. In short, the SIP is the mechanism for air resource management. Air resource management begins with:

- A determination of existing conditions – air quality, meteorological conditions, and an inventory of emissions;

• Development of goals or objectives for an area (typically air quality standards that must be met or maintained); and
• Development of control strategies that may include emission reduction measures or measures to ensure no further degradation of air quality occurs.

A key component of air resource management, or SIP development, is coordination with the local communities who have a stake in how a plan is to be implemented.

*Ozone*

Ground-level ozone is different than the ozone found in Earth's protective ozone layer, which is located far from earth's surface in the stratosphere. Ground-level ozone is a secondary, man-made pollutant and is the primary component of smog. Secondary pollutants are not emitted directly from a stack, but rather are formed when two primary pollutants mix in the atmosphere. In this case, ground-level ozone is formed when volatile organic compounds (VOCs) and nitrogen oxides ($NO_x$) combine in the presence of heat and strong sunlight. This makes ozone a summertime pollutant.

"The EPA has finalized the new 8-hour ozone standard at 75 ppb. This caused portions of Boone, Campbell, and Kenton counties to be designated nonattainment due to violating monitors in Ohio and their inclusion in the Cincinnati-Hamilton Metropolitan Statistical Area. The division will be reviewing the requirements necessary to redesignate these Kentucky counties to attainment."

*John Gowins,*
*Evaluation Section Supervisor*

On September 2, 2011, the EPA was directed by the President to end review of the range proposed of between 60 to 70 ppb and to begin the process of implementing the originally proposed 2008 8-hour ozone standard of 75 ppb. On May 21, 2012, EPA published final designations to be effective July 20, 2012. The northern Kentucky Counties of Boone, Campbell, and Kenton were designated as partial nonattainment for the 2008 8-hour ozone standard. The portions are approximately the northern half of each county. Ozone monitors in this area of Kentucky measure levels that meet the standard; however, this nonattainment designation was made due to several violating monitors in the Cincinnati, Ohio area. Due to the inclusion of these Kentucky counties in the Metropolitan Statistical Area, EPA indicated that these Kentucky counties contribute to the violations in Ohio.

*Ozone damage on milkweed leaf. The black stippling characteristic of ozone damage is found only on the upper leaf surface, and never crosses the veins. Photo: National Park Service.*

*Fine Particulate Matter*

There are actually two standards set for fine particulate matter. In addition to the 24-hour standard of 35 micrograms per cubic meter of air ($\mu g/m^3$), there is an annual standard set at 15 $\mu g/m^3$.

In June 2008 the division submitted an attainment demonstration that relied on projected changes from the court-remanded Clean Air Interstate Rule (CAIR). DAQ has monitored compliance with these standards in Kentucky for the years 2007-2010. On January 27, 2011, the division requested redesignation of the Cincinnati-Hamilton PM 2.5 Nonattainment Area which includes the Northern Kentucky Counties of Boone, Campbell, and Kenton. EPA approved this redesignation on December 15, 2011.

DAQ submitted redesignation requests for the two remaining nonattainment areas in the state: the

Louisville area on March 5, 2012, and the Huntington Ashland area on February 9, 2012. It is uncertain at what point EPA will approve these submittals since the submittals utilized CAIR's replacement, the Cross State Air Pollution Rule (CSAPR). The Cross-State Air Pollution Rule requires 28 states in the eastern half of the United States to significantly improve air quality by reducing power plant emissions that cross state lines and contribute to ground-level ozone and fine particle pollution in other states. This action builds on more than fifteen years of progress in implementing Clean Air Act reductions of sulfur dioxide ($SO_2$) and nitrogen oxides ($NO_X$). On December 30, 2011, the U.S. Court of Appeals for the D.C. Circuit issued a ruling to stay the CSAPR pending judicial review. While this decision delays implementation of the CSAPR and the significant public health benefits associated with the rule, it also leaves CAIR in place while the court considers the merits of the challenges to the CSAPR.*

In June, 2012, EPA proposed to change the annual PM 2.5 standard from 15 $\mu g/m^3$. Under the proposal, EPA would lower the standard to within a range of 12.0 to 13.0 $\mu g/m^3$, calculated on an annual average. As of August 7, 2012, only Jefferson County had a monitor that registered above 12.0 $\mu g/m^3$.

*Nitrogen Dioxide*

On January 22, 2010, the EPA strengthened the standard for nitrogen dioxide ($NO_2$). The new standard is set at a 1-hour level of 100 parts per billion (ppb). This level will protect against the health effects associated with short-term exposure of $NO_2$. The standard is based on a 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations. The EPA also retained the annual average standard for $NO_2$ at 53 ppb.

On January 11, 2011, the division submitted a letter to EPA recommending that the areas in the state which have monitors be designated as attainment, and the rest of the state be designated as attainment/unclassifiable. In a letter dated June 28, 2011, EPA concurred with the division's recommendations.

The EPA is establishing new ambient air monitoring and reporting requirements for $NO_2$. These requirements will require a shift in the division's current monitoring network. For example, monitors will now be required near major roads in urban areas, where currently there are no monitors in these areas. The Program Planning and Administration Branch and the Technical Services Branch are working together to address these new requirements. The division has determined that one new monitor will be required in the Northern Kentucky area, and other expenditures will be required as the monitoring network is shifted to accommodate the new $NO_2$ standards. The new monitor must be operational by January 2013. Once the monitoring system is in place, the state will likely have to reevaluate the areas and modify the recommendations if necessary.

*Sulfur Dioxide*

On June 22, 2010, the EPA strengthened the NAAQS for sulfur dioxide ($SO_2$). This standard had not been changed since 1971 and the EPA was required under a judicial consent decree to review the primary standard. On July 13, 2011, the EPA announced the proposed secondary standard which addresses public welfare. The rule has not yet been published.

The 2010 primary standard, similar to the $NO_2$ standard, is a 1-hour standard of 75 ppb. This new standard will protect public health by reducing exposure to high short-term levels of $SO_2$. The standard is based on the 3-year average of the 99th percentile of the annual distribution of the daily

* While in the final stages of development of this report, and outside the fiscal year for which this report covers, the U.S. Court of Appeals vacated the CSAPR on August 21, 2012. The impacts of this ruling are unknown at this time.

maximum 1-hour average concentrations. The EPA revoked the two existing 1971 primary standards of 140 ppb evaluated over 24 hours, and the annual standard of 30 ppb, because the 2010 standard is more stringent than the older standard and current health evidence indicated little association between long-term exposure to $SO_2$ and health effects.

On June 2, 2011, the division submitted a letter to EPA recommending that Jefferson County be designated as nonattainment, and the rest of the state as attainment. On December 20, 2012, the division submitted a letter to EPA recommending partial areas in Jefferson County near violating monitors and large SO2 sources as nonattainment instead of the entire county. As in the $NO_2$ rule, the new $SO_2$ rule will require the division to site new monitors and make other network adjustments by January 1, 2013. DAQ has determined that an $SO_2$ monitor will be required in Christian County as a result of the new standard.

*Lead*

The EPA revised the NAAQS for lead to 0.15 µg/$m^3$ in November of 2008, and simultaneously established the current monitoring threshold for lead of 1.0 tpy. However, before monitors were put in place to comply with this new monitoring threshold by the state, the EPA issued a proposal to lower the monitoring threshold for lead to 0.5 tpy. This proposal was issued December 23, 2009, but has not yet been made final. Air quality monitoring agencies would use this threshold to determine if an air quality monitor is required to be placed near a facility emitting lead.

The EPA also requested comments on alternative emission thresholds. The current emissions threshold for lead is 1.0 tpy, and three monitors in Kentucky began collecting data in 2010 at facilities emitting lead at that level. The EPA has not finalized recommendations for lead designations due to the lack of available monitoring data. On October 5, 2009, the division submitted a letter to the EPA indicating that we did not have sufficient data to determine designations for lead. DAQ made a recommendation of “unclassifiable” with a request that EPA extend the deadline up to one year for issuing designations due to insufficient information. By letter dated June 14, 2011, EPA proposed adopting Kentucky’s recommended designations for all counties.

*Visibility*

Regional haze is pollution that impairs visibility over a large region, including national parks, forests, and wilderness areas (many termed “Class I” areas). An easily understood measure of visibility to

*Clear (left photo) and hazy (right photo) days at Mammoth Cave National Park. In the photo on the right, ozone exceeded 100 ppb. Photos: National Park Service Air Resources Division, Denver, CO.*

most people is visual range. Visual range is the greatest distance, in kilometers or miles, at which a dark object can be viewed against the sky. As part of the Clean Air Act Amendments and further regulations adopted by the EPA, states must develop plans to restore natural visibility conditions in the 156 Class I areas throughout the nation by the year 2064. Kentucky's Mammoth Cave National Park is included in the list of areas.

Regional haze is typically caused by sources and activities emitting fine particles and their precursors, often transported over large regions. Particles affect visibility through the scattering and absorption of light. Reducing fine particles in the atmosphere is an effective method of improving visibility.

As federally required, DAQ submitted Kentucky's draft plan to the Federal Land Managers and the EPA for review in December 2007. After receiving comments on the draft document and making necessary revisions, the division posted the proposed plan for public comment and submitted it to EPA in March 2008. After addressing comments received during the public comment period in the statement of consideration, the division submitted the final Kentucky Regional Haze SIP to the EPA in June 2008. In May 2010, the division also submitted to EPA a formal SIP revision to amend the June 2008 Regional Haze SIP on two technical issues.

Per a consent decree agreement with the Sierra Club requiring EPA to take final action on Kentucky's Regional Haze SIP by March 15, 2012, EPA signed a final rule. This final rule provided EPA's limited approval and limited disapproval of the Kentucky Regional Haze SIP. The reason for the delay in EPA taking action on the regional haze SIP and for the limited disapproval was that the SIP was based on emission reductions provided by CAIR, which were appropriate at the time of submittal. CAIR was remanded back to EPA without vacature by the D.C. Circuit Court in December 2008, for failing to adequately address interstate transport of pollutants. Thus, EPA did not take final action on any states' regional haze SIPs due to the consent decree agreements.

In addition, EPA published CSAPR on August 8, 2011, which was to have replaced CAIR on January 1, 2012. However, CSAPR was stayed pending judicial review by the D.C. Circuit Court on December 30, 2011, which left CAIR in effect. Since issuing the final CSAPR, EPA has made several revisions and rulemakings regarding CSAPR. Specifically, a final ruling published in the June 7, 2012 determined that CSAPR is better than Best Available Retrofit Technology for Electric Generating Units for $SO_2$ and $NO_x$ emissions. The final rule also addresses EPA's limited disapproval of Kentucky's Regional Haze SIP whereby EPA under a Federal Implementation Plan will replace reliance on CAIR with reliance on the CSAPR in the SIP if the court upholds the regulation.*

* See footnote, page 45.

# TECHNICAL SERVICES

Since July 1967, the Technical Services Branch (TSB) has operated an air quality monitoring network. The 2011 network included 40 monitoring stations in 27 counties (this total includes monitors operated by the Louisville Metro Air Pollution Control District (LMAPCD) and the National Park Service (NPS) at Mammoth Cave.

The monitoring station locations are selected in accordance with EPA regulations (40 CFR 58, Appendix D) and, in general, are established near high population areas or air pollution sources. Each year the site locations are reviewed to ensure that adequate coverage is being provided and regulatory requirements are met.

Many staff hours are devoted to the operation of the monitoring network. Division staff routinely visit our sites to calibrate and maintain the monitoring equipment, collect samples, and verify and document data from the continuous monitors. Because it is imperative that the air monitoring data be accurate and precise, the Division for Air Quality has an extensive quality assurance program. Staff members audit every air monitor on a quarterly basis to ensure that each is operating properly. This audit process includes monitors operated by the LMAPCD, the NPS, and industrial networks.

Monitoring data is used in several ways. The data is utilized to demonstrate compliance with, or progress made toward meeting, ambient air quality standards and to identify pollution trends. The data also assists in evaluating public health impacts and the possible need to initiate emergency control procedures.

The public has access to the monitoring data on a daily basis through the Air Quality Index (AQI) on our website (air.ky.gov) or toll free (1-800-AIR-IN-KY). The AQI is a 24-hour report on Kentucky's air quality. The public can access daily ozone and particulate matter reports through EPA's AIRNOW website at www.epa.gov/airnow.

In addition to operating the division's ambient air monitoring network, the Technical Services Branch is also responsible for ensuring that facilities demonstrate compliance through the review and observation of source stack tests.

TSB is staffed by employees that include managers, supervisors, administrative staff, technicians, and engineers. The branch is comprised of three specialized sections: Quality Assurance, Technical Support, and Source Sampling.

**Source Sampling Section**

The Source Sampling Section provides technical guidance to the division and facilities through the review of compliance demonstration test protocol forms, observation of compliance tests, and technical review of compliance and Relative Accuracy Test Audit (RATA) test reports. The Source Sampling Section's review insures that approved EPA test methods are used and proper engineering principles are followed for source tests throughout the Commonwealth. A facility may be required to test their emissions at a source based on regulation, permit requirements, or upon a division request.

**Quality Assurance Section**

The Quality Assurance Section conducts performance and systems audits of all air monitoring stations within Kentucky's air monitoring network, as well as five industrial sites within Kentucky. The section is responsible for validating all data generated from the air monitors located throughout the state's network. Data audits ensure that all data is in compliance with the state and federal monitoring regulations, particularly 40 CFR Part 58, Appendix A. The section is also responsible for certifying all equipment used within the network.

**Technical Support Section**

The Technical Support Section repairs, modifies, and maintains instrumentation and equipment associated with the Kentucky air monitoring network, which includes continuously operating monitors for particulates, sulfur dioxide, oxides of nitrogen, ozone, and mercury, as well as intermittent particulate and air toxic samplers. The section also maintains a statewide computerized data acquisition network that automatically retrieves air monitoring data and makes information available to the public in the form of an Air Quality Index, which is regularly posted on the division's website. They also maintain a $PM_{2.5}$ weigh-lab operation which has the responsibility of handling and conditioning sample filters, weighing $PM_{2.5}$ filters, and reporting the analytical results.

## Compliance and RATA Tests

Facilities throughout the Commonwealth are required by federal regulations, state regulations, permits, and/or division-directives to sample the emissions being released from identified point sources. Samples must be collected and analyzed in accordance with federally promulgated test procedures and methods, as referenced in:

- 40 CFR Part 51 - Requirements for Preparation, Adoption, and Submittal of Implementation Plans;
- 40 CFR Part 60 - Standards of Performance for New Stationary Sources;
- 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants;
- 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories; and
- 40 CFR Part 75 - Continuous Emission Monitoring.

In general, a compliance source test consists of three sample runs that are averaged together for a single test result. A sample run can last between one and 24 hours, depending upon the facility's production operations. Prior to a test, a facility is required to submit a test protocol explaining the methods and procedures that will occur during the source test. The Source Sampling Section, in conjunction with the Field Operations Branch and Permit Review Branch, reviews test protocols prior to the test to ensure proper procedures and methods will be followed. The Source Sampling Section also makes every effort to observe scheduled source tests throughout the Commonwealth. Following a test, a report is submitted to the division where it is reviewed for accuracy and completeness. The compliance status of the facility is also determined based on the approved reported test results.

In 2011, the Source Sampling Section received 323 Compliance and RATA test protocols by Kentucky facilities; 307 tests were scheduled. The section observed 68% of the scheduled compliance tests in 2011. In 2011, the Source Sampling Section received 241 test reports and completed 90% of the technical reviews for the test reports received.

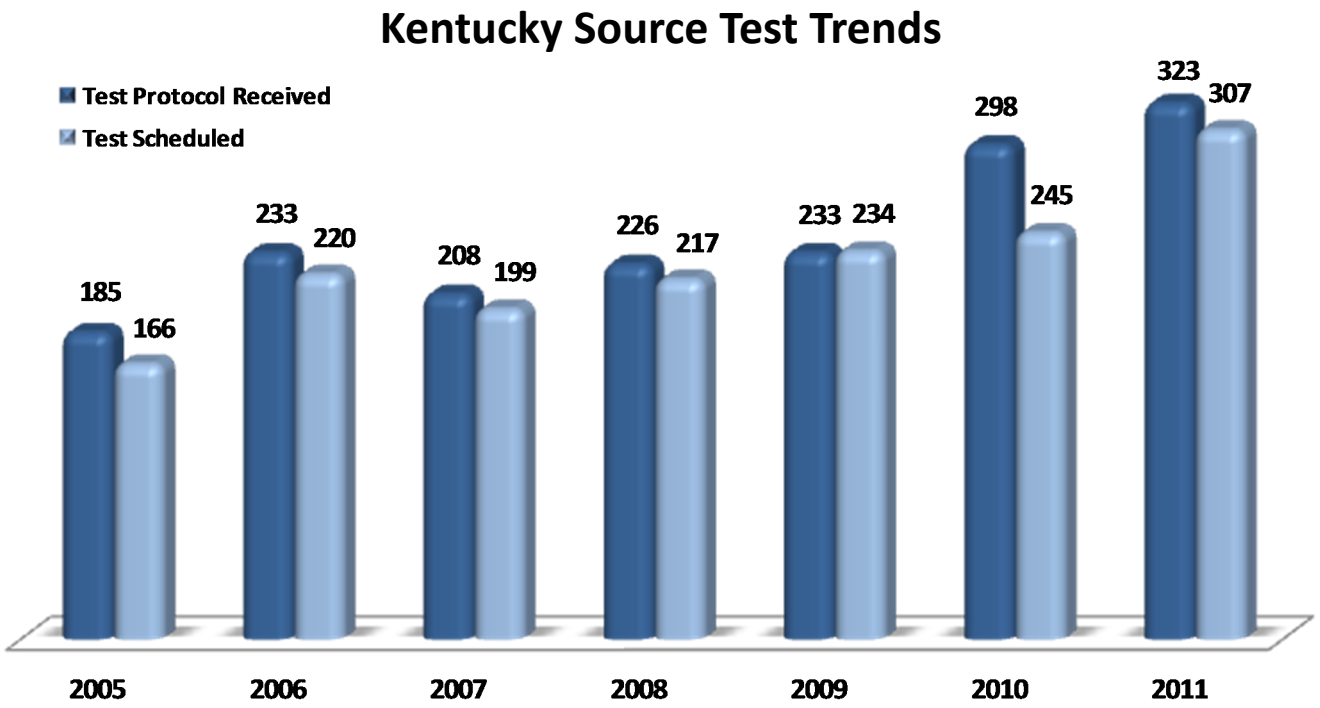



*Figure 28: The last seven years have shown an increase in source testing throughout the state.*

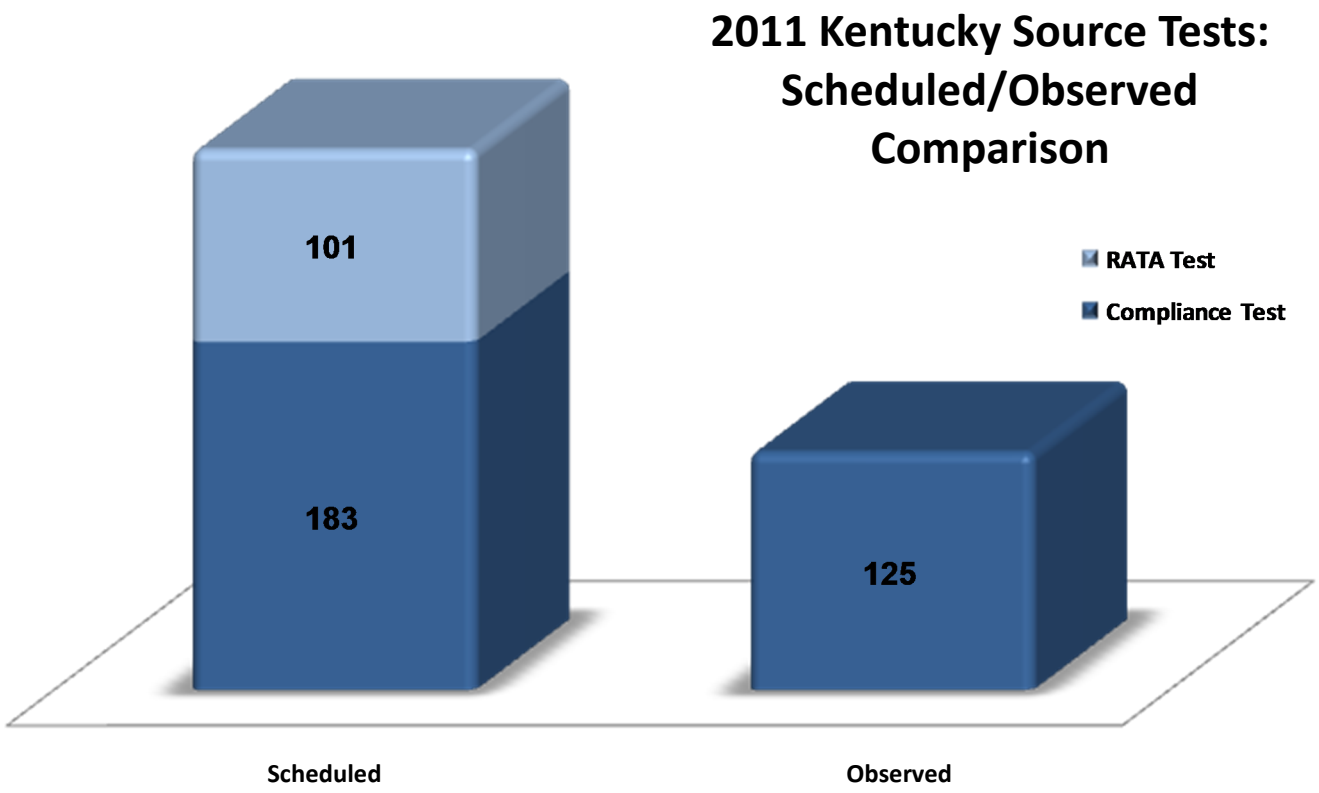



*Figure 29: The Source Sampling Section observed 68% of the scheduled compliance tests in 2011. RATA tests were not observed in 2011.*

In October 2011, the TSB hosted its first-ever division-wide Source Sampling Workshop. The three-day interactive training event brought together FOB inspectors, PRB permit writers, and TSB Source Sampling staff to discuss issues, methodologies, and SOPs relating to compliance demonstrations.

**Ambient Air Monitoring Network**

According to federal regulation (40 CFR Part 58, Appendix D), the ambient air monitoring network must be designed to meet three basic air monitoring objectives:

- The network must provide air pollution data to the general public in a timely manner.
- The network must support compliance with ambient air quality standards and emissions strategy development.
- The network must support air pollution research studies.

In order to meet these three basic monitoring objectives, the network must be designed with a variety of types of monitoring sites. In essence, the network design must be capable of illustrating the peak air pollution levels, typical levels in populated areas, air pollution transported into and outside of a city or region, and air pollution levels near specific emissions sources.

In 2011, TSB completed the Kentucky Ambient Air Monitoring Network Plan; an extensive document that details Kentucky's air monitoring network in terms of scales of representativeness and specific designations (e.g., monitors sited for source impacts, regional transport, background, and so forth). The Ambient Air Monitoring Network Plan was submitted to the EPA by the July 1 regulatory deadline; the document underwent a 30-day public comment period prior to submission. The Ambient Air Monitoring Network Plan is available for review on the division's website at http://air.ky.gov/Pages/DivisionReports.aspx

Pages 58-105 of this Annual Report contain tables and graphs that summarize the concentrations of pollutants measured in Kentucky during the calendar 2011 year, as well as summary statistics for the 2009-2011 design value time period. A **design value** is the most recent three years of data from which an average is calculated to determine compliance with the NAAQS in question. Maps of each pollutant network are representative of the air monitoring network, as submitted to the EPA in the 2011 Ambient Air Monitoring Network Plan. Regulations require that annual network plans be representative of a fiscal year (July-June); however, attainment decisions are typically based upon the data available within a calendar year (January-December).

It's important to note that an *exceedance* of a particular pollutant is not the same as a *violation* of the NAAQS for that pollutant. Violations are determined according to the formula for each standard and involve the average of multiple measured values over a specified amount of time.

Any data contained in this report is subject to change. The most current quality assured dataset can be obtained through a Kentucky Open Records Act (KORA) request to the TSB.

**Data Quality Assurance**

TSB quality-assures and validates all ambient data collected by the monitors and samplers in the network. Upon completing its review of 2011 data, the division submitted its annual data certification request to EPA prior to the May 1 regulatory deadline. This data certification package includes reports that summarize all the hours of valid data collected, as well as the quality control measures taken to ensure the accuracy of that data, and the number of annual performance evaluations completed. The information obtained in the annual data certification request is available to the public through KORA requests.

