
EPA's New and Revised
Ozone and Particulate Matter
National Ambient Air
Quality Standards

July 25, 1997

This Presentation Will Address...

- Background on National Ambient Air Quality Standards
- NAAQS Review Process
- Background on Ozone
- Background on Particulate Matter
- Regional Haze
- EPA's Decisions on the Ozone and PM Standards
- Monitoring PM_{2.5}
- Implementation of the New Standards
- What's Next?
- Sources of Additional Information

Background on the National Ambient Air Quality Standards

What Are NAAQS?

- Title I of CAA directs EPA to establish National Ambient Air Quality Standards (NAAQS) for commonly occurring air pollutants posing public health threats.
- NAAQS set national levels for acceptable concentrations of specific pollutants in outdoor air.
- These are known as “criteria pollutants.”

The Existing NAAQS

- EPA has set NAAQS for 6 criteria pollutants:
 - » ground-level ozone (smog)
 - » particulate matter (PM)
 - » lead
 - » nitrogen dioxide
 - » sulfur dioxide
 - » carbon monoxide

Primary vs. Secondary NAAQS

- For each of these 6 pollutants, EPA has set:
 - » health-based or primary standards to protect public health with adequate margin of safety; and
 - » welfare-based or secondary standards to protect environment (e.g., crops, vegetation, wildlife, buildings and visibility).

NAAQS Review Process

NAAQS Review Process

- CAA directs EPA to review each NAAQS once every 5 years.
- 5-year reviews ensure standards reflect most recent health information available.
- EPA recently concluded reviews of NAAQS for both ozone and PM.

Steps in NAAQS Review Process

- Step 1: EPA Develops Criteria Document
- Step 2: EPA Develops Staff Paper
- Step 3: CASAC Reviews CD and Staff Paper
- Step 4: EPA Decides Whether or Not to Revise Standard
- Step 5: EPA Issues Proposed Decision for Public Review

Step 1: EPA Develops Criteria Document

- Summarizes relevant science on sources, chemistry and effects of criteria pollutant.
- Separate CDs published for ozone and PM.

Step 2: EPA Develops Staff Paper

- Summarizes CD and identifies:
 - » factors EPA believes should be considered during review of standard;
 - » uncertainties in scientific data; and
 - » ranges of alternative standards EPA believes should be considered.
- Separate Staff Papers published for ozone and PM.

Step 3: CASAC Reviews CD and Staff Paper

- CDs and Staff Papers submitted to Clean Air Scientific Advisory Committee (CASAC) -- a Congressionally mandated group of independent scientific and technical experts.
- CASAC conducts extensive review of CD and Staff Paper, culminating in “closure letter” to EPA Administrator.

Step 4: EPA Decides Whether or Not to Revise Standard

- CAA requires EPA to protect public health with adequate margin of safety.
- Act prohibits consideration of issues such as feasibility of meeting standard, cost effectiveness and economics.
- Agency's decision based on most recent health information and CASAC's recommendations on adequacy of standard.

Step 5: EPA Issues Proposed Decision for Public Review

- Proposed decision published in *Federal Register*.
- Public comment period follows:
 - » public hearings held; and
 - » written and oral public comments accepted.
- EPA Administrator makes final decision.

