

US EPA ARCHIVE DOCUMENT

# Overview of Ambient Monitoring Requirements to Support SIP Development



**Lewis Weinstock**  
**Air Quality Assessment Division**  
**Office of Air Quality Planning and Standards**

# The Basics

- Purposes for ambient monitoring
- How ambient networks are impacted by revisions to the NAAQS
- Quality assuring the data and network operations
- Tracking changes to monitoring requirements
- Planning and implementing the necessary changes
- Getting the data into AQS
- Quick overview of Design Values

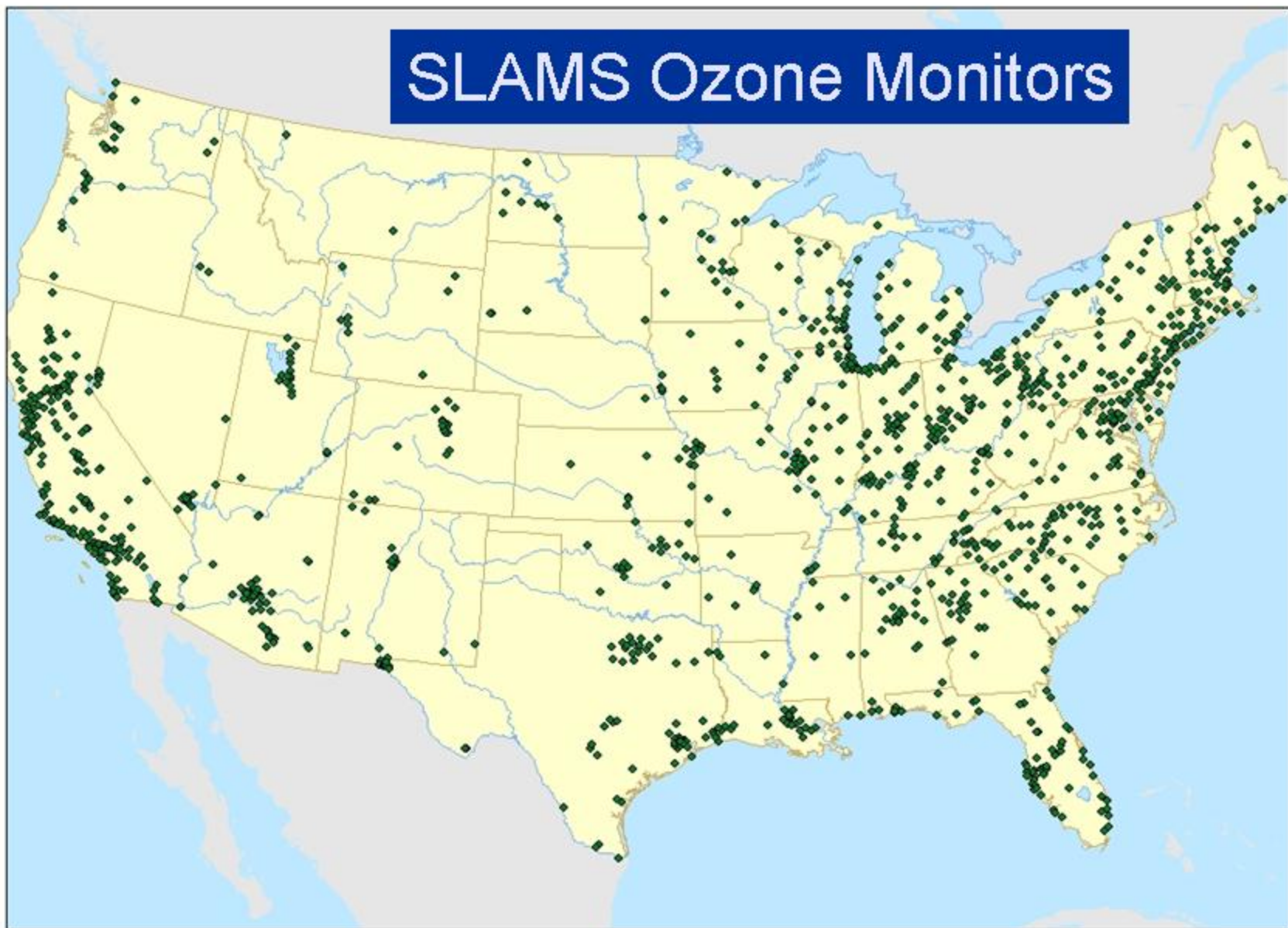
# Purposes for Ambient Monitoring

- The national ambient monitoring network (primarily operated by State, local, and tribal partners) supports many purposes or objectives that include:
  - Providing air quality data in a timely manner
  - Supporting compliance with the National Ambient Air Quality Standards (NAAQS)
  - Supporting air pollution research studies
  - Validating emissions models and verifying control strategies