TSB maintains a library of Quality Assurance Project Plans (QAPPs) and Standard Operating Procedures (SOPs) for each instrument operated in the monitoring network. There are four active and current QAPPs in the DAQ library; two were revised in 2011. There are also 25 SOPs in the DAQ library. In 2011, TSB staff drafted three new SOPs and finalized revisions to one additional SOP.

In 2011, personnel within the TSB conducted a total of 363 performance audits of the division's air monitoring equipment. Performance audits were also conducted on monitors operated by Mammoth Cave National Park, Louisville Metro Air Pollution Control District, and the University of Louisville, as well as for monitors operated by local industry. Such audits are crucial to ensuring data quality and verifying instrument function. Additionally, a total of 44 technical systems audits were performed to ensure that operational procedures at each site were followed. TSB staff also completed a total of 153 instrument-service trips in the field and repaired an additional 82 monitors in-house.

# AIR QUALITY INDEX (AQI)

| Air Quality Index Levels of Health Concern | Numerical Value | Meaning |
|---|---|---|
| Good | 0-50 | Air quality is considered satisfactory, and air pollution poses little or no risk. |
| Moderate | 51-100 | Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution. |
| Unhealthy for Sensitive Groups | 101-150 | Members of sensitive groups may experience health effects. The general public is not likely to be affected. |
| Unhealthy | 151-200 | Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects. |
| Very Unhealthy | 201-300 | Health alert: everyone may experience more serious health effects. |
| Hazardous | > 300 | Health warnings of emergency conditions. The entire population is more likely to be affected. |

*Figure 30: The Air Quality Index (AQI). The purpose of the AQI is to help you understand what local air quality means to your health.*

The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. The EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health.

**How does the AQI work?**

Think of the AQI as a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while a value over 300 signifies hazardous air quality.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy; at first for certain sensitive groups of people, then for everyone as AQI values get higher.

**Where can I find out about the AQI?**

The Division for Air Quality reports nearly real-time AQI values on our website, at air.ky.gov, and via a toll-free telephone number, 1-800-AIR-IN-KY. Forecasted AQI data can be viewed at EPA's website, www.airnow.gov. Forecasted AQI data is generated using a combination of forecasted weather data and known pollution emission values. DAQ does not forecast for air pollution. In Kentucky, the Louisville Air Pollution Control District forecasts due to its population size as required by the CAA.

## NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

| POLLUTANT | MAXIMUM CONCENTRATION | |
|---|---|---|
| | Primary Standard | Secondary Standard |
| **Carbon Monoxide**<br>8-Hour Average<br>1-Hour Average | 9 ppm (1)<br>35 ppm (1) | None |
| **Lead**<br>Rolling 3-Month Average | 0.15 µg/$m^3$ (2) | Same as primary |
| **Nitrogen Dioxide**<br>Annual Average<br>1-Hour Average | 53 ppb (3)<br>100 ppb (4) | Same as primary |
| **Particulate Matter** (measured as $PM_{10}$)<br>24-Hour Average | 150 µg/$m^3$ (5) | Same as primary |
| **Particulate Matter** (measured as $PM_{2.5}$)<br>Annual Average<br>24-Hour Average | 15.0 µg/$m^3$ (6)<br>35 µg/$m^3$ (7) | Same as primary |
| **Ozone**<br>8-Hour Average | 0.075 ppm (2008 std) (8) | Same as primary |
| **Sulfur Oxides**<br>1-Hour Average<br>3-Hour Average | 75 ppb (9) | ---------<br>0.5 ppm (1) |

*Figure 31: The National Ambient Air Quality Standard determines what levels of each pollutant are acceptable in terms of protecting human health (primary standard) and public welfare (secondary standard).*

## Understanding the National Ambient Air Quality Standard

The federal Clean Air Act (42 U.S.C. 7401-7671), as amended by the U.S. Congress in 1970, 1977 and 1990, directs the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards defining maximum allowable ambient (outdoor) concentrations for criteria pollutants. The term "criteria pollutants" derives from the requirement that EPA must set criteria or standards for each pollutant in the table at left.

There are two standard goal levels for each of the criteria pollutants. The Primary Standard is designed to protect the public health. The Secondary Standard is designed to protect public welfare. Welfare includes damage to plants and animals, impairment of visibility, and property damage.

Units of measure in the chart are micrograms of pollutants per cubic meter of air ($\mu g/m^3$), parts of pollutants per million (ppm) parts of air, and parts per billion (ppb) parts of air.

**Footnotes:**

(1) Not to be exceeded more than once per year.

(2) The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved (final rule signed October 15, 2008).

(3) The official level of the annual $NO_2$ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

(5) Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

(9) To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (final rule signed June 22, 2010).

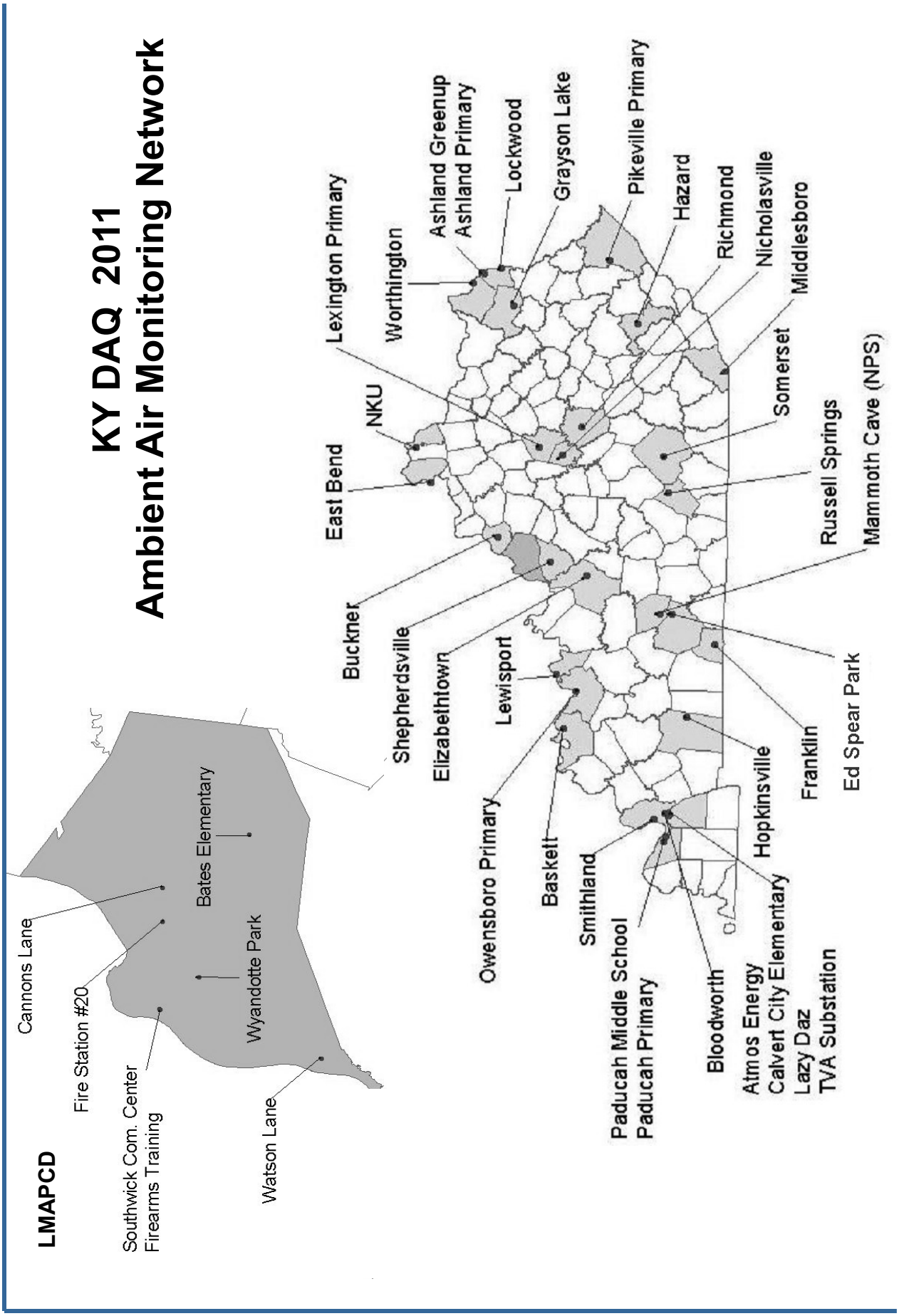



*Figure 32: The Kentucky Division for Air Quality monitoring network. Inset shows the Louisville Metropolitan Air Pollution Control District monitoring network.*

# 2011 MONITORS BY CORE-BASED STATISTICAL AREA

| Metropolitan Statistical Area | Number of Sites | $PM_{2.5}$ | $PM_{10}$ | $SO_2$ | $NO_2$ | $NO_y$ | CO | $O_3$ | Pb | VOC | Carb-onyl | PAH | $Cr^{+6}$ | $PM_{2.5}$ Speciation | Carbon Speciation | Rad-net | MET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bowling Green, KY | 2 | 4 CT | 0 | 1 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Cincinnati-Middletown, OH-KY-IN | 2 | 2 T | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Clarksville, TN-KY | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elizabethtown, KY | 1 | 3 CB | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Evansville, IN-KY | 1 | 2 T | 1 * | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Huntington-Ashland, WV-KY-OH | 4 | 2 T | 2 C* | 2 | 1 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| Lexington-Fayette, KY | 2 | 2 T | 1 * | 2 | 1 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| Louisville-Jefferson County, KY-IN | 9 | 9 CT B | 5 CT B Pb* | 3 | 1 | 1 | 2 | 5 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 4 |
| Owensboro, KY | 2 | 2 T | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Micropolitan Statistical Area | | | | | | | | | | | | | | | | | |
| Paducah, KY-IL | 4 | 2 T | 1 | 1 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Somerset, KY | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Middlesboro, KY | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Richmond-Berea, KY | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Not in a MSA | | | | | | | | | | | | | | | | | |
| Carter County | 1 | 1 | 2 C* | 0 | 0 | 0 | 0 | 1 | 0 | 1 D | 1 D | 1 | 2 C | 1 | 1 | 0 | 1 |
| Marshall County | 4 | 0 | 1 * | 0 | 0 | 0 | 0 | 0 | 0 | 5 C | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Perry County | 1 | 1 T | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Pike County | 1 | 3 CB | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Russell County | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Simpson County | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| TOTALS | 41 | 37 | 13 | 13 | 7 | 2 | 3 | 26 | 5 | 9 | 3 | 1 | 2 | 4 | 4 | 2 | 16 |

C=Collocated monitors; D=Duplicate monitor; T or B= Continuous PM2.5 monitors or continuous PM10 monitors; *=Multiple analysis: PM10 Teflon filters used for PM10, metals, and/or PM10c monitoring; Pb= PM10 Teflon filter used for lead analysis

# 2011 Carbon Monoxide Ambient Air Monitoring Network

**(Louisville Metropolitan Air Pollution Control District and National Park Service)**

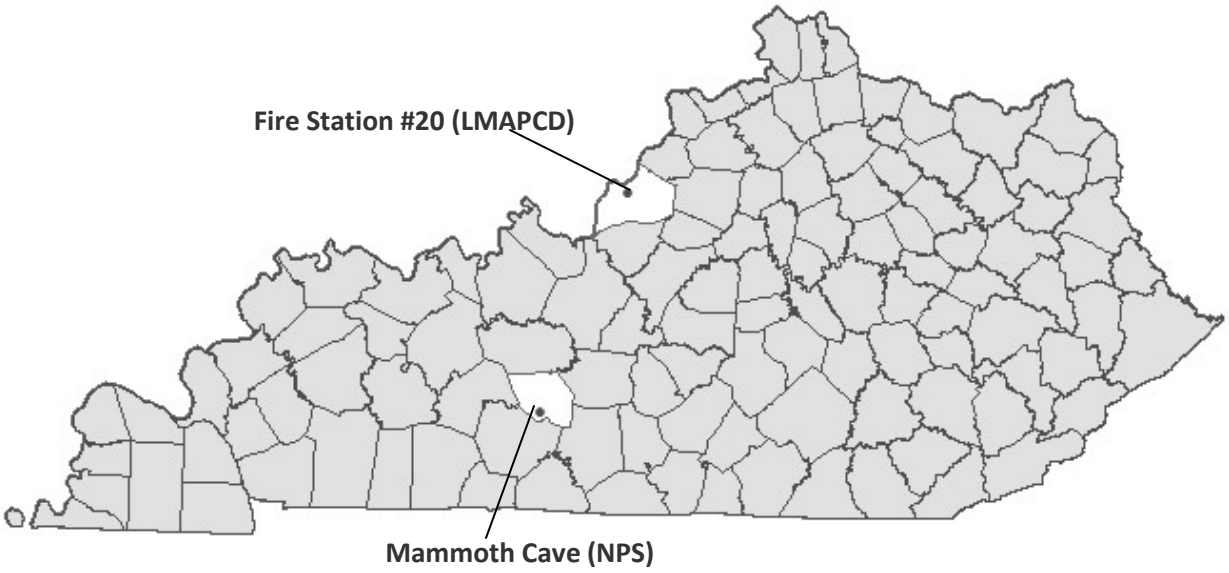



*Figure 33: Carbon monoxide monitoring in Kentucky is currently conducted only in the Louisville Metro region due to statewide compliance. Jefferson County historically has had higher levels of CO than elsewhere in the state, perhaps due to the high levels of vehicle traffic in the area.*

Carbon monoxide (CO) is an odorless, colorless, poisonous gas that is produced by the incomplete combustion of carbon containing fuels. The primary source of carbon monoxide is the exhaust from motor vehicles including highway and off-road vehicles, such as construction equipment. Other sources include industrial processes, and kerosene or wood burning stoves in homes.

*Environmental Impacts*

The main health effect of carbon monoxide is its tendency to reduce the oxygen carrying capacity of blood. Carbon monoxide enters the bloodstream in the lungs where it binds chemically with the hemoglobin in red blood cells. Hemoglobin normally carries oxygen to organs and tissues but because CO binds with the hemoglobin over 200 times more readily than oxygen, the amount of oxygen absorbed into the bloodstream is greatly reduced when CO is present.

Depending on the level of exposure, CO can cause fatigue and headaches and can impair vision and reflexes. Unconsciousness and even death may occur at high concentrations. The severity of the effects is related to the length of exposure and concentration level of CO.

*How is CO Monitored?*

Carbon monoxide is monitored continuously by analyzers that operate using the non-dispersive infrared photometry method. In this method, ambient air is drawn into a sample cell and a beam of infrared light is passed through the sample. Carbon monoxide absorbs infrared light and any decrease in the intensity of the beam is due to the presence of CO. The decrease is directly related

to the concentration of CO in the ambient air. A detector measures the difference between the sample cell beam and a duplicate beam passing through a reference cell with no CO present.

The difference is translated into a measure of the CO present in the ambient air. Data from the analyzer is transmitted, by telemetry, for entry into an automated data storage system. In 2011, the Louisville Metro Air Pollution Control District and the National Park Service at Mammoth Cave each operated one CO monitor.

*Results*

There were no exceedances of the CO standards in 2011. The last exceedance of a standard occurred on January 7, 1998, in Ashland when an 8-hour average of 11.7 ppm was recorded. All Kentucky counties are currently in attainment of the standards for carbon monoxide.

Statewide and regional carbon monoxide levels have declined substantially since 1980, primarily due to improved emission controls on motor vehicles. Due to the substantial drop in monitored levels, carbon monoxide monitoring was discontinued statewide in 2003, except for Jefferson County. The 2003 statewide discontinuation of CO monitors accounts for the uptrend from 2003 to 2008, because the annual average had been based on data only from Jefferson County. Jefferson County has historically had higher CO levels than the rest of the state. In 2009, another dramatic shift, this time downward, can be attributed to the establishment of monitoring at Mammoth Cave, a rural area with fewer mobile sources.

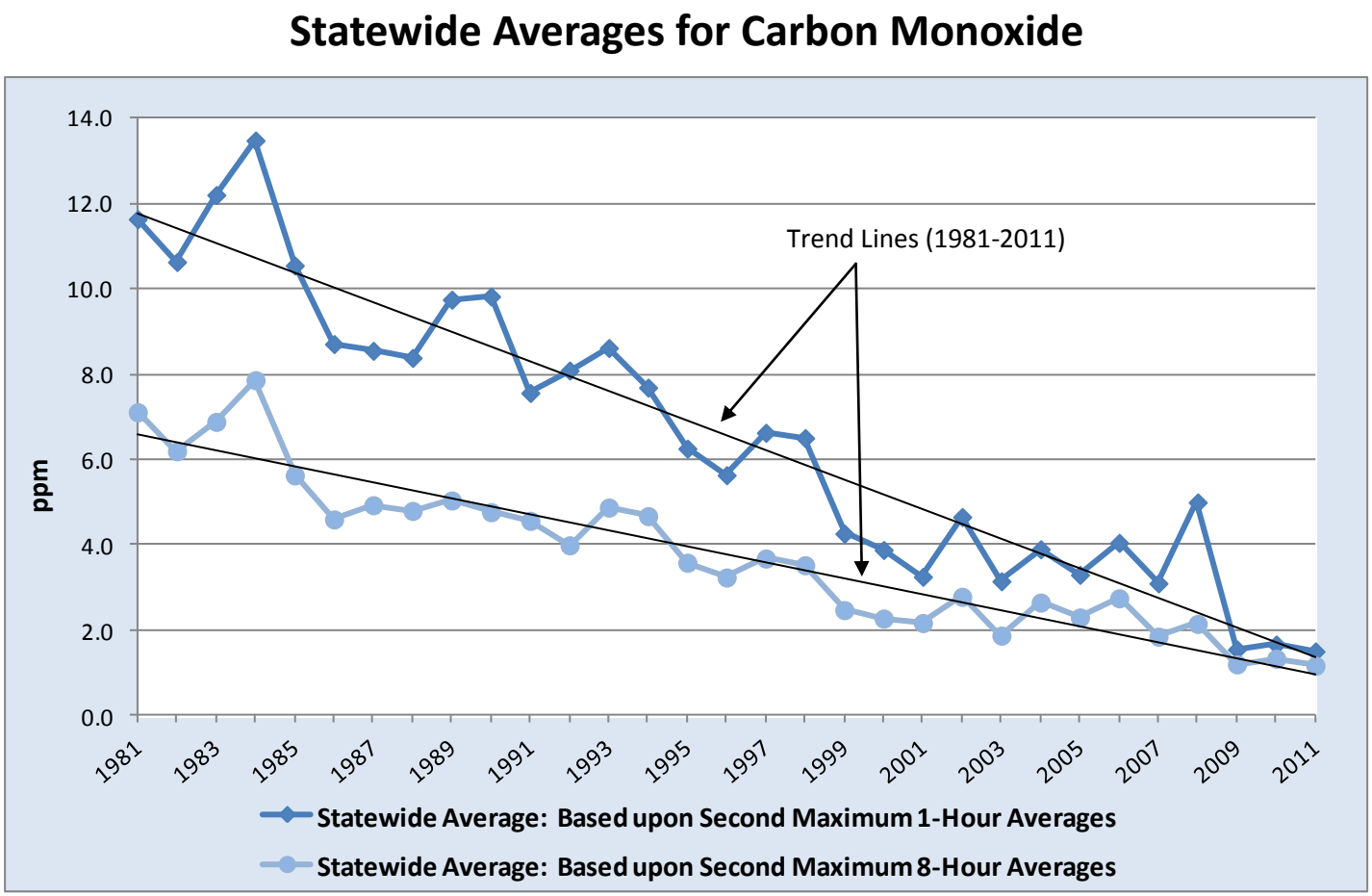



*Figure 34: Statewide averages for CO monitoring indicate pollution reductions.*

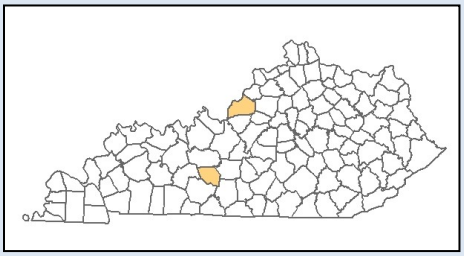
# National Ambient Air Quality Standards for Carbon Monoxide

Primary NAAQS: **8-hour average not to exceed 9 ppm more than once per year**
**1-hour average not to exceed 35 ppm more than once per year**

Secondary NAAQS: **None**

## Criteria Pollutant Summary Report – 2011

**Pollutant:** **Carbon Monoxide**
**Method:** Instrumental/Non-Dispersive Infrared Photometry
**Data Interval:** Hourly
**Units:** Parts-per-million (ppm)



| County | Site Address | AQS-ID | # Obs | 1-Hr Averages | | | 8-Hr Averages | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1st max | 2nd max | Obs> 35.0 | 1st max | 2nd max | Obs > 9.0 |
| Edmondson[1] | Alfred Cook Road Mammoth Cave | 21-061-0501 | 7724 | 0.3 | 0.3 | 0 | 0.3 | 0.3 | 0 |
| Jefferson[2] | 2730 Cannons Lane Louisville | 21-111-0067 | 8637 | 2.1 | 1.7 | 0 | 1.4 | 1.3 | 0 |
| Jefferson[2] | 1735 Bardstown Road Louisville | 21-111-1019 | 7575 | 2.9 | 2.5 | 0 | 2.0 | 1.9 | 0 |

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.

# LEAD (Pb)

## 2011 Lead Ambient Air Monitoring Network

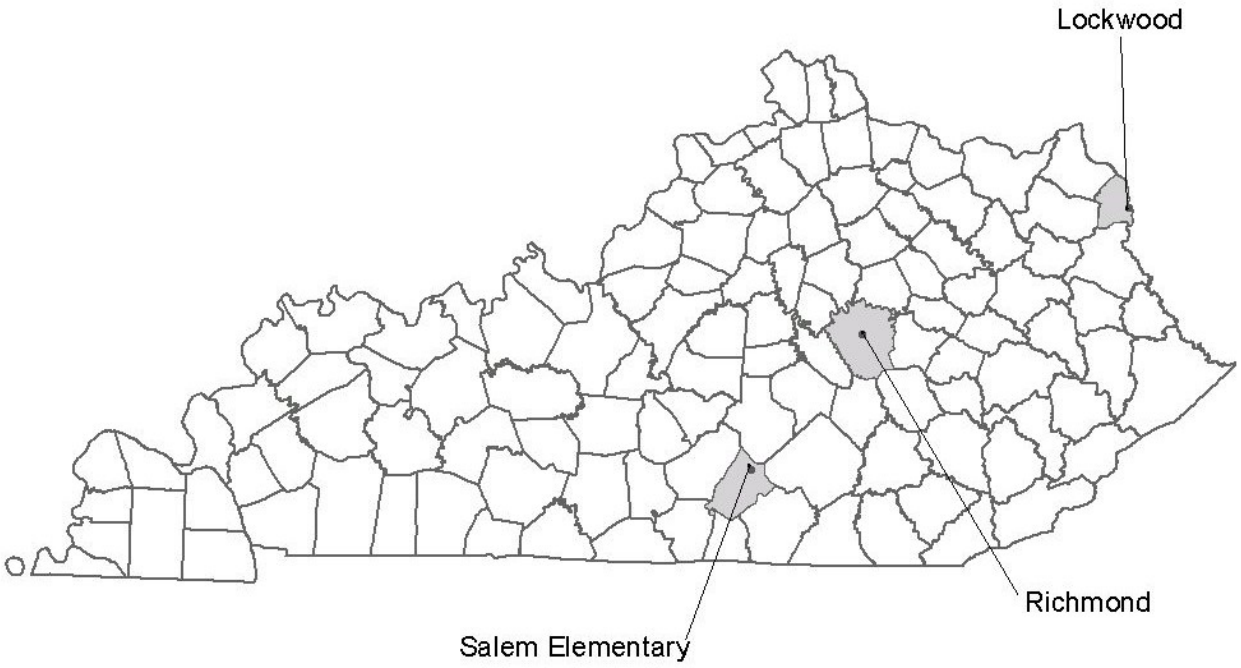



*Figure 35: Lead monitoring locations in Kentucky.*

Lead is a soft, blue-gray metal that occurs naturally. However, the historical use of lead in gasoline, paint, and plumbing, along with modern use in batteries, bridge paint, and plastic has caused lead to accumulate in the environment. The accumulation of lead in the environment is the reason lead can be found in everyone's body today.

On November 12, 2008, the NAAQS for lead was lowered from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$. The NAAQS required State, Tribal, and Local agencies to monitor near sources that emit more than one ton of lead per year . The division identified three sources that emitted over one ton of lead annually and began monitoring near the sources in 2010. In December 2010, the EPA released a new set of monitoring requirements. The new monitoring rule requires lead monitoring near sources that emit more than 0.5 tons per year. The new rule also requires lead monitoring at sites designated as NCore in core-based statistical areas with populations greater than 500,000. LMAPCD operates one such NCore site. New lead monitors were required to be established in 2011.