Background on Ozone

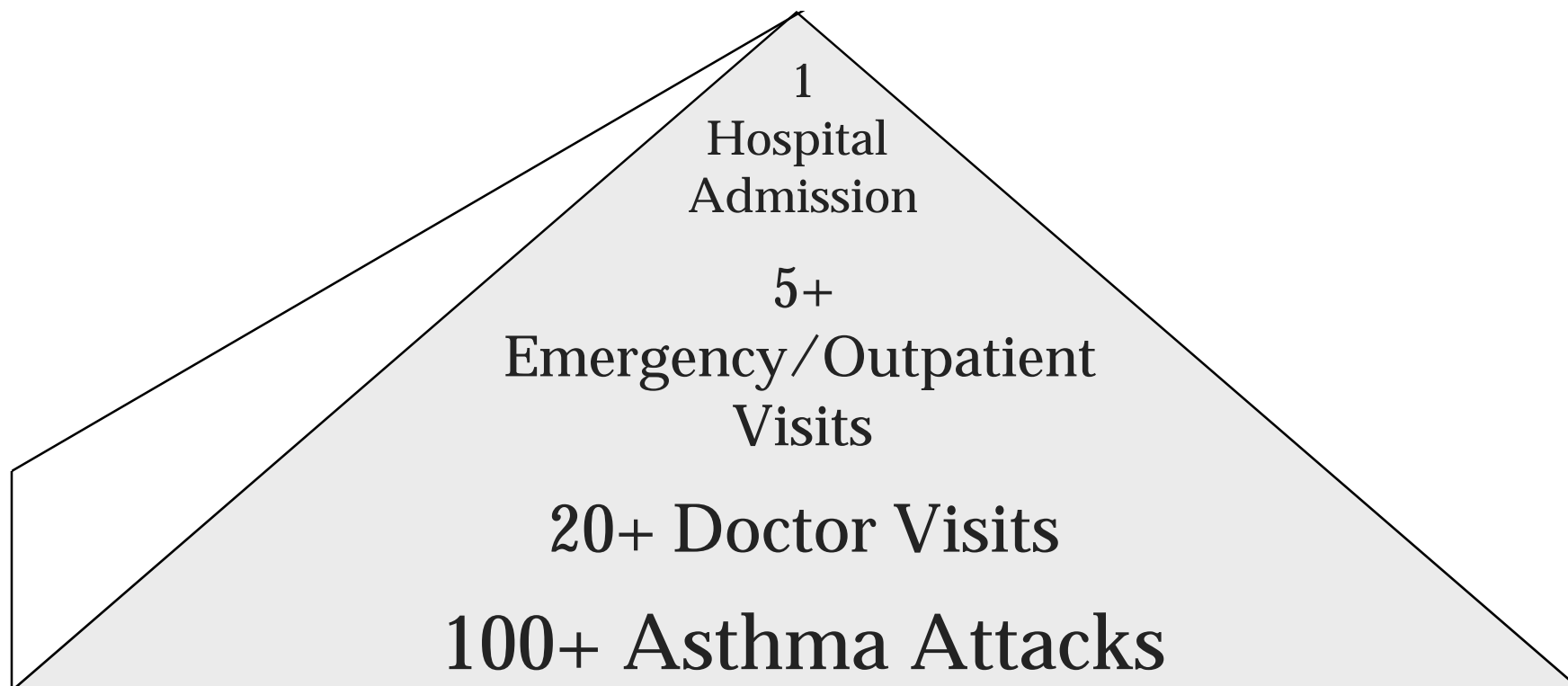
What is Ozone?

- Ozone: “Good up high, bad nearby.”
- Ground-level ozone results from chemical reaction of nitrogen oxides and hydrocarbons in presence of sunlight.
- At ground-level, ozone is principal component of smog and one of 6 “criteria pollutants” for which EPA sets NAAQS.
- In stratosphere, ozone occurs naturally and screens out harmful ultraviolet rays from sun.

Health Effects of Ozone

- When inhaled at harmful levels, ozone can:
 - » pose health problems for children, asthmatics, the elderly and even healthy adults;
 - » cause acute respiratory problems;
 - » aggravate asthma, emphysema and bronchitis;
 - » lead to hospital admissions and emergency room visits; and
 - » impair the body's immune system defenses.

Hospital Admissions Are Just the Tip of the Iceberg



Cite: US Department of Health and Human Services (1994) National Hospital Ambulatory Medical Care Survey: 1992 Summary. The NY Electricity Externality Study (1995) Rowe et al.