# A Few Quick Definitions

- **Monitor** – a device used to measure air quality, typically automated continuous gases like ozone or carbon monoxide
- **Sampler** - a device that supports manually operated, filter-based methods, typically for particle measurement or air toxics
- **Station** – a physical monitoring location (with a building or platform) that houses monitors or samplers
- **Network** – a collection of stations. The stations that monitoring agencies operate to determine compliance with the NAAQS are called the State and Local Air Monitoring Stations or SLAMS.
  - This module on monitoring is generally oriented to describing aspects of the SLAMS network

# SLAMS Ozone Monitors



# Linking Monitoring and the NAAQS

- Section 319 of the Clean Air Act requires an air quality monitoring system throughout the United States to meet multiple objectives and provides for recordkeeping with respect to such monitoring data and for periodic analysis and reporting to the general public by the Administrator with respect to air quality based upon such data.
- 40 CFR Part 50 is the actual “home” of the NAAQS
- Where is the linkage for monitoring requirements?

# 40 CFR Parts 53 and 58

- The “home” of requirements for:
  - Method approvals
  - Sampling frequency
  - Network design
  - Annual plans and network assessments
  - Monitor location
  - Quality Assurance
  - Data reporting
- Let's walk through an example of how these requirements are triggered by a NAAQS revision

# Case Study

## Revision of the Lead (Pb) NAAQS

- On October 15, 2008, EPA substantially strengthened the NAAQS for lead. The revised the level of the primary (health-based) standard was tightened from 1.5 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), to 0.15  $\mu\text{g}/\text{m}^3$ , measured as total suspended particles (TSP).
- Ambient monitoring challenges associated with this decision were numerous, and provide an excellent illustration of what can happen when a NAAQS is revised.

# Updating the Nation's Lead Monitoring Network

- Methods needed revision
- More sites needed in different places (“network design”)
- Sampling frequency and schedule
- New quality assurance requirements
- Implementing an expanded network
- Communicating the changes to EPA and the public

# General Method Issues

- For NAAQS monitoring, ambient methods must be EPA approved. Options include:
  - Federal Reference Method(s) that are spelled out in an appendix to 40 CFR Part 50
  - Federal Equivalent Methods that are approved according to the requirements of 40 CFR Part 53
  - Approved Regional Method (specific to  $PM_{2.5}$  as outlined in 40 CFR Part 58)

# Specific Method Issues with Lead

- The approved High volume sampling method is quite old and subject to more uncertainty than more modern hardware
- The analysis portion of the method (Flame Atomic Absorption) also uses dated equipment and lab methods
- A newer alternative sampling approach (using  $PM_{10}$  sampling) had no associated FRM



Lead Sampler Designs

# How EPA is solving the Method Problems

- We are retaining the use of the old Hi-vol sampler while encouraging ORD to explore the development of alternatives
- We are also retaining use of existing lead laboratory methods while expediting development and approval of a new lead FRM and associated FEMs with help from ORD and the states
- A transition plan for new lead analysis methods will be developed once the alternatives are approved and will be communicated to States

# When to be most concerned about NAAQS Method Issues

- NAAQS level or averaging time is dramatically changed
- Indicator changed (e.g., potential shift from  $PM_{10}$  to  $PM_{10-2.5}$ )
- Ambient levels have decreased significantly and long term trends are approaching detection limits

# General Network Design Issues

- **Minimum monitoring requirements are detailed in Appendix D of Part 58**
  - **Numbers of sites in areas based on factors including ambient concentration and area population**
  - **What objectives should be met in addition to NAAQS (e.g., regional transport)**
  - **What types of areas should monitors represent (spatial scales)**
  - **Locations of maximum concentration must always be represented by required monitors. Additional monitors may be required to provide additional information, for example, on spatial gradients**