*Environmental Impacts*

Ingestion of lead is the first major pathway of exposure. Inhalation is the second leading pathway of exposure for lead. Only 20 percent to 70 percent of ingested lead is absorbed into the body whereas almost all of the lead inhaled is absorbed into the body. Children absorb lead into their system faster than an adult.

Lead can accumulate in soil, water, and sediments through deposition from air sources. The accumulation can damage ecosystems through the loss of biodiversity, changes in community composition, and decreased growth and reproductive rates in plants and animals.

Lead contamination can cause nervous system and kidney damage, learning disabilities, poor muscle coordination, decreased bone and muscle growth, and hearing damage in children. Lead can also affect adult nervous systems. However, most adults require a much larger exposure than a child to have a negative health impact.

*How is lead monitored?*

Lead concentrations are determined from the analysis of suspended particulates collected by high volume particulate samplers. These samplers use a brushless motor and a critical flow orifice in order to achieve a sampling flow rate between 1.10 and 1.70 cubic meters per minute (m3/min) over the course of 24 hours. Samples are collected on 8x10 glass fiber filters. Upon collection, the filters are sent to an EPA certified laboratory for analysis. The sample filters are cut into strips, acid digested according to 40 CFR Part 50, Appendix G, and analyzed by Inductively Coupled Plasma with Mass Spectroscopy Detection (ICP-MS).

*Results*

There were no exceedances of the three-month rolling average standard of 0.15 µg/$m^3$ in 2011.

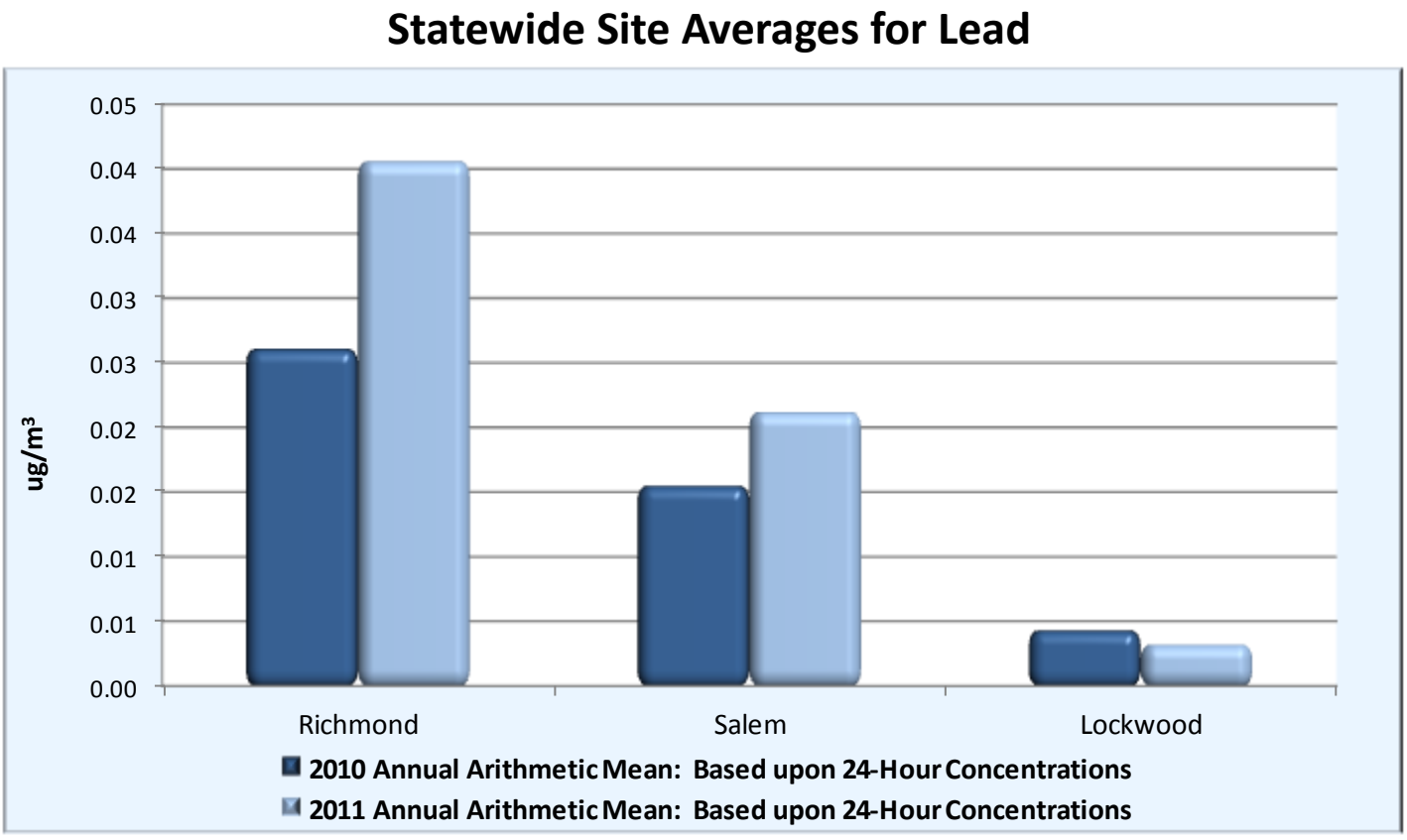



*Figure 36: Statewide averages for lead based upon annual arithmetic mean per site. Trend analysis is not available, since monitoring data is only available for 2010-2011.*

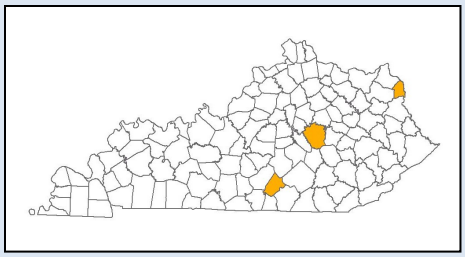
# National Ambient Air Quality Standards for Lead

Primary NAAQS: **Rolling 3-month average not to exceed 0.15 µg/m$^3$**

Secondary NAAQS: **Same as primary standard**

## Criteria Pollutant Summary Report – 2011

**Pollutant:** **Lead**
**Method:** High volume sampler; Inductively Coupled Plasma-Mass Spectroscopy
**Data Interval:** 24-hour
**Units:** Micrograms per cubic meter (µg/m$^3$)



| County | Site Address | AQS-ID | # Obs | Rolling 3- Month Average | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 1st max | 2nd max | 3rd max | 4th max | Obs > 0.15 |
| Boyd | Lockwood Estates Catlettsburg | 21-019-0016 | 67 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| Madison | 300 Bond Street Richmond | 21-151-0003 | 63 | 0.09 | 0.08 | 0.04 | 0.04 | 0 |
| Russell | 1409 S. Highway 76 Russell Springs | 21-207-0001 | 65 | 0.04 | 0.03 | 0.02 | 0.02 | 0 |

## 2011 Nitrogen Dioxide Ambient Air Monitoring Network

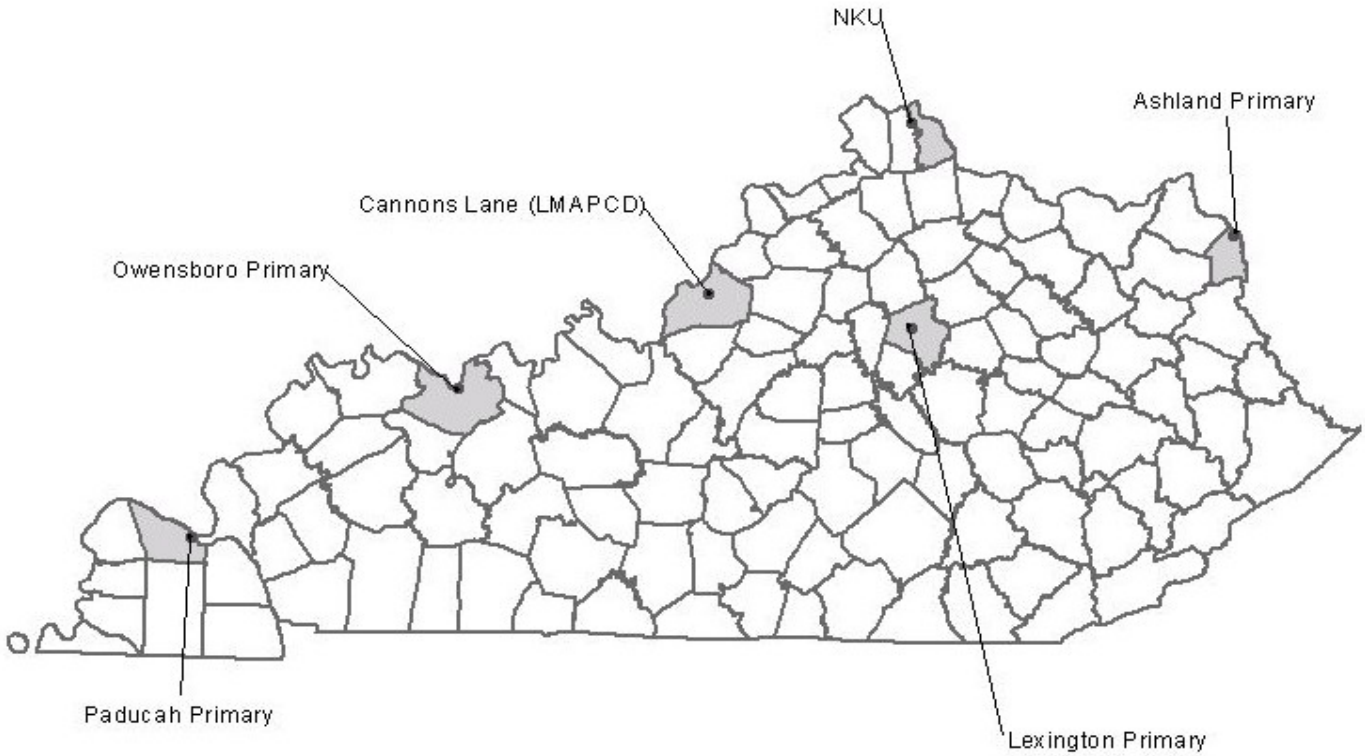



*Figure 37: Nitrogen dioxide monitoring locations in Kentucky.*

Nitrogen dioxide is a reddish brown gas that is produced during high temperature combustion. During combustion, nitrogen, and oxygen are combined, or oxidized, to form a family of highly reactive gases called nitrogen oxides ($NO_x$), which includes nitrogen dioxide ($NO_2$) and nitrogen oxide (NO). In addition to the $NO_2$ produced during combustion, the NO produced may, in the presence of sunlight, undergo a photochemical reaction that will also form $NO_2$. The rate of reaction is dependent upon the intensity of the sunlight. Major combustion or oxidation sources that produce $NO_2$ include motor vehicles, power plants, incinerators, boilers, and chemical processes.

*Environmental Impacts*

The primary health effect of $NO_2$ is as a lung irritant, which can cause an increase in respiratory rate, a decrease in lung function, and an increase the susceptibility of the respiratory system to infection. Nitrogen oxides are also considered detrimental to human health due to their association in the formation of ozone and the resulting health effects caused by that pollutant.

$NO_2$ is a contributor to the formation of acid precipitation, which can damage plant life, aquatic life, cause the deterioration of stone/masonry-type buildings, and deteriorate statues.

Nitrogen oxides also react with ammonia to form ammonium nitrate, a component of $PM_{2.5}$. Nitrates are also a key component in regional haze that has been attributed to poor visibility in the southeast region of the United States.

*How is $NO_2$ monitored?*

Nitrogen dioxide is monitored continuously by analyzers that utilize the principle of photometric

detection of the chemiluminescence (light) resulting from the gas phase reaction of nitric oxide (NO) and ozone. When these two gases react, light at a specific wavelength is produced.

In operation, sample air is drawn into the analyzer and split into two streams. The first air stream reacts directly with ozone (which is produced by a generator in the analyzer) and the light energy produced is proportional to the NO in the sample. Since $NO_2$ does not react with ozone, the second stream of air passes through a catalytic converter that converts the $NO_2$ in the sample to NO. The second air stream then reacts with ozone, providing a total measurement of nitrogen oxides ($NO_x$) in the sample.

The assumption is that the majority of the $NO_x$ value is not $NO_2$. By subtracting the second air stream NO concentration from the first stream $NO_x$ concentration, an $NO_2$ value is obtained. Data from the analyzer is transmitted into an automated data storage system. In 2011, the division and the LMAPCD operated six nitrogen dioxide monitors in Kentucky.

*Results*

On January 22, 2010, the EPA added an additional primary $NO_2$ standard. The new NAAQS was set to 100 ppb, measured as the three-year average of the 98$^{th}$ percentile of the daily maximum one-hour averages. The EPA also maintained the annual NAAQS, which is set to 53 ppb. There were no exceedances of the $NO_2$ standard in 2011, and there have been no recorded exceedances of a NAAQS since the inception of sampling in 1970. Statewide nitrogen dioxide levels show a steady downward trend, primarily due to the use of pollution control devices on motor vehicles, power plants and industrial boilers.

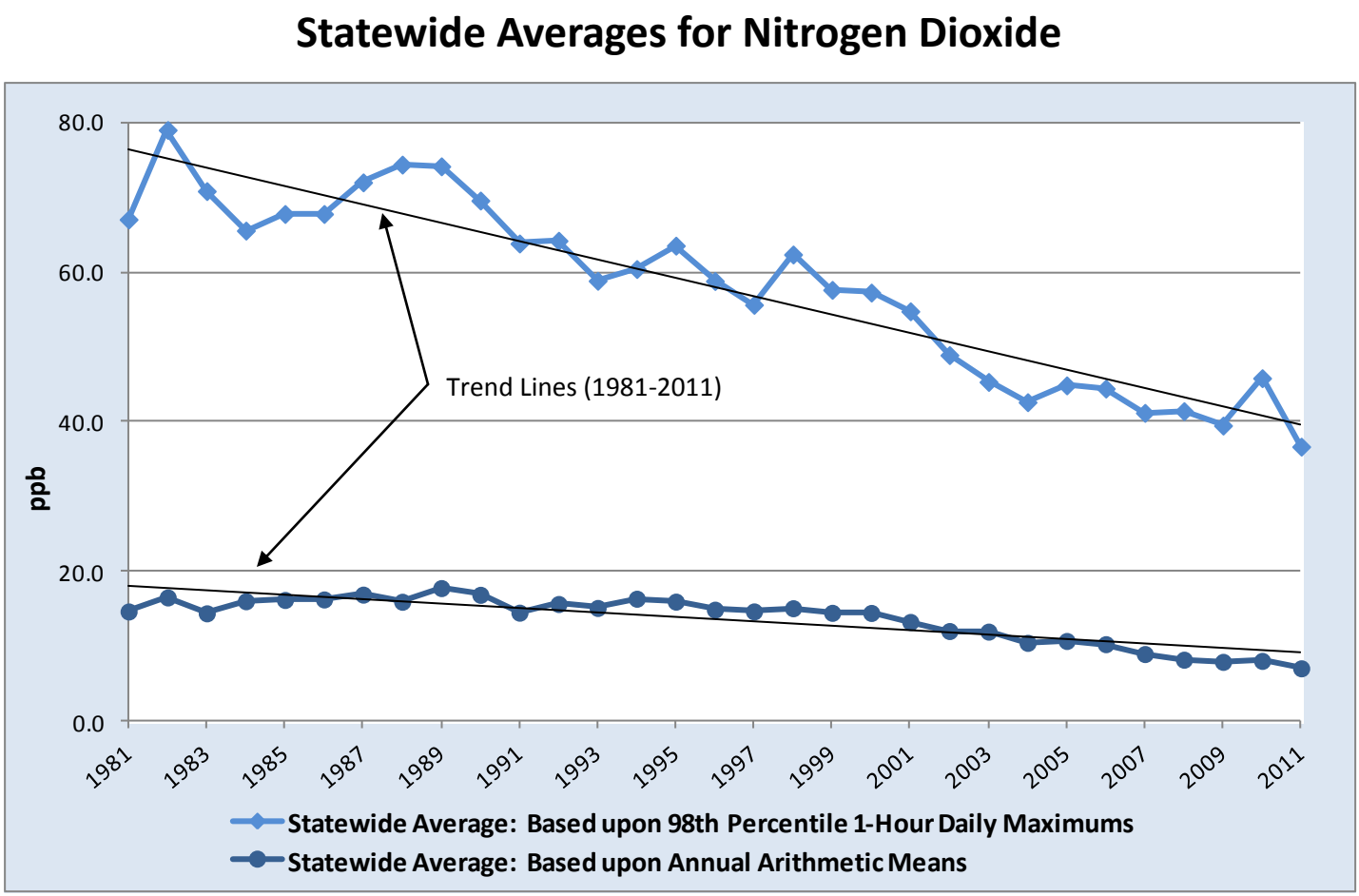



*Figure 38: Statewide averages for nitrogen dioxide monitoring indicate pollution reductions.*

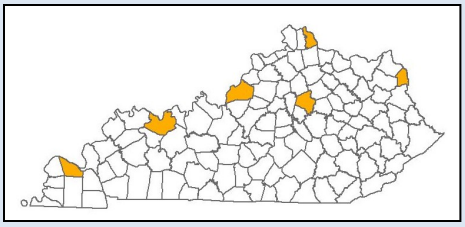
# National Ambient Air Quality Standards for Nitrogen Dioxide

Primary NAAQS: **Annual arithmetic mean must not exceed 53 ppb**
**3-year average of the 98th percentile of daily maximum one hour averages must not exceed 100 ppb**

Secondary NAAQS: **Same as Primary Standard**

## Criteria Pollutant Summary Report – 2011

**Pollutant:** **Nitrogen Dioxide**
**Method:** Instrumental/Gas-Phase Chemiluminescence
**Data Interval:** Hourly
**Units:** Parts-per-billion (ppb)



| County | Site Address | AQS-ID | # Obs | Annual Arithmetic Mean | Obs > 53 |
|---|---|---|---|---|---|
| Boyd | 2924 Holt Street<br>Ashland | 21-019-0017 | 4615 | 7.16 * | 0 |
| Campbell | 524A John Hill Road<br>Highland Heights | 21-037-3002 | 7836 | 3.62 | 0 |
| Daviess | US 60 and Pleasant Valley Road<br>Owensboro | 21-059-0005 | 8074 | 6.12 | 0 |
| Fayette | 650 Newtown Pike<br>Lexington | 21-067-0012 | 8296 | 8.33 | 0 |
| Jefferson[1] | 2730 Cannons Lane<br>Louisville | 21-111-0067 | 8592 | 11.45 | 0 |
| McCracken | 2901 Powell Street<br>Paducah | 21-145-1024 | 8232 | 5.69 | 0 |

[1] Nitrogen dioxide monitors located in Jefferson County are operated by the Louisville Metro Air Pollution Control District.

* Incomplete data set.

# $NO_2$ Criteria Pollutant Multi-Year Summary Report – 2011
# 98th Percentile Daily 1-Hour Maximum, 3-Year Average

| County | Site Address | AQS-ID | 98th Percentile Daily Maximum 1-Hr Averages | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2009 | 2010 | 2011 | 3-Yr Avg | Obs > 100 |
| Boyd | 2924 Holt Street<br>Ashland | 21-019-0017 | 36.0 | 37.0 | 30.0 * | 34 * | 0 |
| Campbell | 524A John Hill Road<br>Highland Heights | 21-037-3002 | 31.0 | 39.0 | 28.0 | 33 | 0 |
| Daviess | US 60 and Pleasant Valley Road<br>Owensboro | 21-059-0005 | 35.0 | 38.0 | 33.0 | 35 | 0 |
| Fayette | 650 Newtown Pike<br>Lexington | 21-067-0012 | 44.0 | 56.0 | 47.0 | 49 | 0 |
| Jefferson[1] | 2730 Cannons Lane<br>Louisville | 21-111-0067 | n/a | 58.0 | 45.1 | 52 * | 0 |
| McCracken | 2901 Powell Street<br>Paducah | 21-145-1024 | 40.0 | 47.0 | 37.0 | 41 | 0 |

* Incomplete data set. The mean does not satisfy summary criteria.

[1] Nitrogen dioxide monitors located in Jefferson County are operated by the Louisville Metro Air Pollution Control District.

# 2011 Ozone Ambient Air Monitoring Network

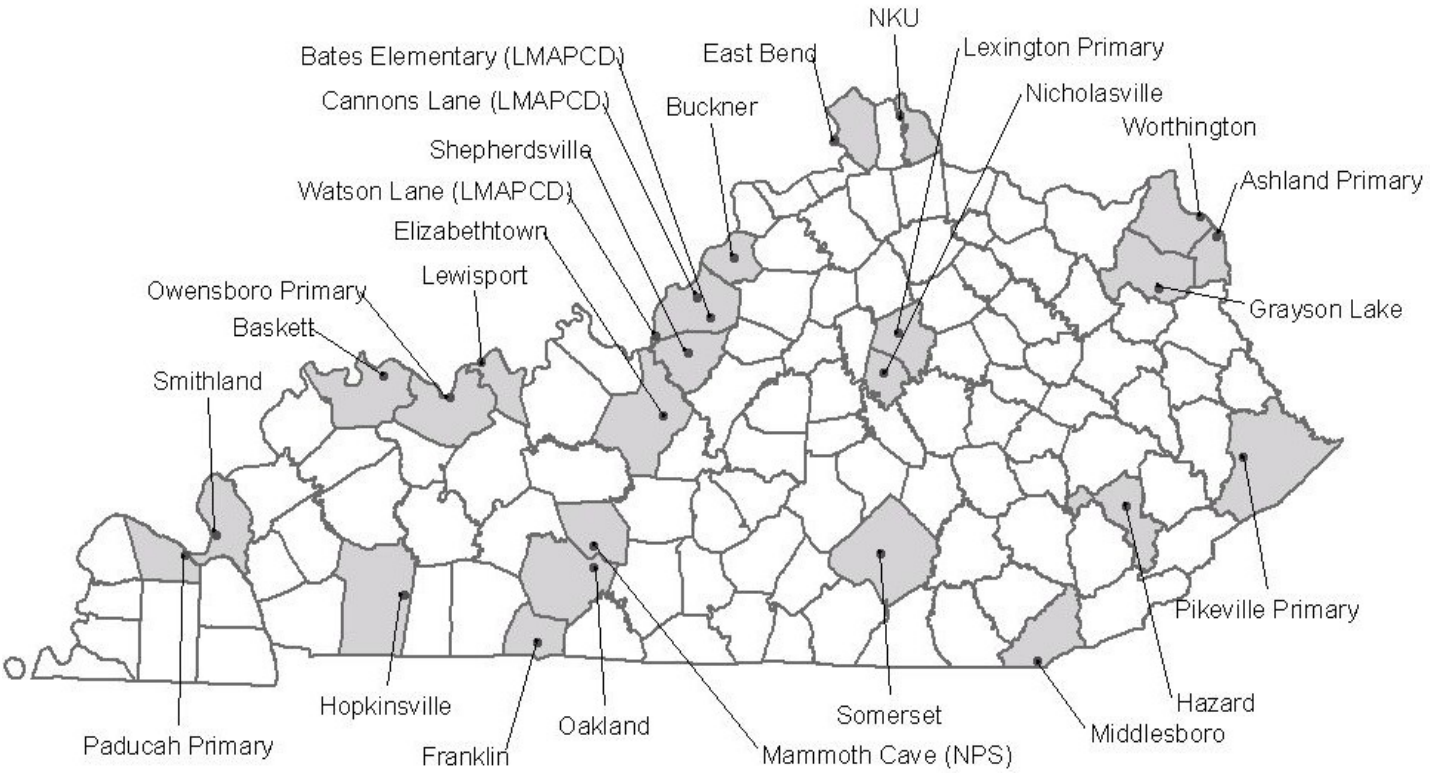



*Figure 39: Ozone monitoring locations in Kentucky.*

Ozone ($O_3$) is a colorless gas that is not emitted directly into the atmosphere from sources, but rather forms in the atmosphere from a photochemical reaction between volatile organic compounds (VOCs) and nitrogen oxides ($NO_x$) in the presence of sunlight. Sources of VOCs include motor vehicle exhaust, dry cleaning, paint solvents, and evaporation of gasoline from storage and fuel transfer facilities. Sources of $NO_x$ include emissions from motor vehicles, boilers, and power plants.

*Environmental Impacts*

In the upper atmosphere, naturally occurring stratospheric ozone (commonly called the ozone layer) shields the earth's surface from the sun's harmful ultraviolet rays. However, tropospheric ozone, also known as ground-level ozone, can trigger health problems at low level exposure, cause permanent lung damage after long term exposure, and can damage ecosystems.

*How is $O_3$ monitored?*

Ozone is monitored from March 1st through October 31st each year, when meteorological conditions are most conducive to the formation of ozone. Analyzers, which operate continuously, monitor ozone by using the ultraviolet photometry method. In this method, ambient air is drawn into a sample cell and a beam of ultraviolet light is passed through the cell.