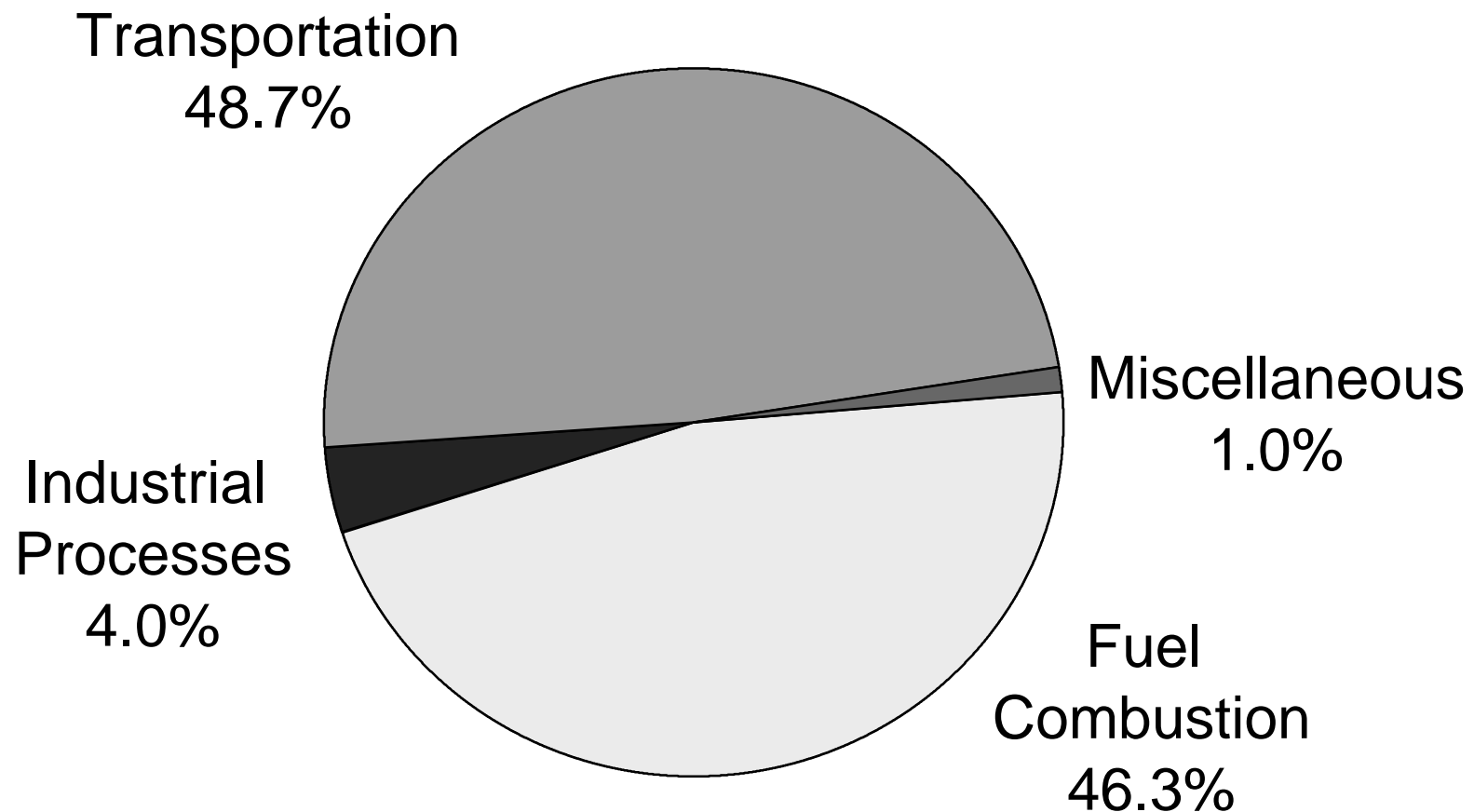
Environmental Effects of Ozone

- Reduces agricultural yields for many economically important crops.
- Reduces visibility by 70% in many parts of the U.S.
- Causes soiling and damage to materials.
- Adversely affects forests, plant life and ecosystems.