# Specific Network Design Issues for Lead

- Decision was made to employ an emissions threshold as part of monitoring requirements
  - Updates then required to emissions inventory
  - Lots of dispersion modeling was needed to evaluate source data and identify maximum concentration locations
  - New types of sources were identified for potential ambient monitoring (airports, racetracks)
- Additional non-source requirements put in place to track trends away from sources

# Locations of New Lead Monitors



- Facilities that emit 1.0 or more tons of lead per year (135)
- CBSA with **population** of 500,000 or more (101)
- ▲ Existing ambient lead (Pb-TSP) monitoring sites (133)

# When to be most concerned about NAAQS Network Design Issues

- Requirements based on ambient concentration and/or population have changed
  - Monitors required in smaller urban areas
  - Monitors required in rural areas
  - Changes in other types of thresholds (e.g., emissions)
- More specific monitor placement criteria (e.g., near roads or other emission sources)

# Related Sampling Issues

- Filter based sampling techniques have required frequency specifications, typically a 24-hour sample every 3<sup>rd</sup> or 6<sup>th</sup> day
  - Frequency requirements can be changed during NAAQS revisions, for example, higher frequencies at worst sites including up to daily sampling
  - Continuous particulate matter (PM) sampling is often employed at sites where daily sampling is required
  - For lead, sampling frequency remained unchanged at every 6<sup>th</sup> day
- EPA Regional Administrators can also grant waivers to allow reduced sampling frequency based on analyses of historical data, presence of collocated continuous monitors, or other factors

# Sampling Season Issues

- In some cases, ambient monitoring is only required during periods when pollutants are expected to be higher (e.g., ozone)
  - Required seasonal sampling period can be modified during NAAQS revisions or in subsequent rulemakings that support the NAAQS
  - EPA Regional Administrators can also grant waivers to allow a shorter sampling season based on analyses of historical data, meteorology, or other factors

# General Quality Assurance Issues

- Appendix A of 40 CFR Part 58 contains QA requirements, including:
  - Quality system requirements
  - Data quality objectives
  - Performance of measurement quality checks, colocated sampling, and independent audits
  - Procedures for calculating measurement uncertainty (precision and bias)
  - Reporting requirements

# When to be most concerned about NAAQS QA Issues

- Level has been tightened significantly (e.g., lead)
  - Acceptable concentrations for quality control (QC) checks and audit materials (e.g., filter strips) may also decrease significantly, possibly requiring new procedures to produce acceptable data for decision making
- Averaging time has changed (shortened), possibly requiring a shift in technology and associated QA procedures (e.g., from filter-based integrated sampling to continuous monitoring)
- Indicator changed (e.g., potential shift from  $PM_{10}$  to  $PM_{10-2.5}$ )

# Tracking Potential Changes to Monitoring Requirements

- In recent years, revisions to monitoring requirements have typically been handled in the same (or in a parallel) rulemakings as NAAQS revisions
  - PM NAAQS – October 17, 2006
  - Lead NAAQS – November 12, 2008
  - NO2 NAAQS (proposal) – November 15, 2009
- In the case of ozone monitoring, the proposed monitoring rule followed the NAAQS revision by approximately 16 months
- Monitoring regulation revisions can also occur independently of NAAQS revisions, but these actions are infrequent

# Keeping Track of Rulemakings

## ■ EPA resources

- Office of Air and Radiation (OAR)  
<http://www.epa.gov/air/>
- OAR Policy and Guidance  
<http://www.epa.gov/ttn/oarpg/new.html>
- Ambient Monitoring Technical Information Center  
<http://www.epa.gov/ttnamti1/>

## ■ Code of Federal Regulations (Title 40)

- Electronic Code of Federal Regulations  
<http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl>

## ■ Federal Register main page <http://www.gpoaccess.gov/fr/>

# Implementing NAAQS-driven Monitoring Network Changes

- Timelines are specified in rulemakings. EPA balances the need for revised monitoring with the logistical capabilities of agencies to:
  - Perform technical reviews of final revisions and evaluate existing monitoring resources
  - Identify locations for new or relocated stations and obtain permission for use
  - Identify sources of funding including federal or state resources
  - Obtain new monitors, samplers, or shelters
  - Revise analytical methods, if necessary
  - Update standard operating procedures and quality assurance documents