Ozone absorbs ultraviolet light and a decrease in the intensity of the light indicates the presence of ozone. The intensity of the light is first measured with no ozone present to determine a reference value. An ambient sample is then introduced and the intensity of the resultant light is measured by an ultraviolet detector. The amount of light absorbed by the sample indicates the level of ozone

present. Data from the analyzers are transmitted into an automated data storage system. In 2011, DAQ, the National Park Service at Mammoth Cave, and the Louisville Metro Air Pollution Control District operated a total of 26 ozone monitors in Kentucky.

*Results*

In November 1997, the EPA adopted an eight-hour ozone standard based on scientific and medical research, which indicated that extended exposure to lower levels of ozone might be as harmful as short-term exposure to elevated levels. The eight-hour standard was set at 0.08 ppm. On May 27, 2008, the EPA adopted a new 8-hour standard set at 0.075 ppm. On September 16, 2009, EPA notified the Court of its decision to initiate a rulemaking to reconsider the 2008 ozone standard. However, on September 16, 2011, the EPA announced their plans to implement the 2008 ozone NAAQS of 0.075 ppm.

In 2011, there were 74 daily maximum eight-hour averages that were greater than 0.075 ppm. Seven sites showed fourth highest daily maximums in exceedance of the eight-hour standard.

Generally, there has been a decline in ozone levels over the past twenty-five years based on one-hour data. This downward trend is the result of emission controls on vehicles and a regional strategy controlling of $NO_x$ emissions from large stationary internal combustion engines, large boilers and turbines used in power plants, and other industrial applications.

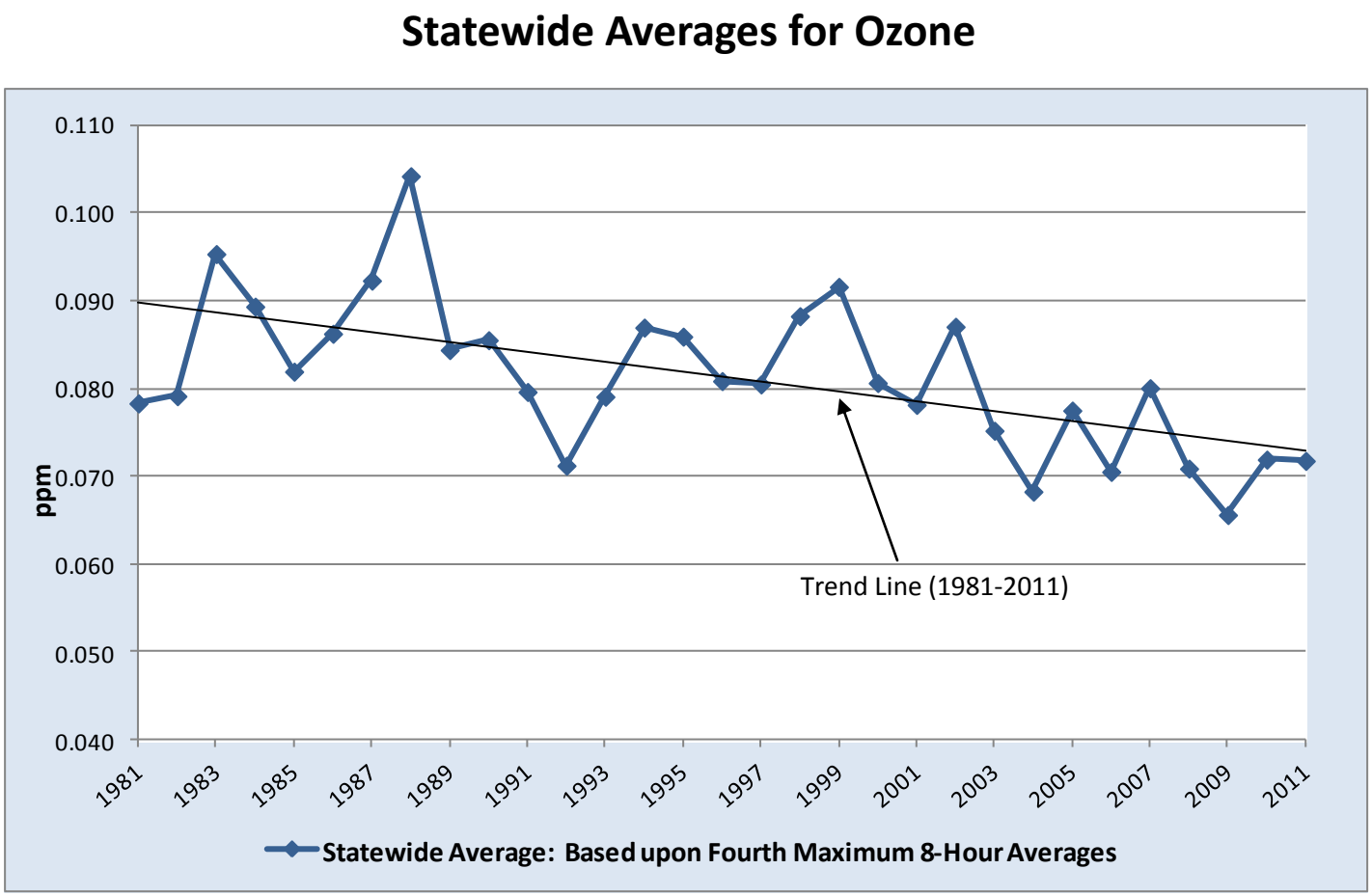



*Figure 40: Statewide averages for ozone monitoring indicate pollution reductions.*

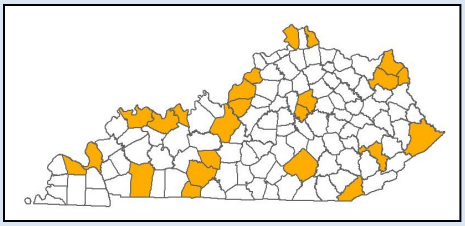
# National Ambient Air Quality Standards for Ozone

Primary NAAQS: **3-year average of the 4th highest daily maximum 8-hr concentration not to exceed 0.075 ppm**

Secondary NAAQS: **Same as Primary Standard**

## Criteria Pollutant Summary Report – 2011

**Pollutant:** **Ozone**
**Method:** Ultra-Violet Photometry
**Data Interval:** Hourly
**Units:** Parts-per-million (ppm)



| County | Site Address | AQS-ID | Valid Days Meas. | Daily Maximum 8-Hr Average | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Obs> 0.075 | 1st max | 2nd max | 3rd max | 4th max |
| Bell | 34th & Dorchester Middlesboro | 21-013-0002 | 245 | 0 | .066 | .063 | .063 | .062 |
| Boone | KY 338 & Lower River East Bend | 21-015-0003 | 239 | 0 | .075 | .072 | .071 | .070 |
| Boyd | 2924 Holt Street Ashland | 21-019-0017 | 239 | 2 | .079 | .076 | .073 | .070 |
| Bullitt | 2nd & Carpenter St Shepherdsville | 21-029-0006 | 243 | 1 | .100 | .73 | .073 | .072 |
| Campbell | 524A John Hill Rd Highland Heights | 21-037-3002 | 243 | 12 | .084 | .084 | .080 | .080 |
| Carter | Camp Webb Grayson Lake | 21-043-0500 | 233 | 0 | .070 | .067 | .067 | .066 |
| Christian | 10800 Pilot Rock Hopkinsville | 21-047-0006 | 245 | 0 | .073 | .072 | .070 | .070 |
| Daviess | US 60 and Pleasant Valley Owensboro | 21-059-0005 | 238 | 5 | .084 | .083 | .083 | .080 |
| Edmonson[1] | Alfred Cook Road Mammoth Cave | 21-061-0501 | 236 | 0 | .073 | .072 | .072 | .071 |
| Fayette | 650 Newtown Pike Lexington | 21-067-0012 | 244 | 3 | .080 | .078 | .077 | .075 |
| Greenup | Scott & Center St Worthington | 21-089-0007 | 245 | 2 | .086 | .076 | .073 | .071 |
| Hancock | 2nd & Caroline Lewisport | 21-091-0012 | 233 | 3 | .079 | .078 | .076 | .075 |
| Hardin | 801 North Miles St Elizabethtown | 21-093-0006 | 245 | 0 | .074 | .070 | .070 | .069 |
| Henderson | Baskett Fire Dept. Baskett | 21-101-0014 | 244 | 4 | .082 | .081 | .078 | .077 |
| Jefferson[2] | 7601 Bardstown Rd Louisville | 21-111-0027 | 245 | 6 | .096 | .091 | .083 | .081 |
| Jefferson[2] | 7201 Watson Lane Louisville | 21-111-0051 | 244 | 5 | .084 | .083 | .082 | .082 |
| Jefferson[2] | 2730 Cannons Lane Louisville | 21-111-0067 | 242 | 8 | .087 | .085 | .084 | .082 |

# Ozone Criteria Pollutant Summary Report – 2011 Continued

| County | Site Address | AQS-ID | Valid Days Meas. | Daily Maximum 8-Hr Average | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Obs> 0.075 | 1st max | 2nd max | 3rd max | 4th max |
| Jessamine | KYDOT, Etter Drive Nicholasville | 21-113-0001 | 245 | 2 | .082 | .076 | .075 | .072 |
| Livingston | KYDOT 811 US 60E Smithland | 21-139-0003 | 228 | 2 | .077 | .076 | .071 | .071 |
| McCracken | 2901 Powell Street Paducah | 21-145-1024 | 242 | 3 | .089 | .078 | .076 | .071 |
| Oldham | DOT Garage, 3995 Morgan Buckner | 21-185-0004 | 245 | 13 | .097 | .093 | .090 | .090 |
| Perry | Perry Co Horse Park Hazard | 21-193-0003 | 231 | 0 | .066 | .064 | .064 | .063 |
| Pike | 101 North Mayo Trail Pikeville | 21-195-0002 | 235 | 0 | .069 | .067 | .067 | .066 |
| Pulaski | Clifty Street Somerset | 21-199-0003 | 245 | 0 | .072 | .070 | .069 | .067 |
| Simpson | KYDOT, HWY 1008 Franklin | 21-213-0004 | 237 | 3 | .083 | .082 | .076 | .071 |
| Warren | Oakland Elementary School Oakland | 21-227-0008 | 241 | 0 | .070 | .069 | .067 | .066 |

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
Values in red are a visual representation of an exceedance of the NAAQS.

# Ozone Criteria Pollutant Multi-Year Summary Report – 2011
## 8-hour 4th Maximum, 3-year Average

| County | Site Address | AQS-ID | 4th Maximum 8-hr Average | | | |
|---|---|---|---|---|---|---|
| | | | 2009 | 2010 | 2011 | 3-Yr Avg |
| Bell | 34th & Dorchester<br>Middlesboro | 21-013-0002 | .060 | .068 | .062 | .063 |
| Boone | KY 338 & Lower River Road<br>East Bend | 21-015-0003 | .064 | .067 | .070 | .067 |
| Boyd | 2924 Holt Street<br>Ashland | 21-019-0017 | .066 | .072 | .070 | .069 |
| Bullitt | 2nd & Carpenter Streets<br>Shepherdsville | 21-029-0006 | .064 | .074 | .072 | .070 |
| Campbell | 524A John Hill<br>Highland Heights | 21-037-3002 | .068 | .073 | .080 | .073 |
| Carter | Camp Webb<br>Grayson Lake | 21-043-0500 | .063 | .071 | .066 | .066 |
| Christian | 10800 Pilot Rock Road<br>Hopkinsville | 21-047-0006 | .066 | .074 | .070 | .070 |
| Daviess | US 60 & Pleasant Valley Rd<br>Owensboro | 21-059-0005 | .067 | .072 | .080 | .073 |
| Edmonson[1] | Alfred Cook Road<br>Mammoth Cave | 21-061-0501 | .065 | .075 | .071 | .070 |
| Fayette | 650 Newtown Pike<br>Lexington | 21-067-0012 | .063 | .071 | .075 | .069 |
| Greenup | Scott & Center Streets<br>Worthington | 21-089-0007 | .063 | .071 | .071 | .068 |
| Hancock | 2nd & Caroline Streets<br>Lewisport | 21-091-0012 | .069 | .073 | .075 | .072 |
| Hardin | 801 North Miles Street<br>Elizabethtown | 21-093-0006 | .066 | .071 | .069 | .068 |
| Henderson | Baskett Fire Dept<br>Baskett | 21-101-0014 | .071 | .074 | .077 | .074 |
| Jefferson[2] | 7601 Bardstown Road<br>Louisville | 21-111-0027 | .068 | .075 | .081 | .074 |
| Jefferson[2] | 7201 Watson Lane<br>Louisville | 21-111-0051 | .078 | .074 | .082 | .078 |
| Jefferson[2] | 2730 Cannons Lane<br>Louisville | 21-111-1021 | n/a | .085 | .082 | .083 |
| Jessamine | KYDOT, Etter Drive<br>Nicholasville | 21-113-0001 | .065 | .069 | .072 | .068 |
| Livingston | KYDOT, 811 US 60 East<br>Smithland | 21-139-0003 | .065 | .069 | .072 | .068 |
| McCracken | 2901 Powell Street<br>Paducah | 21-145-1024 | .066 | .073 | .071 | .070 |
| Oldham | DOT Garage, 3995 Morgan Rd<br>Buckner | 21-185-0004 | .068 | .078 | .090 | .078 |
| Perry | Perry County Horse Park<br>Hazard | 21-193-0003 | .062 | .071 | .063 | .065 |
| Pike | 101 North Mayo Trail<br>Pikeville | 21-195-0002 | .062 | .070 | .066 | .066 |
| Pulaski | Clifty Street<br>Somerset | 21-199-0003 | .061 | .066 | .067 | .064 |
| Simpson | KYDOT, Hwy 1008<br>Franklin | 21-213-0004 | .066 | .073 | .071 | .070 |
| Warren | Oakland Elementary School<br>Oakland | 21-227-0008 | .058 | .068 | .066 | .064 |

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
Values in red are a visual representation of an exceedance of the NAAQS.

# PARTICULATE MATTER ($PM_{2.5}$)

## 2011 Particulate Matter ($PM_{2.5}$) Ambient Air Monitoring Network

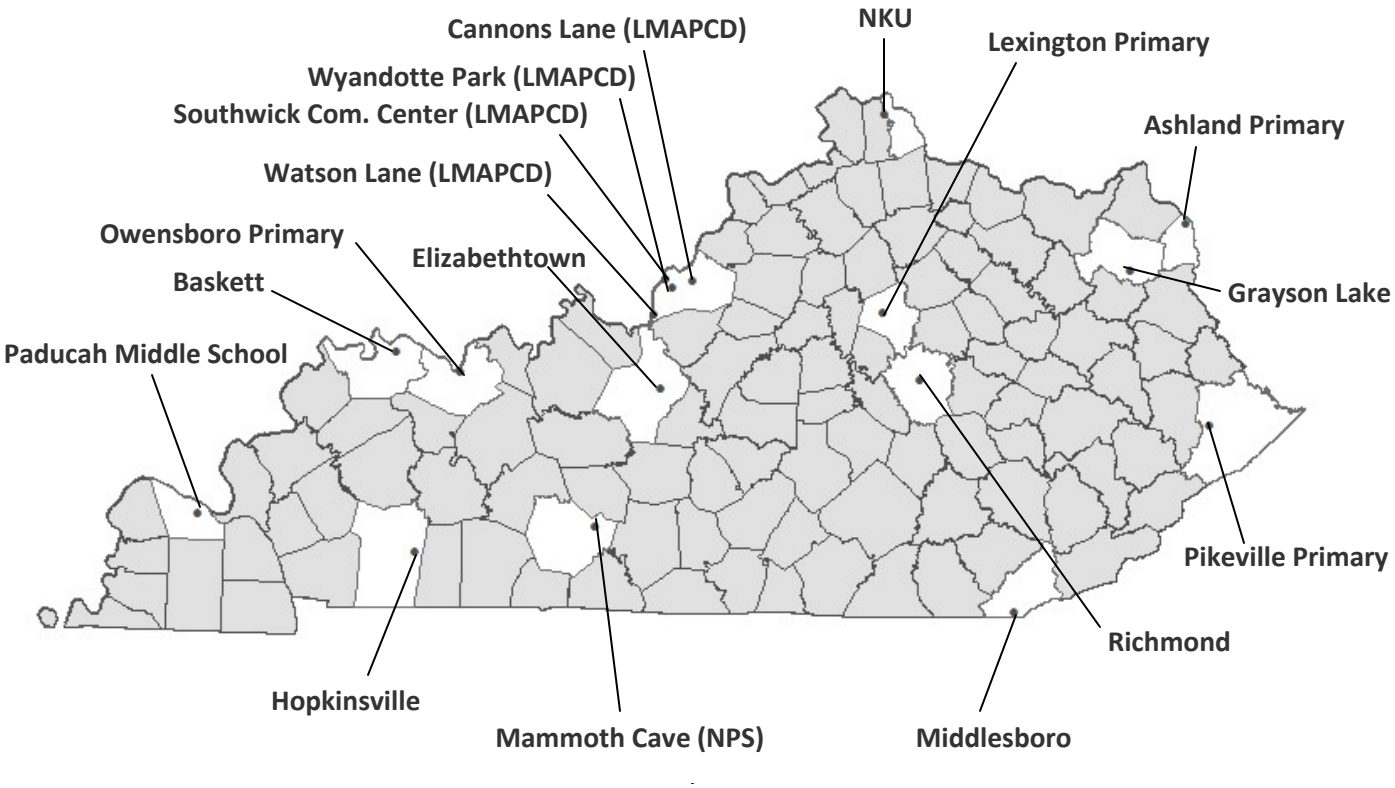



*Figure 41: $PM_{2.5}$ monitoring locations in Kentucky.*

Particulate Matter ($PM_{2.5}$) is a mixture of solid particles and liquid droplets that are 2.5 microns or smaller in size. Sources of $PM_{2.5}$ include power plants, wood burning, industrial processes, and fuel combustion. Fine particulates are also formed in the atmosphere when gases are transformed through chemical reactions. Sulfur dioxide, nitrogen oxides, and VOCs are all examples of gases that can transform by chemical reactions.

*Environmental Impacts*

Particulate matter of 2.5 microns or less has the ability to penetrate into the deepest parts of the lungs, causing chronic respiratory symptoms in sensitive populations and premature deaths in the elderly. $PM_{2.5}$ also affects the environment by reducing visibility (up to 70% in some areas of the U.S.) and contributing to acid rain.

*How is $PM_{2.5}$ monitored?*

The division currently operates continuous Tapered Element Oscillating Microbalance (TEOM) monitors, continuous FEM Beta Attenuation Monitors (BAM), and manual intermittent FRM and FEM samplers. However, only the FRM and FEM manual intermittent samplers are used for comparisons to the NAAQS. The BAM and TEOM monitors continuously report $PM_{2.5}$ Air Quality Index (AQI) results. The FRM and FEM manual samplers are used for calculation of the AQI for historic data.

The manual intermittent FRM-type monitors collect a sample over a 24-hour run cycle. While most

samplers operate every third day, some samplers operate every sixth day and others operate every day. These samplers operate by drawing a measured volume of air through a pre-weighed filter. Before reaching the filter, the air passes through an impaction chamber where larger particles fall out of the air stream while particles smaller than 2.5 microns pass on to the sample filter where they are collected.

After completion of the sample run, the filter is removed from the sampler and weighed to determine the mass of the particulates collected. In 2011, DAQ, the NPS at Mammoth Cave, and the LMAPCD operated a network of 38 continuous and intermittent samplers. Eleven sites were equipped with FRM-type samplers for comparison to the NAAQS.

*Results*

There was only one exceedance of the 24-hour $PM_{2.5}$ standard and zero exceedances of the annual standard in 2011. Furthermore, no sampler exceeded either the three-year 24-hour (2009-2011) standard or the three- year (2009-2011) annual standard. This is a significant accomplishment.

Generally, statewide $PM_{2.5}$ levels have declined from 2000-2011 time period.

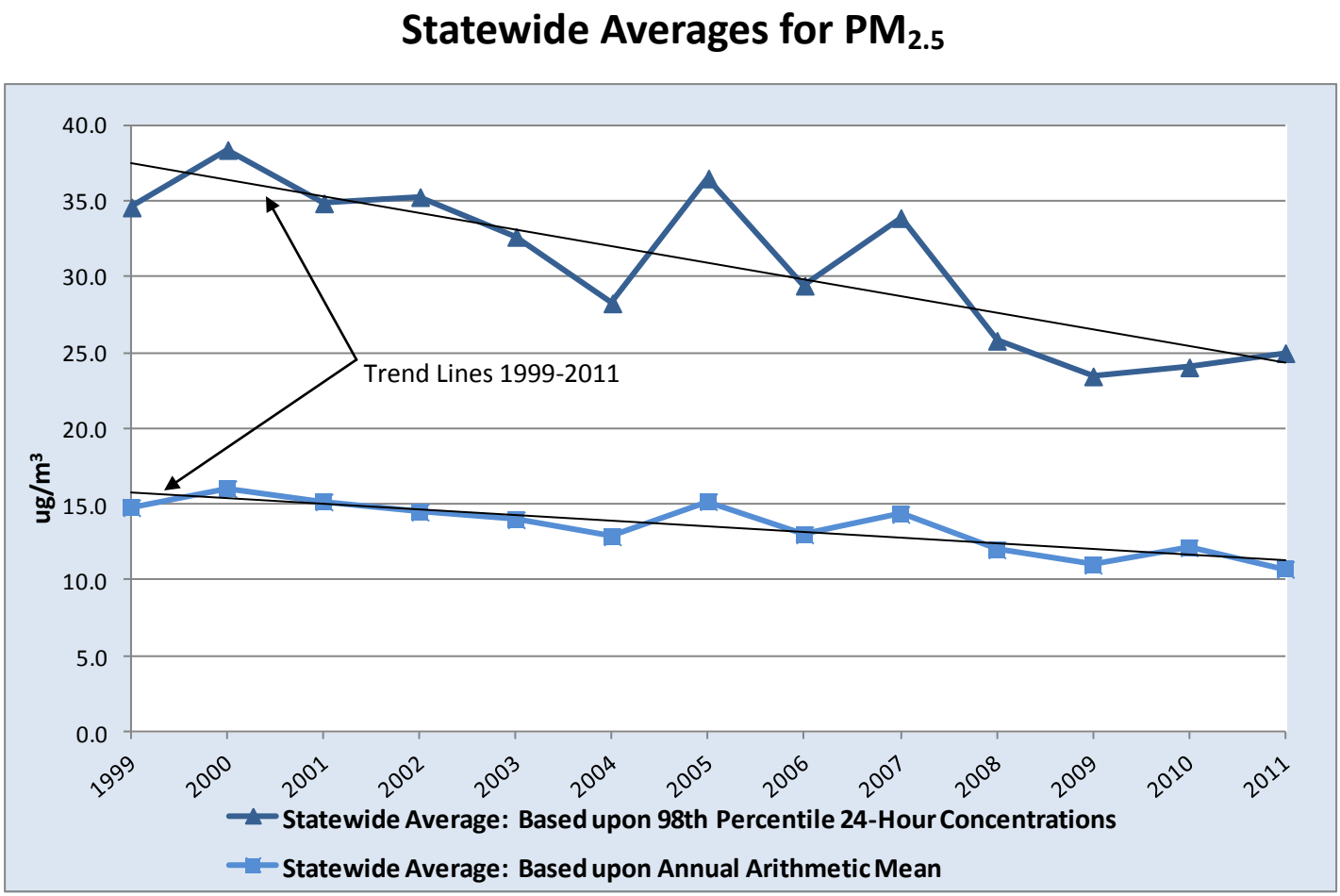



*Figure 42: Statewide averages for $PM_{2.5}$ monitoring indicate pollution reductions.*

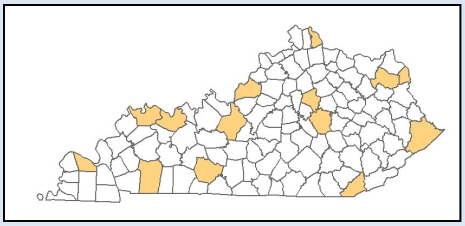
# National Ambient Air Quality Standards for Particulate Matter $PM_{2.5}$

Primary NAAQS: **3-year average of the weighted annual mean not to exceed 15.0 µg/m$^3$**
**3-year average of the 98$^{th}$ percentiles of 24-hour concentrations not to exceed 35 µg/m$^3$**