Major Contributors to Ozone

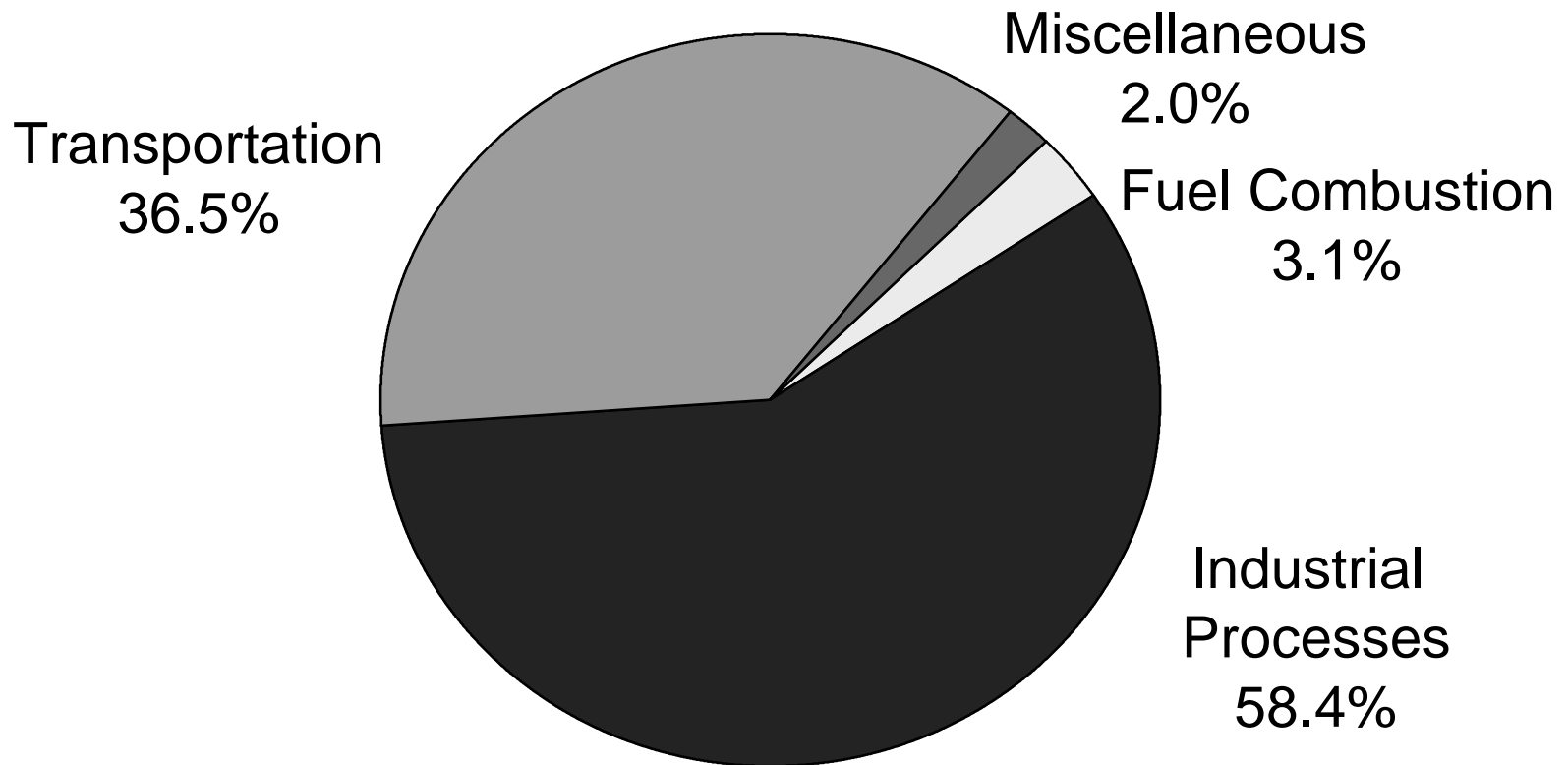
- Sources of NO_x and VOCs
 - » Motor Vehicles
 - » Power Plants
 - » Factories
 - » Consumer and Commercial Products
 - » Fuel Combustion Processes

NO_x Emissions by Source Category -- 1995



Source: EPA Trends Report, October 1996

VOC Emissions by Source Category -- 1995



Source: EPA Trends Report, October 1996

Background on Particulate Matter

What is Particulate Matter?

- A complex mixture of solid and liquid particles suspended in atmosphere.
- PM_{10} is coarse particulate matter 10 microns or less in diameter.
- $PM_{2.5}$ is fine particulate matter 2.5 microns or less in diameter.

Types of Particles

- Primary Particles -- Those emitted directly into the air.
- Secondary Particles -- Those formed in the atmosphere by transformation of gases (SO_x , NO_x and VOCs) into solids or liquids.