# Implementing NAAQS-driven Monitoring Network Changes (cont.)

- EPA typically allows at least one year from the publication date of the final rule before monitoring revisions must be fully implemented
- Rule deadlines are often coordinated with January 1 of each year
- Lead example
  - Rule finalized November 12, 2008
  - Deadline for initial monitoring: January 1, 2010
- Monitoring deadlines are sometimes staggered over two years to lessen burden on monitoring agencies
- This means that newly required monitors will not be able to provide complete data (typically 3 years) in time for an initial round of designations following a NAAQS revision

# Example:

## Timeline For Implementing Revised Lead NAAQS

<b>Milestone</b>	<b>Date</b>
<b>Signature—Final Rule</b>	<b>Oct. 15, 2008</b>
<b>State Designation Recommendations to EPA</b>	<b>No later than October 2009</b> (based on existing network data)
<b>Monitoring Network</b>	<b>At least half of required sites operational by Jan. 1, 2010</b> (additional required sites operational by Jan. 1, 2011)
<b>Final Designations</b>	<b>No later than effective date Jan. 1, 2012*</b> *Based on one-year deadline extension due to insufficient information; some areas are expected to be designated earlier based on existing data.
<b>Transitional Strategy (Antibacksliding)</b>	<b>Revoke 1978 Pb NAAQS in pre-2009 attainment areas no later than October 2012</b>
<b>Attainment Demonstration SIPs Due</b>	<b>No later than June 2013</b> (18 month maximum)
<b>Attainment Date</b>	<b>No later than January 2017</b> (5 year maximum)

# Documenting Network Changes

- 40 CFR 58.10 lists the requirements for documenting network changes in the Annual Monitoring Network Plan
- Must include all proposed changes due to NAAQS revisions or other reasons
- Must be made available for public inspection for at least 30 days prior to submission to EPA
- EPA Regional Administrator has 120 days to review and approve
- Always due to EPA by July 1 of each year.
- Plan elements required to support NAAQS revisions will typically have specific due dates, e.g., July 1, 2009, for source-oriented lead monitors.

# Assessing Network Adequacy

- 40 CFR 58.10 also requires a network assessment every 5 years. The next one is due July 1, 2010.
- The assessment differs from an annual plan revision by including a more in-depth review of certain elements, including:
  - Use of more advanced tools to review spatial and temporal trends in ambient data
  - Evaluation of new technologies
  - Exposure of sensitive individuals
  - Reliance of health studies on sites being proposed for discontinuing or relocation
- Network assessments are a particularly powerful tool to support monitoring network changes that are needed to respond to the recently rapid pace of NAAQS revisions

# Reporting the Data

- 40 CFR 58.16 requires data reporting to the national database – the Air Quality System (AQS)
  - All ambient data and quality assurance data must be reported on a quarterly schedule within 90 days after the end of the quarterly reporting period. Applies to all SLAMS monitors and some special purpose monitors
- 40 CFR 58.15 also requires a data certification letter from the senior air pollution official by May 1 of each year (formerly July 1), attesting that the previous calendar year of data are accurate and complete, taking into account QA findings.
  - The certification process is intended to demonstrate to stakeholders that data have undergone final edits
- OAQPS typically waits for data to be certified before issuance of final design values used for calculating violations of the NAAQS

# Design Values

- Every NAAQS is defined by four parts:
  - Indicator
    - e.g., ozone,  $PM_{10}$
  - Averaging period
    - e.g., 1 hour, 8 hours, 3 months
  - Statistical form
    - e.g., three-year average of 4<sup>th</sup> highest daily maximum 8-hour concentration)
  - Level (the “bright line” concentration)
- The Design Value for a monitoring site is the summary concentration value that gets compared to the “bright line” level of a particular NAAQS to make the pass/fail determination, consistent with the other three parts.
- The Design Value for an area is (generally) the highest Design Value among all the monitors.

# Design Values (cont.)

- Detailed instructions for the complicated NAAQS are given in Appendices to 40 CFR 50
  - Ozone: H, I, and P
  - $PM_{10}$ : K
  - $PM_{2.5}$ : N
  - Lead: R
  - $NO_2$ : S (proposed July 2009)
- Instructions for CO and  $SO_2$  are simpler, and are included in the section of 40 CFR 50 that defines the NAAQS.
- Design values are calculated by EPA each year for informational purposes, whether EPA is actually making an official determination or not.
  - See <http://www.epa.gov/airtrends/values.html>
- Please see the NAAQS Design Value training module for more information on this topic

# AMTIC website

- [www.epa.gov/ttn/amtic](http://www.epa.gov/ttn/amtic)