Secondary NAAQS: **Same as Primary Standard**

## Criteria Pollutant Summary Report – 2011

**Pollutant:** **Particulate Matter $PM_{2.5}$**
**Method:** Gravimetric
**Data Interval:** 24-hour
**Units:** Micrograms per cubic meter (µg/m$^3$)



| County | Site | AQS-ID | # Obs | Mean | 24-Hour Average | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Obs >35 | 1$^{st}$ max | 2$^{nd}$ max | 3$^{rd}$ max | 4$^{th}$ max |
| Bell | 34$^{th}$ & Dorchester Middlesboro | 21-013-0002 | 53 | 10.57 | 0 | 26.6 | 26.0 | 24.3 | 17.8 |
| Boyd | 2924 Holt Street Ashland | 21-019-0017 | 119 | 10.37 | 0 | 28.3 | 25.0 | 22.5 | 20.0 |
| Bullitt | 2$^{nd}$ & Carpenter Street Shepherdsville | 21-029-0006 | 103 | 11.32 * | 0 | 32.1 | 25.9 | 25.7 | 23.3 |
| Campbell | 524A John Hill Rd Highland Heights | 21-037-3002 | 118 | 10.34 | 0 | 28.5 | 26.4 | 25.8 | 25.7 |
| Carter | Camp Webb Grayson Lake | 21-043-0500 | 119 | 8.61 | 0 | 23.1 | 20.9 | 19.6 | 19.6 |
| Christian | 10800 Pilot Rock Hopkinsville | 21-047-0006 | 114 | 11.16 | 0 | 25.3 | 24.3 | 23.2 | 23.2 |
| Daviess | US 60 and Pleasant Valley Rd Owensboro | 21-059-0014 | 115 | 12.05 | 0 | 32.0 | 31.5 | 27.2 | 25.7 |
| Fayette | 650 Newtown Pike Lexington | 21-067-0012 | 116 | 10.33 | 0 | 27.0 | 25.7 | 24.0 | 22.9 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 95 | 10.86 * | 0 | 30.0 | 24.4 | 23.5 | 22.5 |
| Franklin | 803 Schenkel Lane Frankfort | 21-073-0006 | 98 | 10.17 * | 0 | 34.4 | 26.4 | 24.2 | 23.4 |
| Hardin | 801 North Miles Street Elizabethtown | 21-093-0006 | 114 | 10.76 | 0 | 26.3 | 25.5 | 24.7 | 23.6 |

# $PM_{2.5}$ Criteria Pollutant Summary Report – 2011 Continued

| County | Site | AQS-ID | # Obs | Mean | 24-Hour Average | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Obs >35 | 1st max | 2nd max | 3rd max | 4th max |
| Henderson | Basket Fire Dept Baskett | 21-101-0014 | 114 | 11.03 | 0 | 27.9 | 26.6 | 26.2 | 26.0 |
| Jefferson[1] | 37th & Southern Avenue Louisville | 21-111-0043 | 348 | 12.08 | 0 | 31.7 | 31.7 | 29.6 | 29.1 |
| Jefferson[1] | 1032 Beecher Avenue Louisville | 21-111-0044 | 354 | 12.29 | 1 | 36.5 | 33.2 | 31.9 | 30.8 |
| Jefferson[1] | 7201 Watson Lane Louisville | 21-111-0051 | 59 | 11.78 | 0 | 33.0 | 31.3 | 28.4 | 27.1 |
| Jefferson[1] | 2730 Cannons Lane Louisville | 21-111-0067 | 119 | 11.47 | 0 | 33.2 | 28.1 | 27.0 | 25.8 |
| McCracken | 342 Lone Oak Road Paducah | 21-145-1004 | 119 | 10.38 | 0 | 24.3 | 23.3 | 23.2 | 21.5 |
| Madison | Mayfield School Richmond | 21-151-0003 | 117 | 9.18 | 0 | 23.1 | 22.8 | 21.8 | 21.8 |
| Pike | 101 North Mayo Trail Pikeville | 21-195-0002 | 117 | 9.49 | 0 | 24.0 | 23.9 | 23.7 | 22.9 |
| Warren | Oakland Elementary Oakland | 21-227-0008 | 108 | 10.97 | 0 | 26.5 | 24.7 | 22.2 | 20.7 |

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red are a visual representation of an exceedance of the NAAQS.

# $PM_{2.5}$ Criteria Pollutant Multi-Year Summary Report – 2011
# 24-Hour 98th Percentile, 3-Year Average

| County | Site | AQS-ID | 24-Hour, 98th Percentile | | | |
|---|---|---|---|---|---|---|
| | | | 2009 | 2010 | 2011 | 3-Yr Avg |
| Bell | 34th & Dorchester<br>Middlesboro | 21-013-0002 | 23.1 | 28.3 | 26.0 | 26 |
| Boyd | 2924 Holt Street<br>Ashland | 21-019-0017 | 23.5 | 26.2 | 22.5 | 24 |
| Bullitt | 2nd & Carpenter Streets<br>Shepherdsville | 21-029-0006 | 23.1 | 24.0 | 25.7 * | 24 * |
| Campbell | 524A John Hill<br>Highland Heights | 21-037-3002 | 22.5 | 25.6 | 25.8 | 25 |
| Carter | Camp Webb<br>Grayson Lake | 21-043-0500 | 16.9 | 20.2 | 19.6 | 19 |
| Christian | 10800 Pilot Rock Road<br>Hopkinsville | 21-047-0006 | 24.0 * | 21.8 | 23.2 | 23 * |
| Daviess | US 60 and Pleasant Valley Rd<br>Owensboro | 21-059-0005 | 25.4 | 28.1 | 27.2 | 27 |
| Fayette | 650 Newtown Pike<br>Lexington | 21-067-0012 | 21.4 | 22.8 | 24.0 | 23 |
| Fayette | 533 South Limestone<br>Lexington | 21-067-0014 | 20.0 | 22.0 | 24.4 * | 22 * |
| Franklin | 803 Schenkel Lane<br>Frankfort | 21-073-0006 | 19.6 | 22.9 | 26.4 * | 23 * |
| Hardin | 801 North Miles Street<br>Elizabethtown | 21-093-0006 | 22.3 | 21.1 | 24.7 | 23 |
| Henderson | Baskett Fire Dept<br>Baskett | 21-101-0014 | 26.2 | 24.4 | 26.2 | 26 |
| Jefferson[1] | 37th & Southern Avenue<br>Louisville | 21-111-0043 | 24.3 | 27.5 | 28.0 | 27 |
| Jefferson[1] | 1032 Beecher Avenue<br>Louisville | 21-111-0044 | 25.7 | 28.8 | 26.8 | 27 |
| Jefferson[1] | 7201 Watson Lane<br>Louisville | 21-111-0051 | 24.7 | 26.1 | 31.3 | 27 |
| Jefferson[1] | 2730 Cannons Lane<br>Louisville | 21-111-0048 | 24.1 | 25.8 | 27.0 | 26 |
| McCracken | 342 Lone Oak Road<br>Paducah | 21-145-1004 | 25.1 | 25.0 | 23.2 | 24 |
| Madison | Mayfield School<br>Richmond | 21-151-0003 | 18.5 | 20.8 | 21.8 | 20 |
| Pike | 101 North Mayo Trail<br>Pikeville | 21-195-0002 | 23.5 | 23.6 | 23.7 | 24 |
| Warren | Oakland Elementary<br>Oakland | 21-227-0008 | 21.0 | 20.7 | 24.0 | 22 |

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.

# $PM_{2.5}$ Criteria Pollutant Multi-Year Summary Report – 2011
## Annual Weighted Mean, 3-Year Average

| County | Site | AQS-ID | Annual Weighted Mean | | | |
|---|---|---|---|---|---|---|
| | | | 2009 | 2010 | 2011 | 3-Yr Avg |
| Bell | 34th & Dorchester<br>Middlesboro | 21-013-0002 | 10.4 | 12.9 | 10.6 | 11.3 |
| Boyd | 2924 Holt Street<br>Ashland | 21-019-0017 | 10.9 | 11.2 | 10.4 | 10.8 |
| Bullitt | 2nd & Carpenter Streets<br>Shepherdsville | 21-029-0006 | 11.8 | 13.4 | 11.3 * | 12.2 * |
| Campbell | 524A John Hill<br>Highland Heights | 21-037-3002 | 11.3 | 11.8 | 10.3 | 11.1 |
| Carter | Camp Webb<br>Grayson Lake | 21-043-0500 | 8.8 | 9.9 | 8.6 | 9.1 |
| Christian | 10800 Pilot Rock Road<br>Hopkinsville | 21-047-0006 | 10.7 * | 11.2 | 11.2 | 11.0 * |
| Daviess | US 60 and Pleasant Valley Rd<br>Owensboro | 21-059-0005 | 11.9 | 12.9 | 12.1 | 12.3 |
| Fayette | 650 Newtown Pike<br>Lexington | 21-067-0012 | 11.1 | 12.2 | 10.3 | 11.2 |
| Fayette | 533 South Limestone<br>Lexington | 21-067-0014 | 11.0 | 12.0 | 10.9 * | 11.3 * |
| Franklin | 803 Schenkel Lane<br>Frankfort | 21-073-0006 | 10.4 | 11.4 | 10.2 * | 10.7 * |
| Hardin | 801 North Miles Street<br>Elizabethtown | 21-093-0006 | 10.9 | 11.8 | 10.6 | 11.1 |
| Henderson | Baskett Fire Dept<br>Baskett | 21-101-0014 | 11.6 | 12.5 | 11.0 | 11.7 |
| Jefferson[1] | 37th & Southern Avenue<br>Louisville | 21-111-0043 | 12.2 | 13.5 | 12.1 | 12.6 |
| Jefferson[1] | 1032 Beecher Avenue<br>Louisville | 21-111-0044 | 12.5 | 13.7 | 12.3 | 12.8 |
| Jefferson[1] | 7201 Watson Lane<br>Louisville | 21-111-0051 | 11.6 | 14.8 | 11.8 | 12.7 |
| Jefferson[1] | 2730 Cannons Lane<br>Louisville | 21-111-0067 | 11.7 | 13.3 | 11.5 | 12.1 |
| McCracken | 342 Lone Oak Road<br>Paducah | 21-145-1004 | 11.5 | 11.4 | 10.4 | 11.1 |
| Madison | Mayfield School<br>Richmond | 21-151-0003 | 9.7 | 10.7 | 9.2 | 9.9 |
| Pike | 101 North Mayo Trail<br>Pikeville | 21-195-0002 | 9.3 | 10.4 | 9.5 | 9.7 |
| Warren | Oakland Elementary<br>Oakland | 21-227-0008 | 10.7 | 11.6 | 10.8 | 11.0 |

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.

# PARTICULATE MATTER ($PM_{2.5}$): SPECIATION

## 2011 Particulate Matter ($PM_{2.5}$) Speciation Ambient Air Monitoring Network

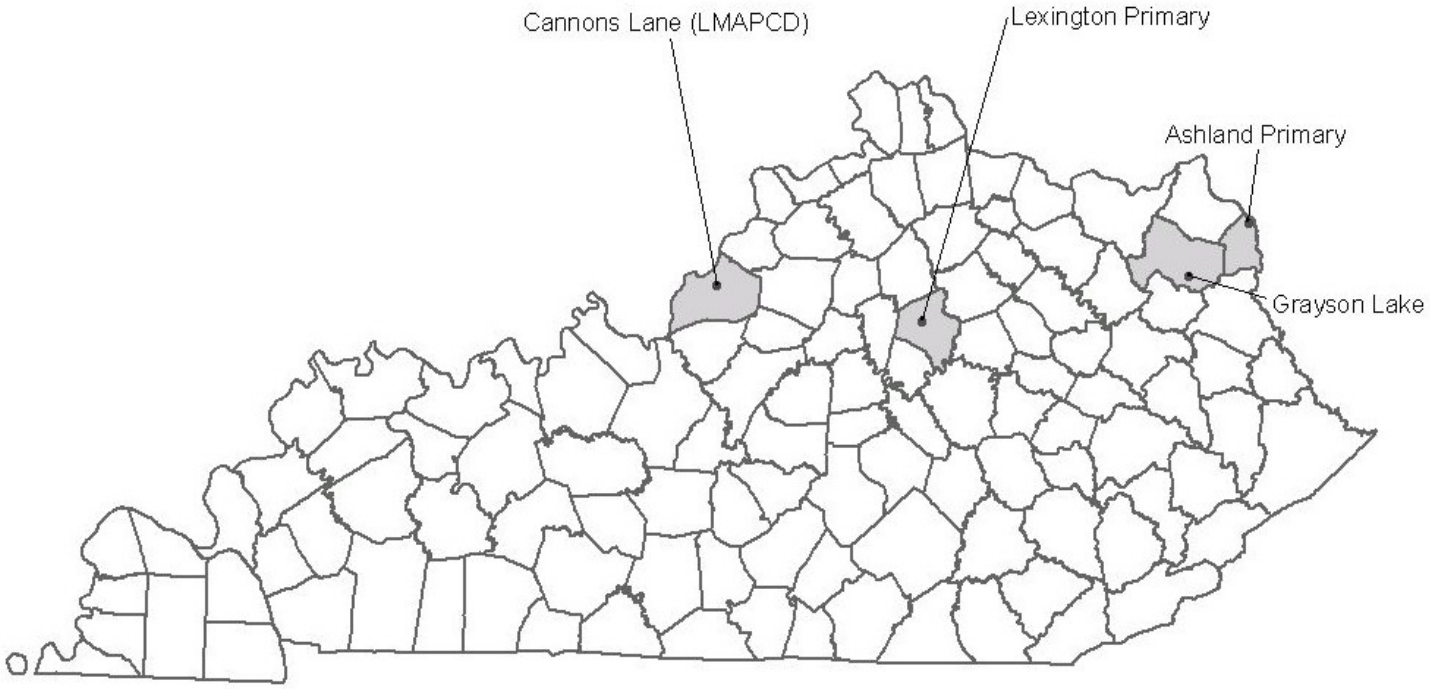



*Figure 43: $PM_{2.5}$ speciation monitoring locations in Kentucky.*

The promulgation of the new $PM_{2.5}$ standards may require all future areas not meeting the standards to reduce emissions of fine particulates and their precursors. Efficient air quality management requires knowing which sources contribute to the problem and estimating how much. However, determining $PM_{2.5}$ source contributions is complicated due to the fact that often half or more of the $PM_{2.5}$ mass is comprised of secondarily formed species, therefore hiding their point of origin. In addition, $PM_{2.5}$ may remain in the atmosphere for several days enabling sources several hundred miles away to affect an area. Realizing this, the EPA established the Speciation Trends Network designed to assist in identifying the compounds associated with fine particulates. The network is used to provide data on a target group of chemical species known to be significant contributors to $PM_{2.5}$ mass. The data provided by the network can be used to support several areas that include:

- Assisting the implementation of the $PM_{2.5}$ standard by using speciated data as input to air quality modeling analyses and as indicators to track progress of controls.
- Aiding the interpretation of health studies by linking effect to $PM_{2.5}$ constituents.
- Understanding the effect of atmospheric constituents on visibility impairment.
- Using the speciated particulate data to aid in monitoring network design and siting adjustment.

*How is $PM_{2.5}$ speciation monitored?*

The approach to be used for chemical speciation involves both sampling and analysis components. The target groups of chemical species include a list of analytes that consist of an array of cations, anions, carbon species, and trace elements. Because no one sample media is capable of providing the appropriate sample collection for all of the target analytes, each series of analytes requires

sample collection on the appropriate media and utilization of the appropriate analytical techniques. One instrument collects $PM_{2.5}$ speciation samples. Samples are collected on a set of two filters, one comprised of Teflon and one comprised of nylon, over a 24-hour sampling period. A second instrument collects a sample on a quartz filter over a 24-hour sampling period. The quartz filter is used to collect a speciated carbon sample.

$PM_{2.5}$ speciation samples are sent to an EPA contract laboratory for analysis. Listed below are the target analytes and the analytical techniques used:

- Trace Elements: X-ray fluorescence and particle induced X-ray emission
- Anion and Cations: Ion chromatography
- Carbon: Controlled-combustion/thermal optical

Once analysis is complete, the analytes are grouped into the target chemical species listed below. These species in turn can be linked to source categories that ultimately can be used to assist in understanding $PM_{2.5}$ and developing control strategies needed to reduce ambient levels.

- Nitrate (total)
- Sulfate
- Ammonium
- Organic Carbon
- Elemental Carbon
- Crustal Component (trace elements, fine soil)
- Other ($PM_{2.5}$ mass unaccounted for by analytical methods)

*Results*

In 2011, the Kentucky Division for Air Quality operated a network of three Speciation Trends Network monitors and the Louisville Metro Air Pollution Control District operated one monitor. The sites are strategically located to address different types of land-use ranging from heavy industrial, urban, and rural. The charts on the following pages provide a visual representation of the major components of speciation data collected at each site during 2011. The data suggests that particulates identified as non-crustal species and other elements, along with sulfates and organic carbon are the primary contributors to $PM_{2.5}$ in Kentucky. Sulfates are formed from sulfur dioxide emissions with the major sources of those emissions being coal-fired power plants. Organic carbon comes from a combination of mobile and stationary combustion sources.

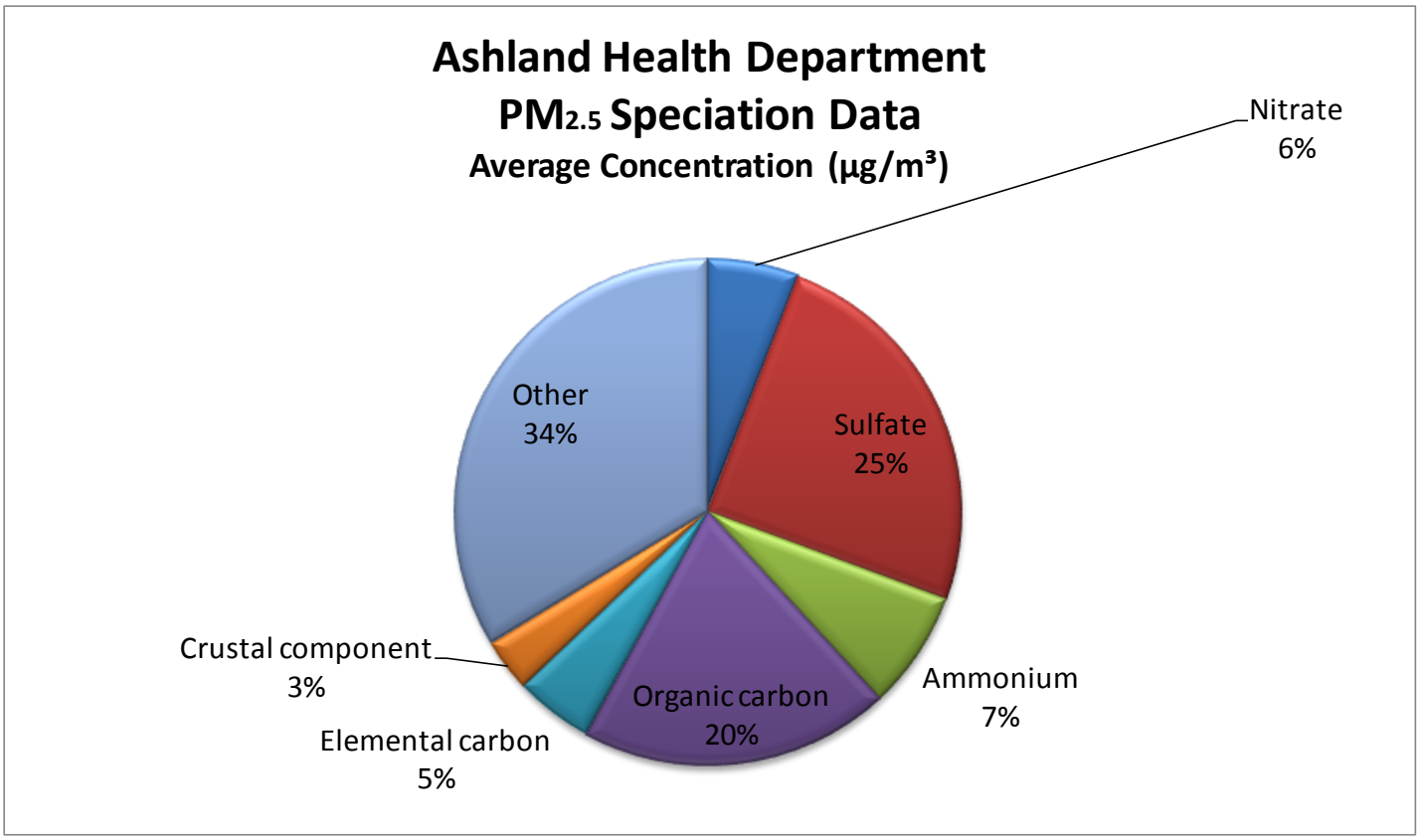



Figure 44: Speciation trends network data from 1/3/2011 - 12/29/2011, Ashland Health Department monitor. AQS I.D.: 21-019-0017. "Other" represents the percentage of mass not characterized as a major element or crustal component.

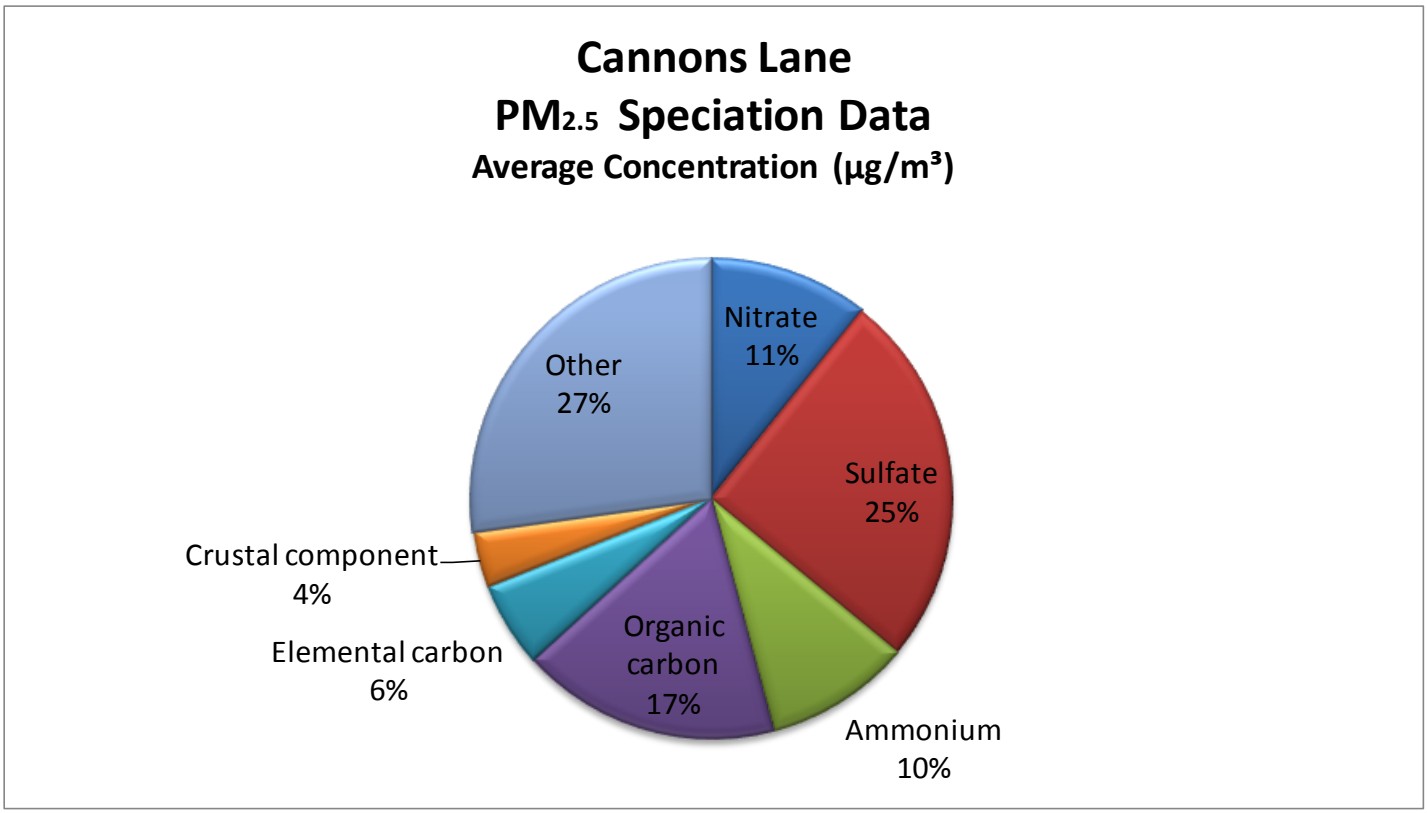



Figure 45: Speciation trends network data from 1/3/2011 - 12/29/2011, Louisville Metro Air Pollution Control District monitor. AQS I.D.: 21-111-0067. "Other" represents the percentage of mass not characterized as a major element or crustal component.