Major Effects of PM

- Acute respiratory symptoms, including severe chest pain, gasping and aggravated coughing;
- Aggravated asthma;
- Decreased lung function and chronic bronchitis;
- Premature death; and
- Environmental effects such as visibility impairment and materials damage.

Populations Most at Risk

- Elderly
- Children
- Asthmatics
- Adults with preexisting heart or lung disease

Sources of PM

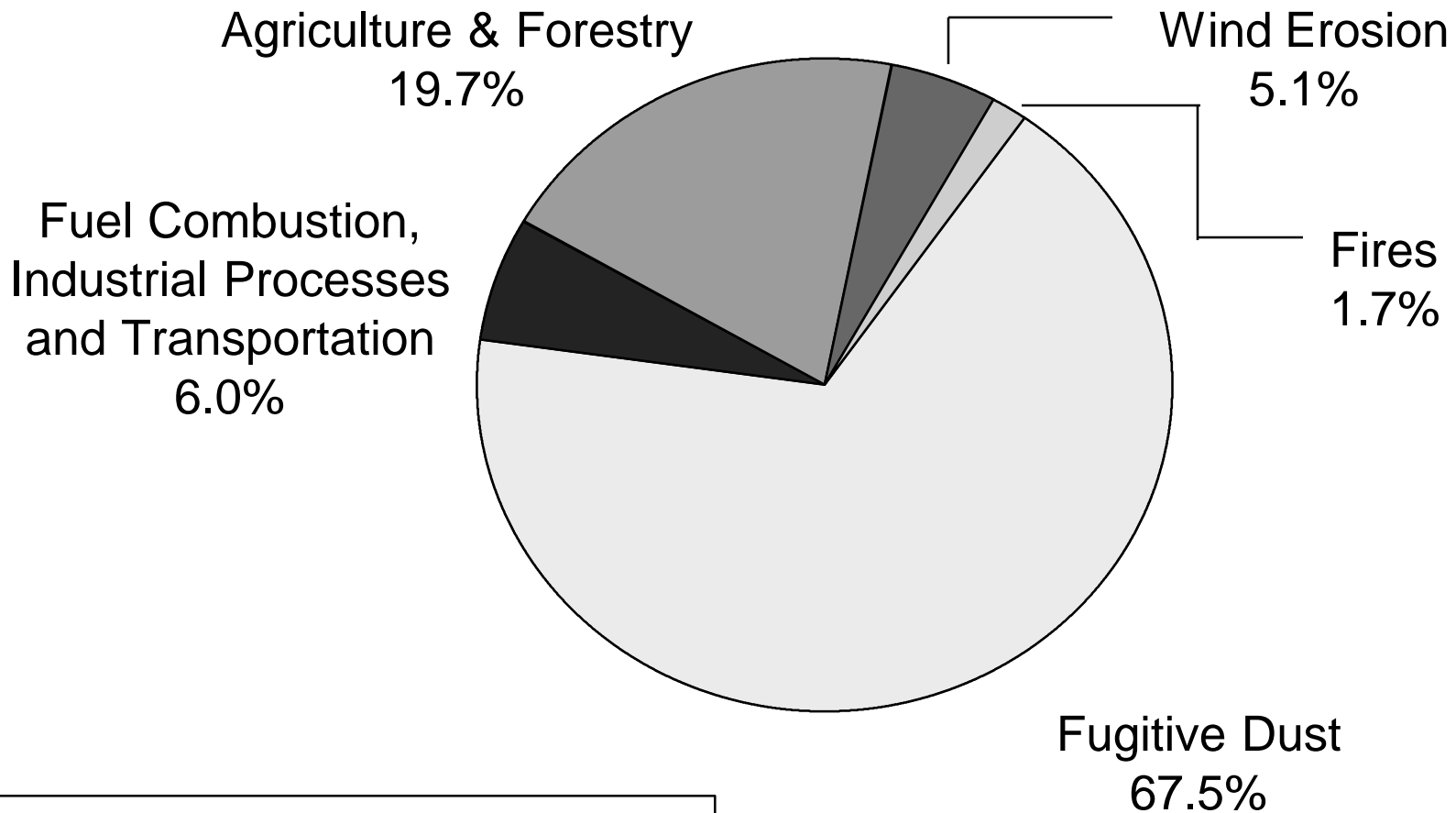
- PM₁₀

- » Street Sand
- » Road Dust
- » Grinding Operations
- » Agricultural Operations
- » Volcanoes