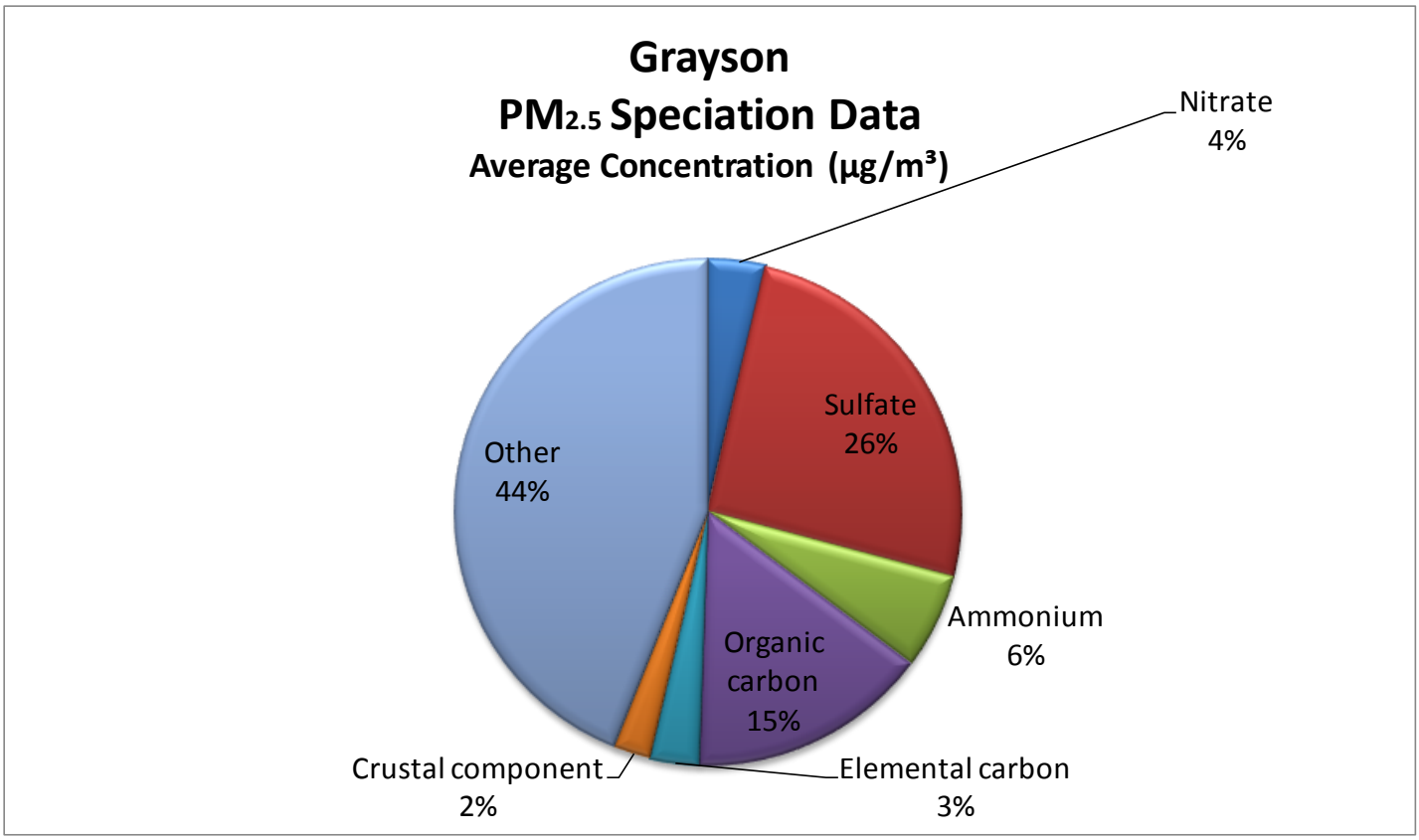



Figure 46: Speciation trends network data from 1/3/2011 - 12/29/2011, Grayson Lake monitor. AQS I.D.: 21-043-0500. "Other" represents the percentage of mass not characterized as a major element or crustal component.

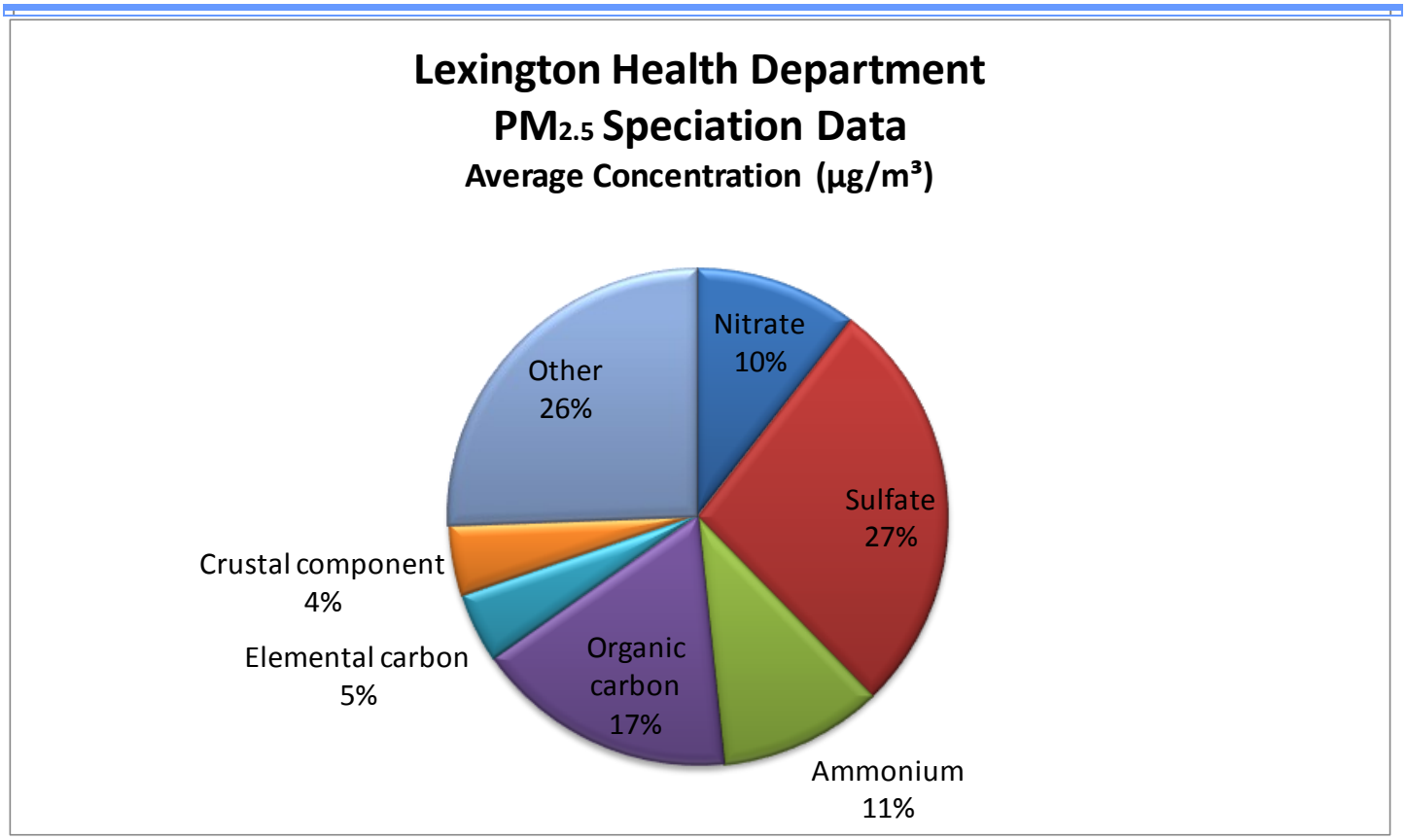



Figure 47: Speciation trends network data from 1/3/2011 - 12/29/2011, Lexington Health Department monitor. AQS I.D.: 21-067-0012. "Other" represents the percentage of mass not characterized as a major element or crustal component.

# PARTICULATE MATTER ($PM_{10}$)

## 2011 Particulate Matter ($PM_{10}$) Ambient Air Monitoring Network

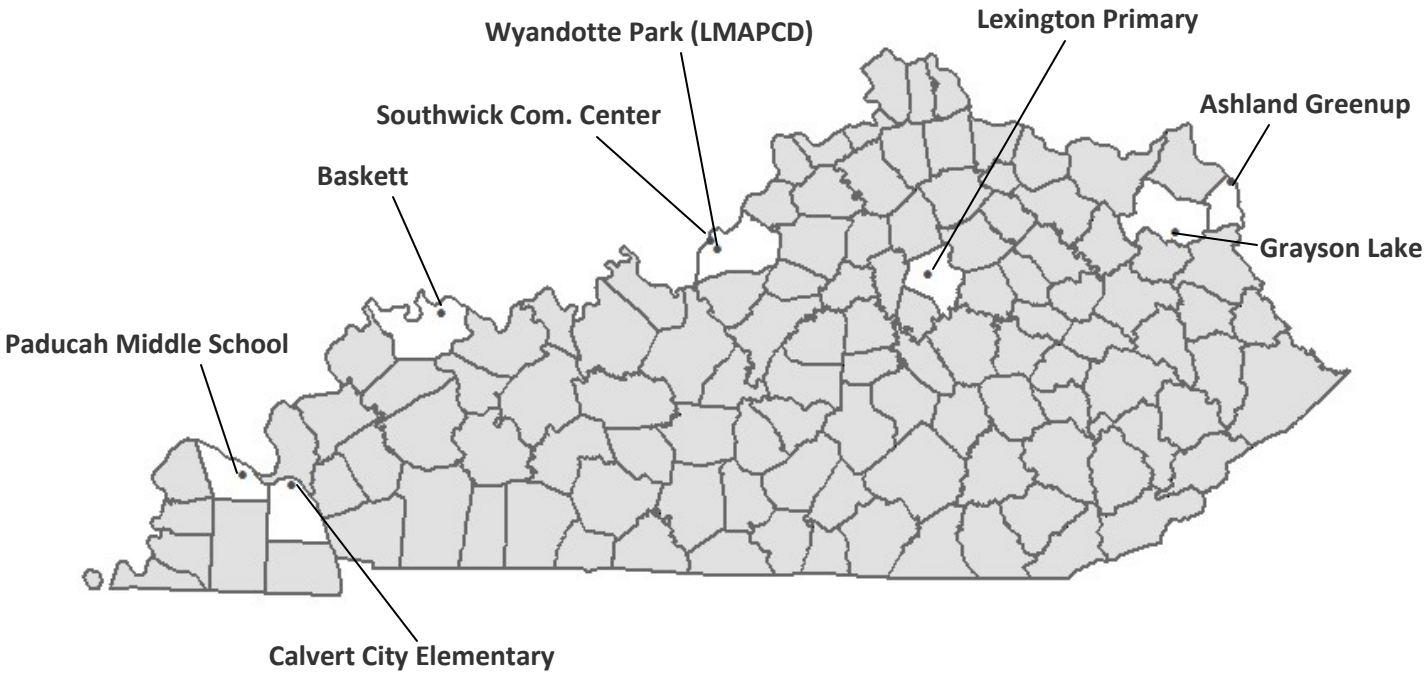



*Figure 48: $PM_{10}$ monitoring locations in Kentucky.*

Particulate Matter of 10 microns or less in diameter ($PM_{10}$) is a mixture of solid particles and liquid droplets. Some common sources of $PM_{10}$ are prescribed fires, construction activities, agricultural practices, and smokestacks.

*Environmental Impacts*

The primary health effects of particulates are that they aggravate respiratory and cardiovascular disease, and large amounts can increase the death rates of sufferers. The elderly, children, and people with chronic lung disease are especially sensitive to particulate matter.

Particulate matter can soil and damage a wide range of man-made items such as building surfaces. $PM_{10}$ damages vegetation by interfering with plant photosynthesis due to the formation of a film on leaves that reduces exposure to sunlight.

Particulate pollution can also produce haze, which diminishes visibility and the amount of sunlight reaching the earth.

*How is $PM_{10}$ monitored?*

For $PM_{10}$ NAAQS comparisons, both intermittent and continuous monitor types may be used because they are both FRM or FEM equivalents. Most $PM_{10}$ samplers are the intermittent type that operates for 24 hours, every sixth day. These samplers operate by drawing a measured volume of air through a pre-weighed filter over a 24-hour period. Before reaching the filter, the air passes through an impaction chamber where larger particles fall out of the air stream while particles smaller than ten microns pass on to the sample filter where they are collected.

After completion of the sample run, the filter is removed from the sampler and reweighed to determine the mass of the particulates collected. Sample results are entered manually into a data storage system. The network also includes continuously operating $PM_{10}$ samplers that provide results daily. These samplers determine sample weights electronically and transmit results by telemetry into an automated data storage system. In 2011, the DAQ and the LMAPCD operated a combined network of eight $PM_{10}$ intermittent and continuous samplers in Kentucky.

*Results*

The annual $PM_{10}$ standard is attained when the expected number of days per year with a 24-hour concentration greater than 150 ug/$m^3$ is less than or equal to one, when averaged over a three-year period. When a site samples on an everyday frequency, the expected number of exceedances is equal to the number of actual exceedances. However, when sampling frequency does not occur everyday the number of days expected to be greater 150 ug/$m^3$ is obtained via a calculation. Poor data recovery can also impact the expected number of exceedances per year.

There were no exceedances of the annual $PM_{10}$ standard in 2011. The last $PM_{10}$ exceedance occurred on January 7, 2000, at a Louisville site (21-111-0043) where a 24-hour sample measured 152 µg/$m^3$. The only other exceedance of a $PM_{10}$ standard occurred on August 27, 1990, in Ashland, where a 24-hour value measured 182 µg/$m^3$.

All Kentucky counties are currently in attainment with the $PM_{10}$ standard. Statewide and regional $PM_{10}$ levels have shown declining trends. This downward trend is the result of controls on industrial sources for particulate matter.

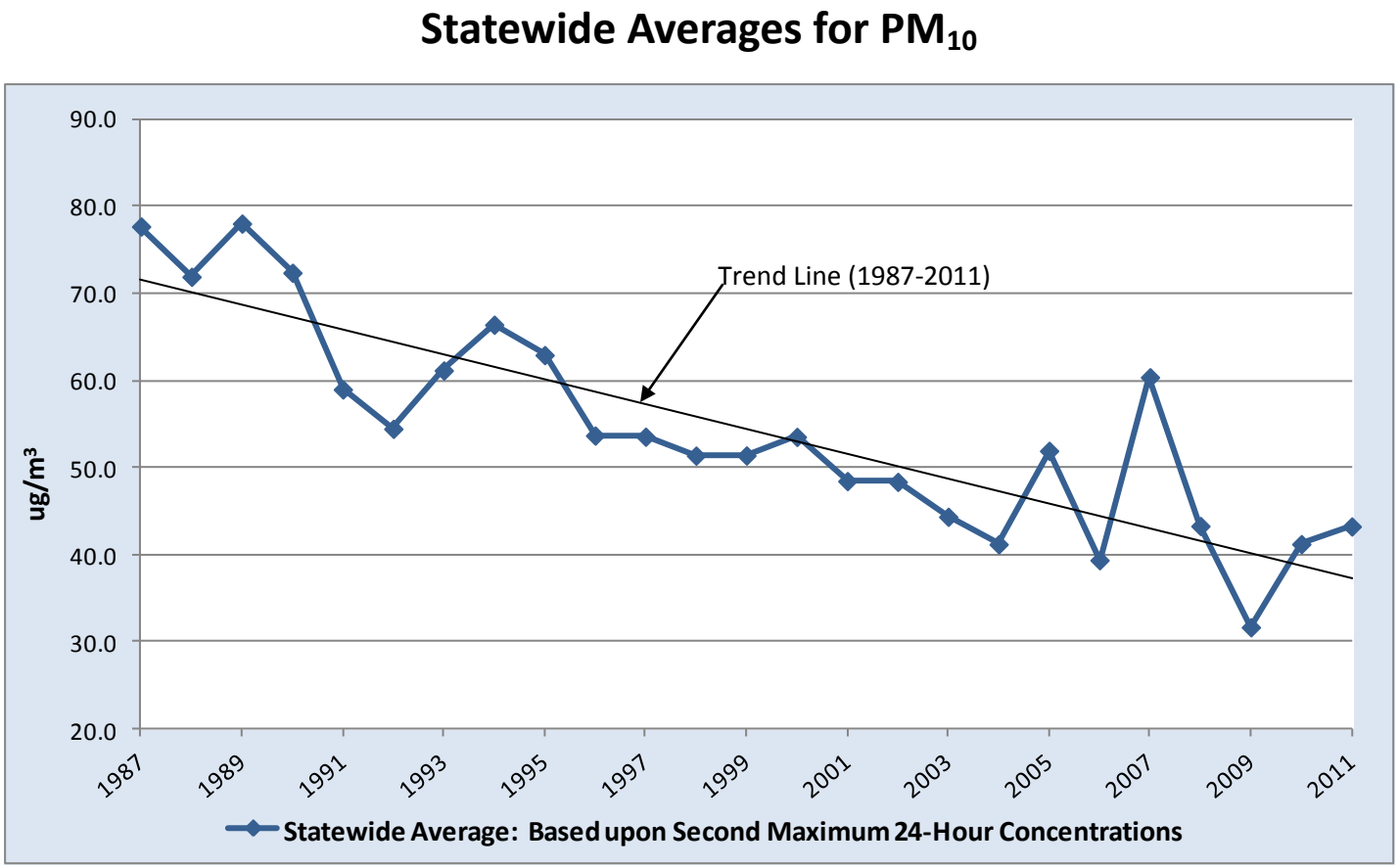



*Figure 49: Statewide averages for $PM_{10}$ monitoring indicate pollution reductions.*

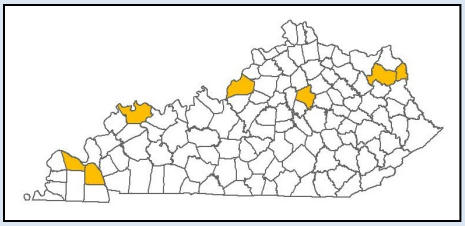
# National Ambient Air Quality Standards for Particulate Matter ($PM_{10}$)

Primary NAAQS: **Expected number of days with a maximum 24-hour concentration greater than 150 µg/m$^3$ must be less than or equal to one, on average over three years.**

Secondary NAAQS: **Same as Primary Standard**

## Criteria Pollutant Summary Report – 2011

**Pollutant:** **Particulate Matter $PM_{10}$**
**Method:** Gravimetric
**Data Interval:** 24-hour
**Units:** Micrograms per cubic meter (µg/m$^3$) (25°C)



| County | Site | AIRS-ID | # Obs | Mean | 24-hour Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1st max | 2nd max | 3rd max | 4th max | Obs> 150 | Expected Obs> 150 |
| Boyd | 122 22nd Street Ashland | 21-019-0002 | 59 | 28.2 | 101 | 63 | 60 | 60 | 0 | 0 |
| Carter | Camp Webb Grayson Lake | 21-043-0500 | 58 | 11.3 | 23 | 22 | 21 | 21 | 0 | 0 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | 17.0 | 36 | 34 | 33 | 27 | 0 | 0 |
| Henderson | Baskett Fire Dept. Baskett | 21-067-0014 | 57 | 15.9 | 34 | 33 | 33 | 33 | 0 | 0 |
| Jefferson[1] | 37th & Southern Ave Louisville | 21-111-0043 | 8592 | 18.2 | 45 | 44 | 44 | 44 | 0 | 0 |
| Jefferson[1] | 1032 Beecher Avenue Louisville | 21-111-0044 | 7925 | 21.3 | 114 | 75 | 70 | 56 | 0 | 0 |
| McCracken | 342 Lone Oak Road Paducah | 21-145-1004 | 58 | 16.6 | 47 | 42 | 35 | 32 | 0 | 0 |
| Marshall | 24 Main Street Calvert City | 21-157-0018 | 59 | 16.0 | 34 | 31 | 30 | 28 | 0 | 0 |

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.

# $PM_{10}$ Criteria Pollutant Summary Report – 2011

| County | Site | AIRS-ID | Estimated Number of Exceedances | | | |
|---|---|---|---|---|---|---|
| | | | 2009 | 2010 | 2011 | Expected 3-Year Avg. |
| Boyd | 122 22nd Street Ashland | 21-019-0002 | 0 | 0 | 0 | 0 |
| Carter | Camp Webb Grayson Lake | 21-043-0500 | 0 | 0 | 0 | 0 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 0 | 0 | 0 | 0 |
| Henderson | Baskett Fire Dept. Baskett | 21-067-0014 | 0 | 0 | 0 * | 0 * |
| Jefferson[1] | 37th & Southern Ave Louisville | 21-111-0043 | 0 | 0 | 0 | 0 |
| Jefferson[1] | 1032 Beecher Avenue Louisville | 21-111-0044 | 0 | 0 | 0 | 0 |
| McCracken | 342 Lone Oak Road Paducah | 21-145-1004 | 0 | 0 | 0 | 0 |
| Marshall | 24 Main Street Calvert City | 21-157-0018 | 0 | 0 | 0 | 0 |

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.

# SULFUR DIOXIDE ($SO_2$)

## 2011 Sulfur Dioxide Ambient Air Monitoring Network

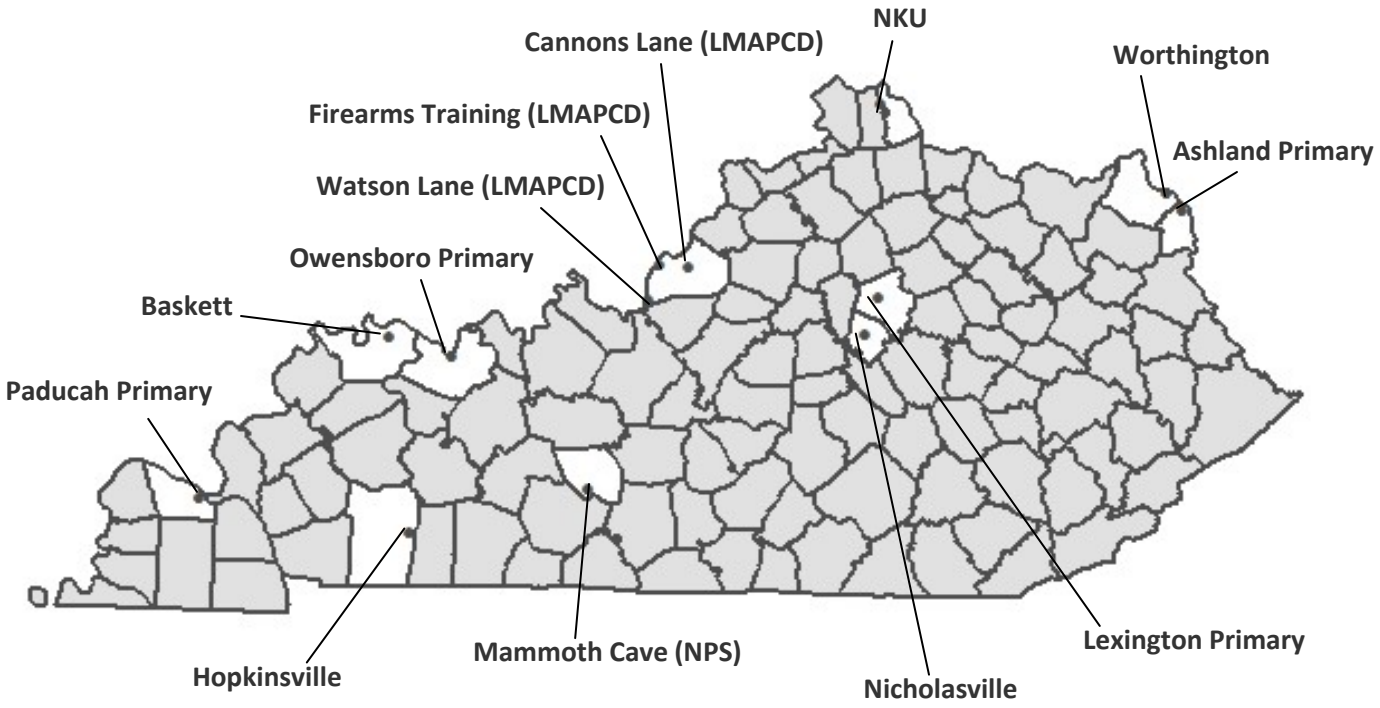



*Figure 50: Sulfur dioxide monitoring locations in Kentucky*

Sulfur dioxide ($SO_2$) is a colorless gas that has a pungent odor at concentrations exceeding 0.5 ppm. $SO_2$ is produced by the combustion of sulfur containing fuels, ore smelting, petroleum processing and the manufacture of sulfuric acid. Nationwide, coal-fired power plants are the largest sources of $SO_2$. Other industrial sources include petroleum refineries and paper mills.

*Environmental Impacts*

The primary health effect of exposure to $SO_2$ is the aggravation of pre-existing respiratory, cardiovascular, and pulmonary disease. Asthmatics, children, and the elderly are especially susceptible to the effects of $SO_2$ pollution. $SO_2$ can also damage the foliage of trees and agricultural crops.

Moisture in the atmosphere combines with $SO_2$ to form sulfuric acid ($H_2SO_4$), which is a component of acid precipitation. Acid precipitation causes acidification of soil and water that can deteriorate plant life, animal life, and structural surfaces.

$SO_2$ may also be converted into sulfates. Sulfates are significant components of $PM_{2.5}$ and regional haze. Regional haze has been attributed to poor visibility at many of the vistas in our national parks, including Mammoth Cave National Park in Kentucky and the Great Smoky Mountains in Tennessee.

*How is $SO_2$ monitored?*

Analyzers continuously monitor $SO_2$ by using the ultraviolet (UV) fluorescence method. Fluorescent analyzers irradiate an ambient air sample with ultraviolet light. $SO_2$ molecules absorb a portion of

this energy and then re-emit the energy at a characteristic wavelength of light. The light energy emitted by the $SO_2$ molecules is proportional to the concentration of $SO_2$ present in the sample. A photo multiplier cell measures the light emitted and converts it to a parts per million measurement.

Data from the analyzer is transmitted into an automated data storage system. In 2011, the division, the NPS at Mammoth Cave, and LMAPCD operated 13 $SO_2$ monitors in Kentucky.

*Results*

On June 22, 2010, the EPA promulgated a new primary $SO_2$ NAAQS. The NAAQS was set to 75 ppb, measured as the three-year average of the 99$^{th}$ percentile of the daily maximum one-hour averages. The EPA revoked the original 24-hour and annual NAAQS standards. Prior to the establishment of the new NAAQS, an exceedance of a $SO_2$ standard had not occurred since November 1981, when the monitor at a Louisville site (21-111-0032) recorded a 24-hour average of 0.159 ppm.

In 2011, three sites were in exceedance of the primary NAAQS. Based upon the three-year average of 99th percentile daily maximum one-hour concentrations, these same three sites are also in violation of the NAAQS.

Statewide and regional sulfur dioxide levels have declined over the past twenty years. The $SO_2$ allowances component of the Acid Rain Program provides an opportunity for electric utilities to participate in a market-based trade of $SO_2$ emissions. An electric utility that is participating in the trading program is required to continually monitor emissions for $SO_2$, $NO_x$, and any other pollutants. The continuous monitoring of the emissions provides compliance data and credibility to the trading program. The trading allowances in the Acid Rain program have directly contributed to the decline in ambient $SO_2$ concentrations.

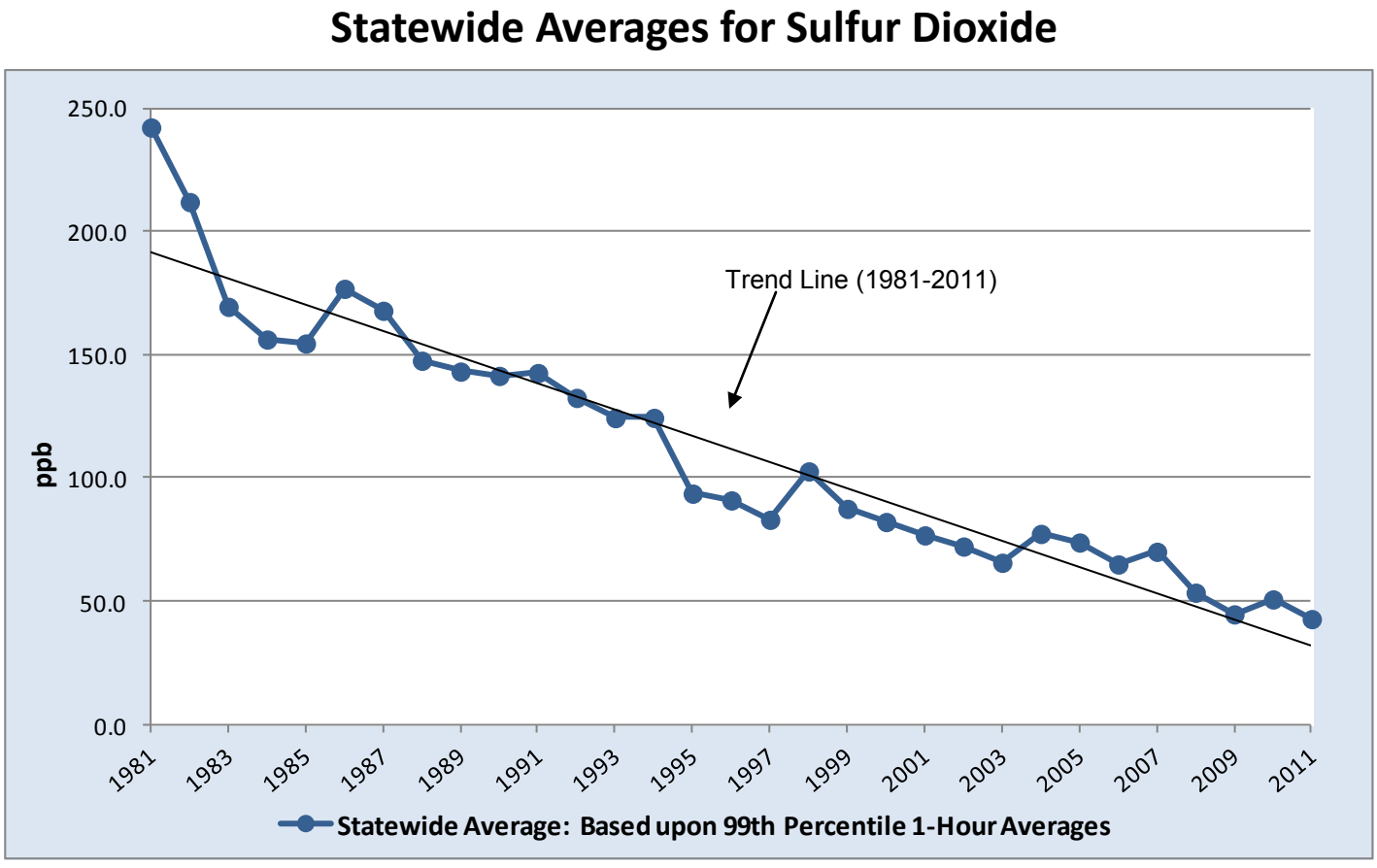



*Figure 51: Statewide averages for $SO_2$ monitoring indicate pollution reductions.*

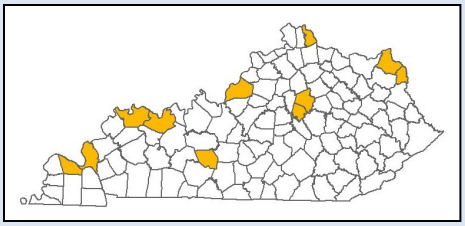
# National Ambient Air Quality Standards for Sulfur Dioxide

Primary NAAQS: **3-year average of the 99th percentile of the daily maximum 1-hour average not to exceed 75 ppb**

Secondary NAAQS: **3-hour concentrations not to exceed 0.5 ppm more than once per year**

## Criteria Pollutant Summary Report – 2011

**Pollutant:** **Sulfur Dioxide**
**Method:** Instrumental
Ultra-Violet Fluorescence
**Data Interval:** Hourly
**Units:** Parts-per-billion (ppb)



| County | Site Address | AQS-ID | # Obs | Annual Mean | Daily Maximum 1-Hr Average (ppb) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1st max | 2nd max | 3rd max | 4th max | Obs > 75 |
| Boyd | 2924 Holt Street Ashland | 21-019-0017 | 8641 | 1.41 | 64.0 | 49.0 | 34.0 | 33.0 | 0 |
| Campbell | 524A John Hill Rd Highland Heights | 21-037-3002 | 8672 | 2.12 | 180.0 | 142.0 | 137.0 | 109.0 | 20 |
| Daviess | US 60 and Pleasant Valley Rd, Owensboro | 21-059-0005 | 8661 | 1.77 | 66.0 | 41.0 | 41.0 | 40.0 | 0 |
| Edmonson[1] | Alfred Cook Road Mammoth Cave | 21-061-0501 | 7784 | 0.95 | 13.8 | 13.4 | 11.8 | 11.6 | 0 |
| Fayette | 650 Newtown Pike Lexington | 21-067-0012 | 8713 | 2.14 | 39.0 | 31.0 | 29.0 | 23.0 | 0 |
| Greenup | Scott & Center Streets Worthington | 21-089-0007 | 8484 | 1.46 | 73.0 | 54.0 | 52. | 49.0 | 0 |
| Henderson | Baskett Fire Dept Baskett | 21-101-0014 | 8712 | 2.11 | 61.0 | 38.0 | 36.0 | 30.0 | 0 |
| Jefferson[2] | 7201 Watson Lane Louisville | 21-111-0051 | 8705 | 3.75 | 180.7 | 135.5 | 126.7 | 114.0 | 15 |
| Jefferson[2] | 2730 Cannons Lane Louisville | 21-111-0067 | 8624 | 2.18 | 113.3 | 64.8 | 57.4 | 50.6 | 1 |
| Jefferson[2] | 4201 Algonquin Pkwy Louisville | 21-111-1041 | 8544 | 3.08 | 60.1 | 44.9 | 38.3 | 35.4 | 0 |
| Jessamine | KYDOT, Etter Drive Nicholasville | 21-113-0001 | 8569 | 1.03 | 27.0 | 20.0 | 16.0 | 16.0 | 0 |
| Livingston | DOT Garage, US 60 Smithland | 21-139-0003 | 7469 | 1.36 * | 21.0 | 19.0 | 17.0 | 17.0 | 0 |
| McCracken | 2901 Powell Street Paducah | 21-145-1024 | 8625 | 1.55 | 31.0 | 30.0 | 29.0 | 27.0 | 0 |

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red are a visual representation of an exceedance of the NAAQS.

# $SO_2$ Criteria Pollutant Multi-Year Summary Report – 2011
# Daily Maximum 1-hour 99th Percentile, 3-Year Average

| County | Site Address | AQS-ID | Daily Maximum 1-Hr Average, 99th Percentile (ppb) | | | |
|---|---|---|---|---|---|---|
| | | | 2009 | 2010 | 2011 | 3-Year Avg |
| Boyd | 2924 Holt Street Ashland | 21-019-0017 | 28 | 34 | 33 | 32 |
| Campbell | 524A John Hill Rd Highland Heights | 21-037-3002 | 60 | 99 | 109 | 89 |
| Daviess | US 60 and Pleasant Valley Rd, Owensboro | 21-059-0005 | 43 | 68 | 40 | 50 |
| Edmonson[1] | Alfred Cook Road Mammoth Cave | 21-061-0501 | 9 * | 15 | 12 | 12 * |
| Fayette | 650 Newtown Pike Lexington | 21-067-0012 | 42 | 40 | 23 | 35 |
| Greenup | Scott & Center Streets Worthington | 21-089-0007 | 28 | 41 | 49 | 39 |
| Henderson | Baskett Fire Dept Baskett | 21-101-0014 | 26 | 22 | 30 | 26 |
| Jefferson[2] | 7201 Watson Lane Louisville | 21-111-0051 | 116 | 107 | 114 | 112 |
| Jefferson[2] | 2730 Cannons Lane Louisville | 21-111-0067 | n/a | 45 * | 51 | 48 * |
| Jefferson[2] | 4201 Algonquin Pkwy Louisville | 21-111-1041 | 96 | 100 | 35 | 77 |
| Jessamine | KYDOT, Etter Drive Nicholasville | 21-113-0001 | 47 | 48 | 16 | 37 |
| Livingston | DOT Garage, US 60 Smithland | 21-139-0003 | 16 | 15 | 17 * | 16 |
| McCracken | 2901 Powell Street Paducah | 21-145-1024 | 25 | 25 | 27 | 26 |

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red are a visual representation of an exceedance of the NAAQS.

# MERCURY

## 2011 Mercury (Wet Deposition) Monitoring Network


*Figure 52: Mercury monitoring locations in Kentucky.*

Mercury (Hg) is a naturally occurring element that is found in air, water, and soil. Mercury exists in several different forms: elemental, inorganic, and organic. Elemental mercury is a shiny, silver-white metal that is in a liquid state at room temperature. Elemental mercury is used in thermometers, fluorescent lights, and electrical switches. Exposed elemental mercury can become an invisible, odorless toxic gas at room temperature.

Inorganic Hg compounds are found as mercury salts and typically have a white-powder or crystal appearance, except for mercuric sulfide (cinnabar), which is red. Inorganic Hg compounds are used in fungicides, antiseptics, disinfectants, skin lightening creams, and traditional medicines.

Organic mercury compounds are formed when mercury combines with carbon. The most common organic mercury compound found in the environment is methylmercury, a highly toxic form that builds up in fish, shellfish, and animals that eat fish. Methylmercury is formed when inorganic mercury is released into the air from the combustion of coal and settles into water or onto land, where it can be washed into water and converted into organic mercury by microorganisms. Fish and shellfish are the main sources of methyl-mercury exposure to humans.

*Environmental Impacts*

Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. Research has shown that most fish consumption does not cause an exposure to high levels of mercury in adults. However, it has been demonstrated that high levels of methylmercury in the bloodstream of unborn babies and young children may harm the developing nervous system.

Kentucky is one of 14 states that have issued statewide fish consumption advisories for some or all fish from rivers or lakes, due to unsafe levels of mercury. The advisory is for women of childbearing age and children six years and younger.

*Results*

Prior to 2011, the division operated a network of five continuous mercury analyzers and four mercury wet deposition samplers. The NPS at Mammoth Cave National Park also operated one mercury analyzer, as well as one wet deposition sampler as a part of the Mercury Deposition Network, a component of the National Atmospheric Deposition Program (NADP).

Despite a lack of federally established standards for comparative analysis of mercury levels, the division had intended to correlate mercury data with fish tissue samples from around the state. However, since the inception of monitoring in 2003, continuous analyzers had not been able to measure concentrations above background levels. During the 2010 monitoring year, the division made the decision to shut down the ambient mercury network due to budget constraints and an inability to purchase speciation-unit attachments for the continuous analyzers. Mercury speciation units may have allowed the continuous analyzers to measure gaseous-oxidized and particle-bound mercury species, in addition to gaseous-elemental mercury. Since wet deposition data works in concert with continuous monitoring, mercury wet deposition was also discontinued. Mercury is not a criteria pollutant—that is, DAQ is not currently required to monitor for mercury as part of the Clean Air Act. The division continues to research new technologies and, as budget allows, may re-establish mercury monitoring in the state.

Mercury wet deposition sampling continued uninterrupted in 2011 as a part of the NADP at Mammoth Cave National Park. Sampling at Mammoth Cave continues to show moderate mercury levels, compared to sites located throughout the country. For more information regarding the NADP, please visit: http://nadp.sws.uiuc.edu/

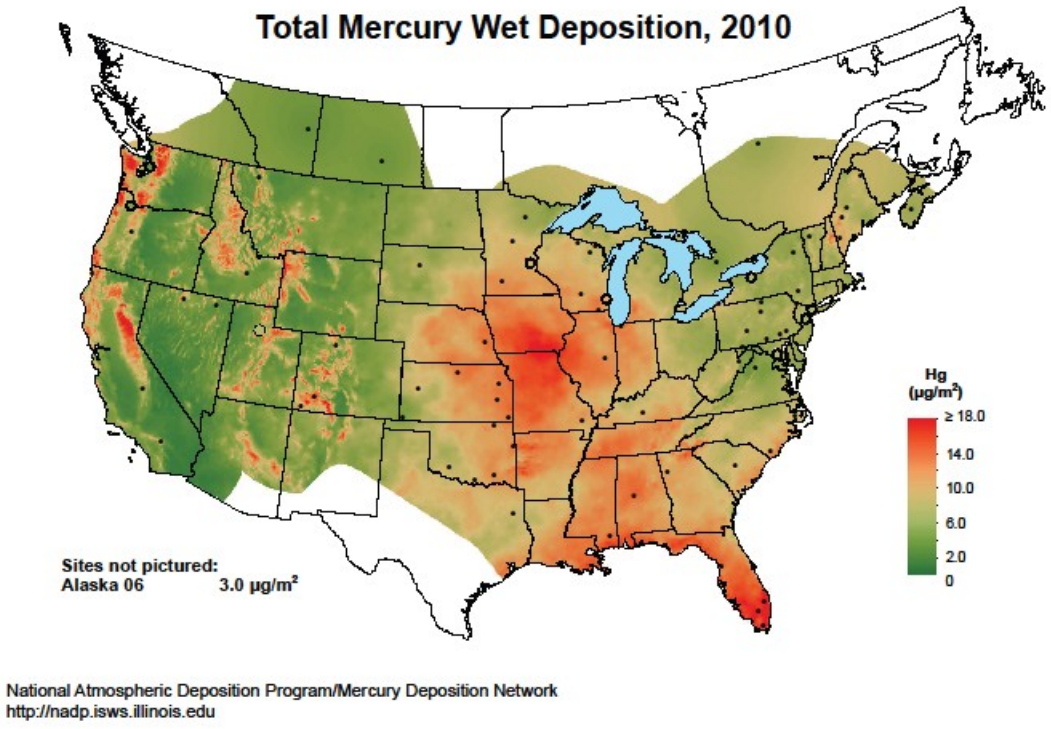



*Figure 53: The mercury isopleth map indicates that mercury deposition concentrations in Kentucky are at moderate levels compared to the South and North East regions of the United States. Map courtesy of the National Atmospheric Deposition Program.*

# WET DEPOSITION (ACID RAIN)

## 2011 Wet Deposition (Acid Rain) Monitoring Network

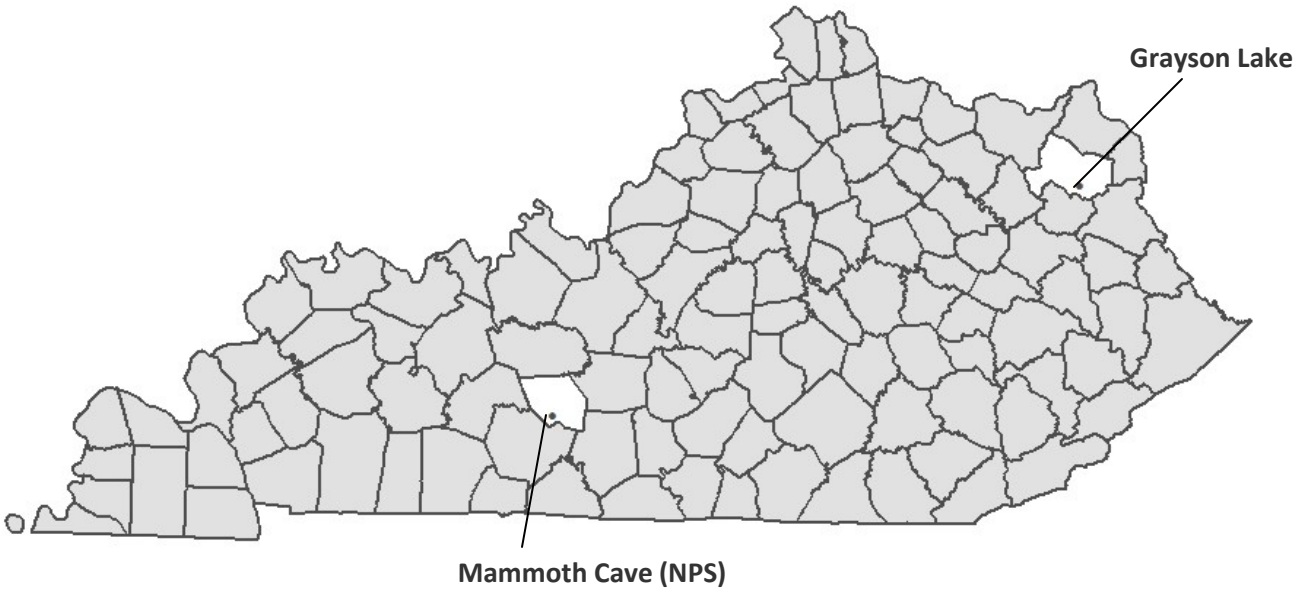



*Figure 54: Acid rain monitoring locations in Kentucky.*

Wet deposition (sometimes referred to as “acid rain”) is a classification of pollutants that are precipitation borne. Snow, sleet, hail, rain, or fog can combine with pollutants in the atmosphere and fall to earth as harmful acidic compounds. Acidified rainwater may contain combinations of sulfuric and nitric acids that form when water vapor, sulfur dioxide, and nitrogen oxides react.

Major sources of sulfur dioxide include power plants, paper and wood pulp processing plants, and facilities with coal fired boilers. Nitrogen oxides are produced primarily from the combustion of fossil fuels in the engines of cars and trucks, as well as from power plant emissions.

Aquatic life appears to be most sensitive to the effects of acidic precipitation. Small changes in the pH levels of lakes and streams may prevent some fish species and other aquatic life forms from reproducing. Many insects cannot survive in acidic waters; therefore, birds and mammals that depend on insects for food may suffer abnormally high mortality rates.

Acidic precipitation can also alter soil chemistry and nutrient availability, in turn weakening trees and shrubs and causing them to be more vulnerable to insects, diseases, and fungus infestations. Acid precipitation may also damage agricultural crops and has been blamed for deterioration of monuments and building surfaces.

Wet deposition monitoring stations operate on a weekly sampling schedule. Cumulative precipitation events occurring during a seven day period are collected in one container to represent a one-week sample. An automatic wet/dry precipitation collector is used to collect the sample. The sampler consists of two collection containers. The “wet” container is fitted with a clean plastic sample bag for collection of precipitation. The “dry” container, designed for dry particulate collection, is not currently utilized for sample collection. The sampler employs a moisture sensor, which activates an electrically driven movable container lid that covers the wet container during dry periods and then moves to cover the dry container when precipitation occurs.

At the end of each weekly sampling period, the wet container is removed and replaced with a new, clean container for the next sampling period. After the sample is removed, field measurements of pH and conductivity are made and recorded. The remaining sample is then shipped to Frankfort where laboratory analysis is conducted to determine levels for pH, conductivity, acidity, sulfates, nitrates, phosphates, ammonia, and metal ions.

In 2011, the DAQ operated one acid rain site at Grayson Lake State Park. However, acid rain sampling was discontinued at Grayson Lake in June 2011; thus, only a partial data set is available. The NPS at Mammoth Cave continues to operate a wet deposition sampler, as a part of the National Atmospheric Deposition Program (NADP). In total, Kentucky hosts six NADP sites. For more information on the NADP, please visit: http://nadp.sws.uiuc.edu/

*Results*

Annual pH averages for both Grayson Lake and Mammoth Cave have shown modest upward trends since 1986.

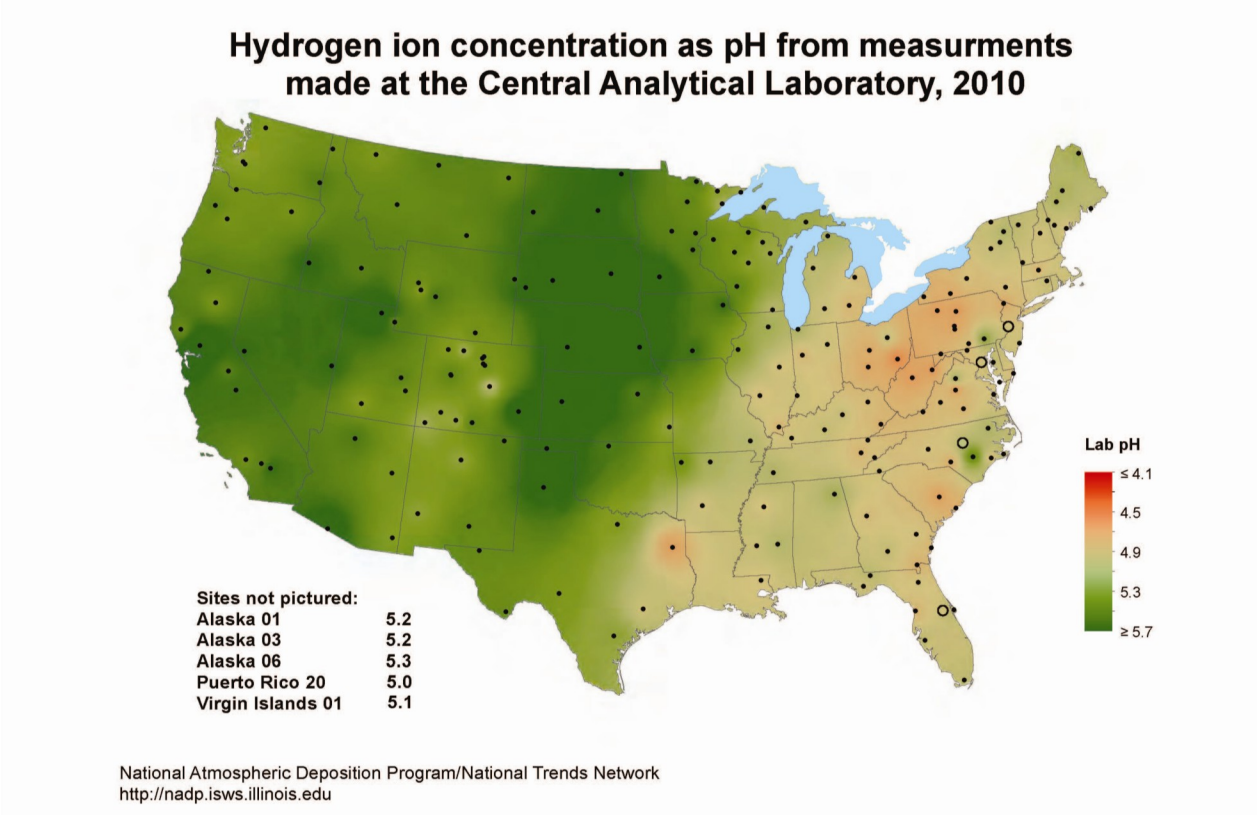
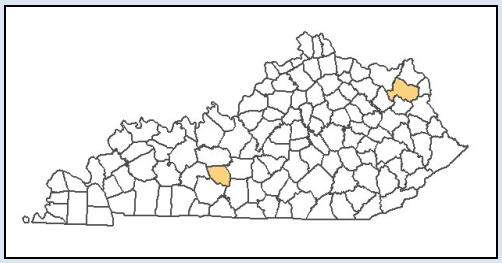



*Figure 55: The pH isopleth map indicates that rainfall is more acidic in the East and Northeast regions of the United States, but monitoring has shown a decrease in acidity levels over time due to reductions in sulfur dioxide and nitrogen oxides. Map courtesy of the National Atmospheric Deposition Program.*

# Kentucky Division for Air Quality
# Wet Deposition Pollutants Summary Report - 2011

**Location:** **Grayson Lake, KY** – Camp Webb
**Site Id**: 21-043-0500
**County:** Carter
**Method:** Wet Collector, Laboratory Analytical



| Parameter | Units | # Obs | Arithmetic Mean | 1st Max | 2nd Max | 3rd Max | 4th Max |
|---|---|---|---|---|---|---|---|
| Acidity | Mg/L as $CaCO^3$ | 19 | 0.250 * | 0.25 | 0.25 | 0.25 | 0.25 |
| Ammonium | Mg/L | 18 | 0.435 * | 1.34 | 1.28 | 0.84 | 0.57 |
| Calcium | Mg/L | 18 | 0.394 * | 2.19 | 1.22 | 0.58 | 0.51 |
| Chloride | Mg/L | 18 | 0.241 * | 0.74 | 0.72 | 0.55 | 0.32 |
| Conductivity | US/cm | 18 | 10.438 * | 27.00 | 18.50 | 17.80 | 12.10 |
| Magnesium | Mg/L | 18 | 0.020 * | 0.28 | 0.01 | 0.01 | 0.01 |
| Nitrate | Mg/L | 18 | 1.094 * | 2.09 | 1.76 | 1.51 | 1.35 |
| pH | pH Units | 19 | 4.944 * | 6.34 | 6.08 | 5.72 | 5.54 |
| Potassium | Mg/L | 18 | 0.219 * | 0.71 | 0.52 | 0.45 | 0.42 |
| Sodium | Mg/L | 18 | 0.251 * | 0.58 | 0.54 | 0.52 | 0.46 |
| Sulfate | Mg/L | 19 | 1.193 | 3.28 | 1.97 | 1.95 | 1.91 |

*** Incomplete data set.**

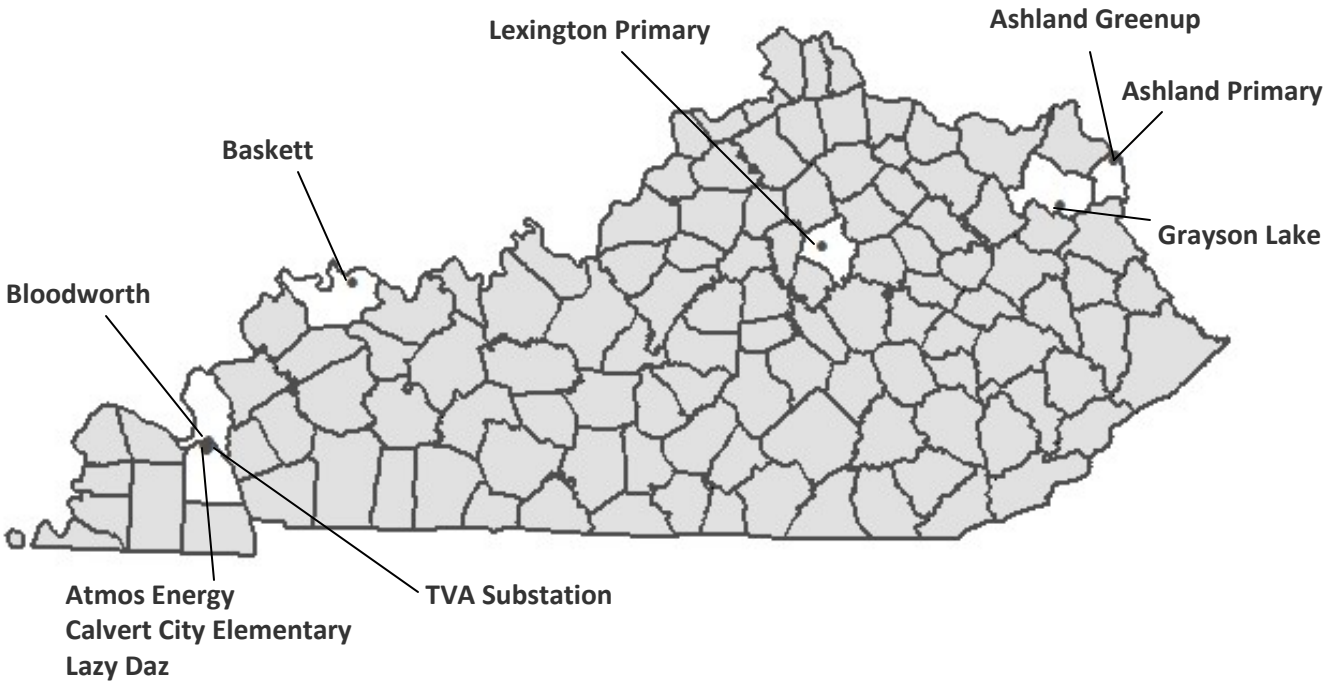



*Figure 56: Hazardous air pollutant monitoring locations in Kentucky.*

Hazardous air pollutants (HAPs) include 187 substances known or suspected to cause neurological, immunological, reproductive, and respiratory disorders, as well as known or suspected human carcinogens. The ultimate goal of the EPA is to eliminate unacceptable risks of cancer, other significant health problems from exposures to air toxics emissions and to substantially reduce or eliminate adverse effects on our natural environment. To provide a basis for decision-making with respect to these matters, the EPA developed the National Air Toxics Trends Stations (NATTS) monitoring network.

In 2003, the EPA designated the Division for Air Quality's Hazard air monitoring site part of that network. The Hazard site was in the Rural Trends Network, and along with its Urban Trends counterpart, was established to provide toxics trends data on a national basis. Data generated by these monitors are needed to understand the behavior of air toxics in the atmosphere and to develop control strategies.

In June 2008, the Hazard NATTS monitoring station was discontinued and moved to Carter County, Kentucky. The new NATTS site is located at the division's Grayson Lake site. Grayson Lake is in a rural setting and meets the criteria for a rural NATTS location.

In 2011, the division operated 11 hazardous air pollutant stations throughout the Commonwealth using the NATTS monitoring objectives; however, only samplers operated at Grayson Lake are a part of the NATTS network. The EPA has identified 19 required hazardous air pollutants that are to be monitored in the National Air Toxics Trends study.

HAPS can be subdivided into five monitoring groups: carbonyls, metals, volatile organic compounds (VOC), polyaromatic hydrocarbons (PAH), and hexavalent chromium ($Cr^{6+}$). The compounds are sampled using the following media:

- Carbonyls: Dinitrophenylhydrazine (DNPH) adsorbent cartridges
- $PM_{10}$ metals: Teflon® filters
- VOCs: passivated SUMMA canisters
- PAHs: polyurethane foam (PUF)/XAD-2® sorbent
- $Cr^{6+}$: Bicarbonate-impregnated ashless cellulose filter

While most samplers collect a 24-hour sample every sixth day, some samplers operate every twelfth day, and a few samplers only collect six samples per year.

VOC, carbonyl, and $PM_{10}$ metals samples associated with the NATTS program were sent to either the Environmental Services Branch (ESB) laboratory or the EPA national contract laboratory for analysis. PAH and $Cr^{6+}$ samples were sent to the EPA national contract laboratory for analysis. VOC, carbonyl, and $PM_{10}$ metals samples from other sites were analyzed by the ESB laboratory.

*Results*

DAQ is currently establishing a baseline for future trends analysis of HAPs. The data indicates that several of the monitored twenty-three hazardous air pollutants are present in Kentucky's ambient air.

Potential sources may be large industrial sources in the immediate area, mobile emissions (cars, trucks and school buses), and small local source emissions such as those from fueling stations, body shops/painting, dry cleaners, asphalt plants, etc.

For more information about air toxics in Kentucky, see the Permit Review Branch section of this report.

## Air Toxics Summary Report - 2011

**Pollutant**: Acetaldehyde

**Method:** TO-11A; Carbonyl sampler with DPNH cartridges

**Data Interval:** 24-hour

**Units:** Micrograms per cubic meter (µg/$m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 2924 Holt Street Ashland | 21-019-0017 | 59 | 1.24 | 2.71 | 2.45 | 2.27 | 2.16 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 51 | 0.68 | 1.98 | 1.17 | 1.08 | 0.99 |
| Fayette | 650 Newtown Pike Lexington | 21-067-0012 | 56 | 1.15 | 3.02 | 2.50 | 2.27 | 2.03 |

## Air Toxics Summary Report - 2011

**Pollutant**: Formaldehyde

**Method:** TO-11A; Carbonyl sampler with DPNH cartridges

**Data Interval:** 24-hour

**Units:** Micrograms per cubic meter (µg/$m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 2924 Holt Street Ashland | 21-019-0017 | 59 | 2.51 | 7.23 | 6.94 | 6.23 | 5.99 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 51 | 1.16 | 4.09 | 3.97 | 3.10 | 2.85 |
| Fayette | 650 Newtown Pike Lexington | 21-067-0012 | 56 | 2.49 | 6.06 | 5.88 | 5.85 | 4.81 |

## Air Toxics Summary Report - 2011

**Pollutant**: Antimony

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Carter | Camp Webb Grayson Lake | 21-043-0500 | 58 | 0.84 | 8.39 | 2.80 | 2.28 | 1.90 |

## Air Toxics Summary Report - 2011

**Pollutant**: Arsenic

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 21st & Greenup Ashland | 21-019-0002 | 59 | 1.40 | 5.80 | 4.35 | 3.73 | 3.68 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 58 | 0.46 | 3.63 | 1.04 | 0.97 | 0.95 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | 0.88 | 6.11 | 3.01 | 2.42 | 2.33 |
| Marshall | 24 Main St Calvert City | 21-157-0018 | 58 | 0.49 | 2.26 | 2.35 | 2.27 | 1.89 |

# Air Toxics Summary Report - 2011

**Pollutant**: Beryllium

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 21st & Greenup Ashland | 21-019-0002 | 59 | ND | ND | ND | ND | ND |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 58 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | ND | ND | ND | ND | ND |
| Marshall | 24 Main St Calvert City | 21-157-0018 | 58 | ND | ND | ND | ND | ND |

ND=Non detect

# Air Toxics Summary Report - 2011

**Pollutant**: Cadmium

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 21st & Greenup Ashland | 21-019-0002 | 59 | 5.29 | 2.90 | 2.03 | 1.74 | 1.14 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 58 | 0.04 | 0.30 | 0.23 | 0.18 | 0.16 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | 0.07 | 0.15 | 0.15 | .014 | 0.13 |
| Marshall | 24 Main St Calvert City | 21-157-0018 | 58 | 0.09 | 0.65 | 0.61 | 0.30 | 0.19 |

# Air Toxics Summary Report - 2011

**Pollutant**: Chromium

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 21st & Greenup Ashland | 21-019-0002 | 59 | 1.72 | 8.56 | 7.38 | 6.36 | 5.34 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 58 | 1.25 | 5.99 | 4.37 | 4.05 | 3.83 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | 0.52 | 2.60 | 2.35 | 2.27 | 1.89 |
| Marshall | 24 Main St Calvert City | 21-157-0018 | 58 | 0.48 | 1.95 | 1.82 | 1.76 | 1.72 |

# Air Toxics Summary Report - 2011

**Pollutant**: Lead

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 21st & Greenup Ashland | 21-019-0002 | 59 | 11.56 | 4.60 | 4.38 | 4.33 | 3.09 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 58 | 2.21 | 8.53 | 7.36 | 5.43 | 4.62 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | 3.26 | 15.30 | 12.40 | 7.99 | 6.88 |
| Marshall | 24 Main St Calvert City | 21-157-0018 | 58 | 2.59 | 24.2 | 7.73 | 4.60 | 4.45 |

# Air Toxics Summary Report - 2011

**Pollutant**: Manganese

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 21st & Greenup Ashland | 21-019-0002 | 58 | 24.00 | 101.00 | 85.20 | 75.80 | 68.80 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 58 | 3.13 | 21.10 | 11.20 | 7.01 | 6.72 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | 4.70 | 15.30 | 11.00 | 10.40 | 10.30 |
| Marshall | 24 Main St Calvert City | 21-157-0018 | 58 | 5.29 | 19.70 | 19.20 | 18.10 | 13.60 |

# Air Toxics Summary Report - 2011

**Pollutant**: Nickel

**Method:** IO-3.5; Metals low volume $PM_{10}$ monitor

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| County | Site | AQS-ID | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|---|---|
| Boyd | 21st & Greenup Ashland | 21-019-0002 | 59 | 1.98 | 14.50 | 7.80 | 7.63 | 6.65 |
| Carter | Camp Webb Grayson Lake | 21-143-0500 | 58 | 0.18 | 2.31 | 1.54 | 1.02 | 0.67 |
| Fayette | 533 South Limestone Lexington | 21-067-0014 | 56 | 4.74 | 3.18 | 1.44 | 1.31 | 1.28 |
| Marshall | 24 Main St Calvert City | 21-157-0018 | 58 | 2.93 | 4.19 | 2.73 | 0.44 | 0.40 |

# Air Toxics Summary Report - 2011

**Site:** Camp Webb-Grayson Lake, Boyd County
**AQS ID:** 21-043-0500
**Method:** TO-15; Passivated SUMMA Canister
**Data Interval:** 24-hour
**Units:** Parts per billion carbon (ppbC)

| Pollutant | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|
| Benzene | 61 | 1.095 | 4.92 | 2.96 | 2.26 | 1.88 |
| 1,3-Butadiene | 61 | 0.069 | 0.22 | 0.18 | 0.17 | 0.16 |
| Carbon tetrachloride | 61 | 0.099 | 0.13 | 0.13 | 0.13 | 0.13 |
| Chloroform | 61 | 0.008 | 0.03 | 0.03 | 0.03 | 0.03 |
| 1,2 Dichloropropane | 61 | 0.035 | 0.03 | 0.03 | 0.03 | 0.03 |
| cis-1,3 Dichloropropene | 61 | 0.033 | 0.03 | 0.03 | 0.03 | 0.03 |
| trans-1,3 Dichloropropene | 61 | 0.038 | 0.04 | 0.04 | 0.04 | 0.04 |
| Ethylene dibromide | 61 | 0.018 | 0.02 | 0.02 | 0.02 | 0.02 |
| Ethylene dichloride | 61 | 0.019 | 0.05 | 0.05 | 0.05 | 0.05 |
| Methylene chloride | 61 | 0.263 | 1.68 | 1.27 | 1.10 | 1.05 |
| Tetrachloroethylene | 61 | 0.018 | 0.02 | 0.02 | 0.02 | 0.02 |
| 1,1,2,2 Tetrachloroethane | 61 | 0.024 | 0.02 | 0.02 | 0.02 | 0.02 |
| Trichloroethylene | 61 | 0.024 | 0.02 | 0.02 | 0.02 | 0.02 |
| Vinyl chloride | 61 | 0.008 | 0.01 | 0.01 | 0.01 | 0.01 |

# Polyaromatic Hydrocarbons

## Air Toxics Summary Report - 2011

**Site:** Camp Webb-Grayson Lake, Boyd County

**AQS ID:** 21-043-0500

**Method:** TO-13; PUF-ZAD2 GC-MS

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| Pollutant | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|
| Napthalene | 61 | 16.59 | 35.1 | 30.4 | 30.3 | 27.6 |
| Benzo(a)pyrene | 61 | 0.05 | 0.32 | 0.28 | 0.19 | 0.12 |

# Hexavalent Chromium

## Air Toxics Summary Report - 2011

**Site:** Camp Webb-Grayson Lake, Boyd County

**AQS ID:** 21-043-0500

**Method:** Ashless cellulose filters; IC UV-VIS

**Data Interval:** 24-hour

**Units:** Nanograms per cubic meter ($ng/m^3$)

| Pollutant | # Obs | Annual Mean | 1st max | 2nd max | 3rd max | 4th max |
|---|---|---|---|---|---|---|
| Hexavalent Chromium | 61 | 0.0086 | 0.0326 | 0.0241 | 0.0238 | 0.0236 |

# APPENDIX A: REGIONAL FIELD OFFICE MAP

## Division for Air Quality
## Regional Office Boundaries

*air.ky.gov*

Environmental Emergency, 24-hour; (502) 564-2380 or (800) 928-2380
Open burn complaints: 888-BURNLAW (888-287-6529)

Florence Region
Clay Redmond, Supervisor
8020 Veterans Memorial Dr.
Suite 110
Florence, KY
41042

Frankfort Region
Jarrod Bell, Supervisor
200 Fair Oaks Ln., 3rd FL
Frankfort, KY 40601-1134
(502) 564-3358
Fax: (502) 564-5043

Ashland Region
Karen Deskins, Supervisor
1550 Wolohan Drive, Suite 1
Ashland, KY 41102-8942
(606) 929-5285
Fax: (606) 928-1267

Louisville Metro
Air Pollution Control District
Lauren Anderson, Director
850 Barret Ave. STE 200
Louisville, KY 40204-1745
(502) 574-6000

Owensboro Region
Mac Cann, Supervisor
3032 Alvey Park Dr. W.
STE 700
Owensboro, KY 42303-2191
(270) 687-7304


Paducah Region
Betsy Ryan, Supervisor
130 Eagle Nest Drive
Paducah, KY 42003
(270) 898-8468
Fax: (270) 898-8640

Bowling Green Region
Troy Tabor, Supervisor
1508 Westen Avenue
Bowling Green, KY 42104-3356
(270) 746-7475
Fax: (270) 746-7865

London Region
David Shivel, Supervisor
875 S. Main Street
London, KY 40741
(606) 330-2080
Fax: (606) 330-2097

Hazard Region
Steven Hall, Supervisor
233 Birch Street, STE 2
Hazard, KY 41701-2179
(606) 435-6022
Fax: (606) 435-6230

Revised: 09/01/12

# APPENDIX B: GLOSSARY OF TERMS

**Analyte** A chemical substance that is the subject of chemical analysis.

**Anion** A negatively-charged particle, having more electrons than protons.

**Asbestos Hazard Emergency Response Act** AHERA requires schools to inventory their asbestos materials and document strategies for dealing with these materials.

**Air Toxics** See Toxic Air Pollutant.

**Ambient air quality** The level of pollution present in the air outside.

**Attainment** When an area meets the national air quality standard set by the federal EPA for a particular pollutant.

**Cation** A positively-charged particle, having more protons than electrons.

**Chemiluminescence** The emission of light by a substance as a result of a chemical reaction that does not involve an increase in its temperature.

**Clean Air Act** Federal clean air program established by Congress in 1963.

**Class I Area** Areas of special natural, scenic, or historic importance are known as "Class 1 Areas," and are protected to maintain long distance, panoramic views.

**Criteria Pollutant** A regulated air pollutant. Currently, there are six criteria pollutants under the Clean Air Act. They are carbon monoxide, lead, ozone, particulate matter, nitrogen oxides and sulfur dioxide.

**Emissions Inventory** A list of sources of air contaminants, containing for each source the amount of each contaminant emitted.

**Exceedance (of NAAQS)** One occurrence of a measured or modeled concentration that exceeds the specified concentration level of a NAAQS for the averaging period specified by that standard.

**Hazardous Air Pollutant** Any pollutant listed in Subsection B of Section 112 of the Clean Air Act.

**Inspection** A scheduled determination of compliance with an existing regulation.

**Investigation** A complaint driven determination of compliance with an existing regulation.

**National Ambient Air Quality Standards (NAAQS)** Standards established by the United States Environmental Protection Agency (EPA) under authority of the Clean Air Act (42 U.S.C. 7401 et seq.) that apply for outdoor air throughout the country.

**National Emissions Standards for Hazardous Air Pollutants** NESHAP, with respect to asbestos, governs renovation and demolition activities and requires safe handling, removal (when applicable), and disposal of asbestos from facilities (everything except for single private homes).

**Nonattainment** When an area does not meet the National Ambient Air Quality Standard set by the U.S. EPA for a particular pollutant.

**Notification** Required reporting by facilities of regulated activities. For example, facilities are required to notify DAQ of certain air emission releases or upcoming asbestos disturbance (removal/demolition activities).

**Primary Standard** A National Ambient Air Quality Standard which establishes limits on specific criteria pollutants to protect public health, including the health of sensitive populations such as children, asthmatics, and the elderly.

**Promulgate** To officially announce, publish, make known to the public; to formally announce a statute or decision by the court.

**Secondary Standard** A National Ambient Air Quality Standard which establishes limits on specific criteria pollutants to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

**Synthetic Minor** A facility that has the PTE that could exceed major Title V thresholds, but they have agreed to control emissions below major threshold. Synthetic minors includes conditional major facilities.

**Title V** Any source that has the PTE of greater than 100 Tons of criteria pollutants or 10/25 TPY of a single HAP or any combined HAP.

**Toxic Air Pollutant** A subset of the pollutants listed as Hazardous Air Pollutants by the U.S. EPA.

# APPENDIX C: GLOSSARY OF ABBREVIATIONS

**AHERA** Asbestos Hazard Emergency Response Act

**AQI** Air Quality Index

**BACT** Best Available Control Technology

**CAA** Clean Air Act

**CO** Carbon Monoxide

**$CO_2$** Carbon Dioxide

**CPT** Cost per Ton

**CSAPR** Cross-State Air Pollution Rule

**DAQ** Division for Air Quality

**DEP** Department for Environmental Protection

**DERA** Diesel Emissions Reduction Act

**EEC** Energy and Environment Cabinet

**EGU** Electric Generating Unit

**EPA** Environmental Protection Agency

**GHG** Greenhouse Gas

**HAP** Hazardous Air Pollutant

**HPV** High Priority Violation

**KORA** Kentucky Open Records Act

**LMAPCD** Louisville Metropolitan Air Pollution Control District

**LOW** Letter of Warning

**MACT** Maximum Achievable Control Technology

**NAAQS** National Ambient Air Quality Standard

**NATTS** National Air Toxics Trends Stations

**NESHAP** National Emission Standard for Hazardous Air Pollutants

**$NO_x$** Nitrogen Oxides

**NOV** Notice of Violation

**NPS** National Park Service

**$O_3$** Ozone

**Pb** Lead

**$PM_{10}$** Particulate Matter, also known as course particles, measure between 2.5-10 microns in diameter

**$PM_{2.5}$** Fine Particulate Matter, also known as fine particles, measuring 2.5 microns in diameter

**PTE** Potential to Emit

**QAPP** Quality Assurance Project Plan

**RATA** Relative Accuracy Test Audit

**SEDC** Southeast Diesel Collaborative

**SIP** State Implementation Plan

**$SO_2$** Sulfur Dioxide

**SOP** Standard Operating Procedure

**TEMPO** Tools for Environmental Management and Protection Organizations

**TPY** Tons per year

**TRI** Toxics Release Inventory

**VISTAS** Visibility Improvement State and Tribal Association of the Southeast

**VOC** Volatile Organic Compound

# ACKNOWLEDGMENTS

**Governor Steven L. Beshear** **Secretary Leonard K. Peters**

**This Annual Report is intended to provide a concise set of facts and measurements to support environmental decision-making. We welcome your questions and comments to the contacts below:**

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