- PM_{2.5}

- » Motor Vehicles
- » Power Plants
- » Woodburning
- » Industrial Processes

PM₁₀ Emissions by Source Category -- 1995



Source: EPA Trends Report, October 1996

Some Sources of PM_{2.5}

- Sulfate

- » Oil and Coal-Fired Boilers
- » Small Combustion Sources

- Nitrate

- » Highway Vehicles
- » Off-Road Diesel Mobile Sources
- » Fertilizer

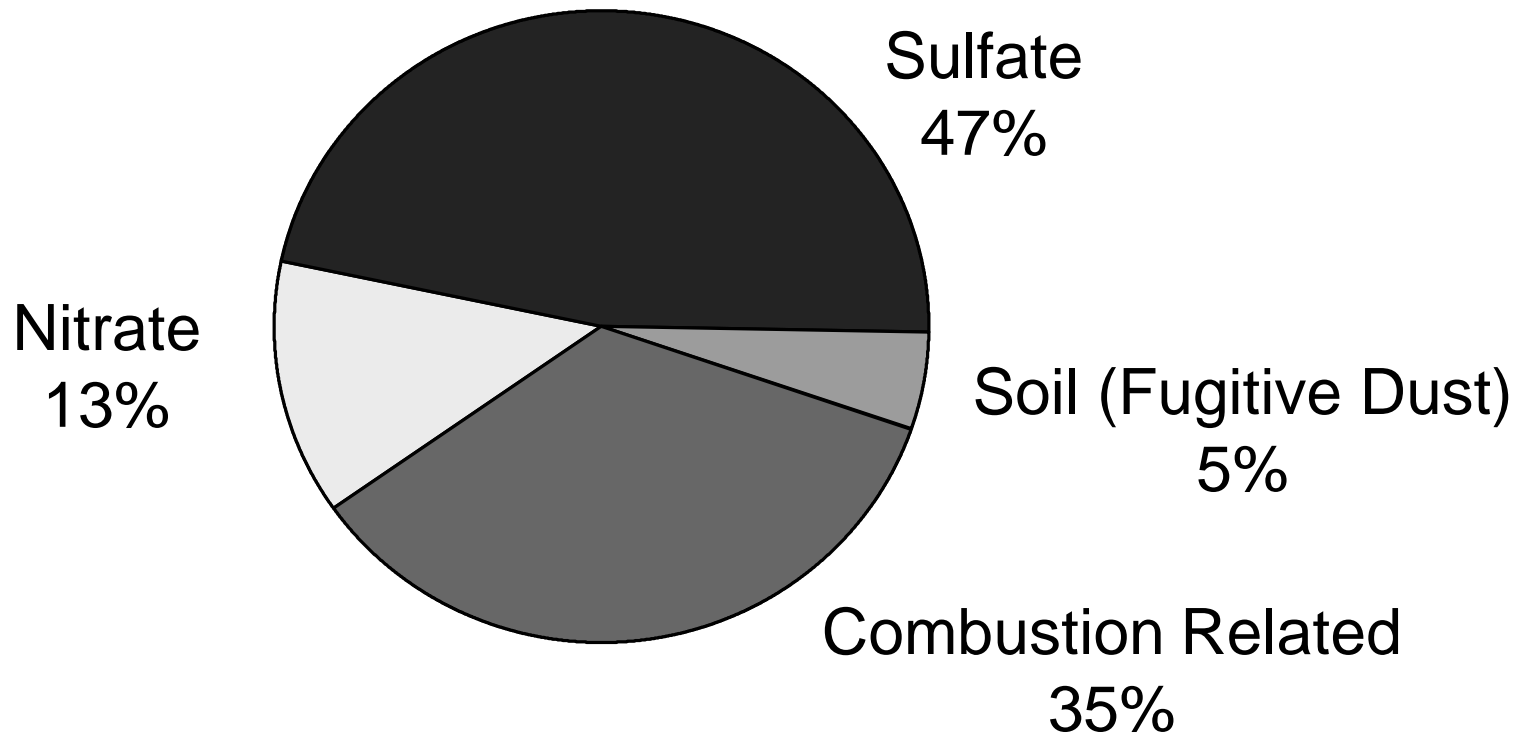
- Soil

- » Fugitive Dust
- » Agricultural Operations
- » Industrial Operations

- Combustion Related

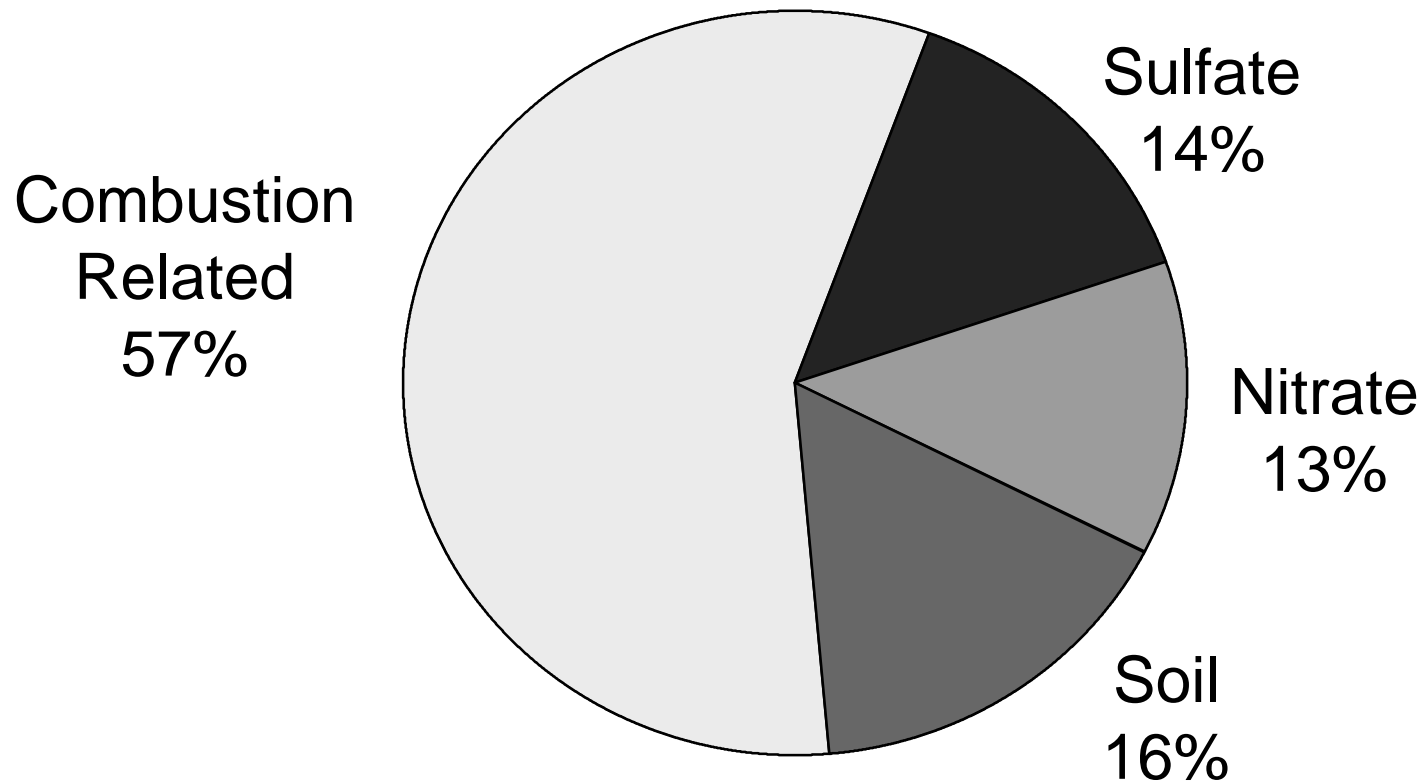
- » Diesels
- » Aircraft and Railway
- » Fuel Combustion
- » Open Burning
- » Residential Burning
- » Structural Fires
- » Organic Gases

Origin of PM_{2.5} in Typical Eastern City -- Washington, DC



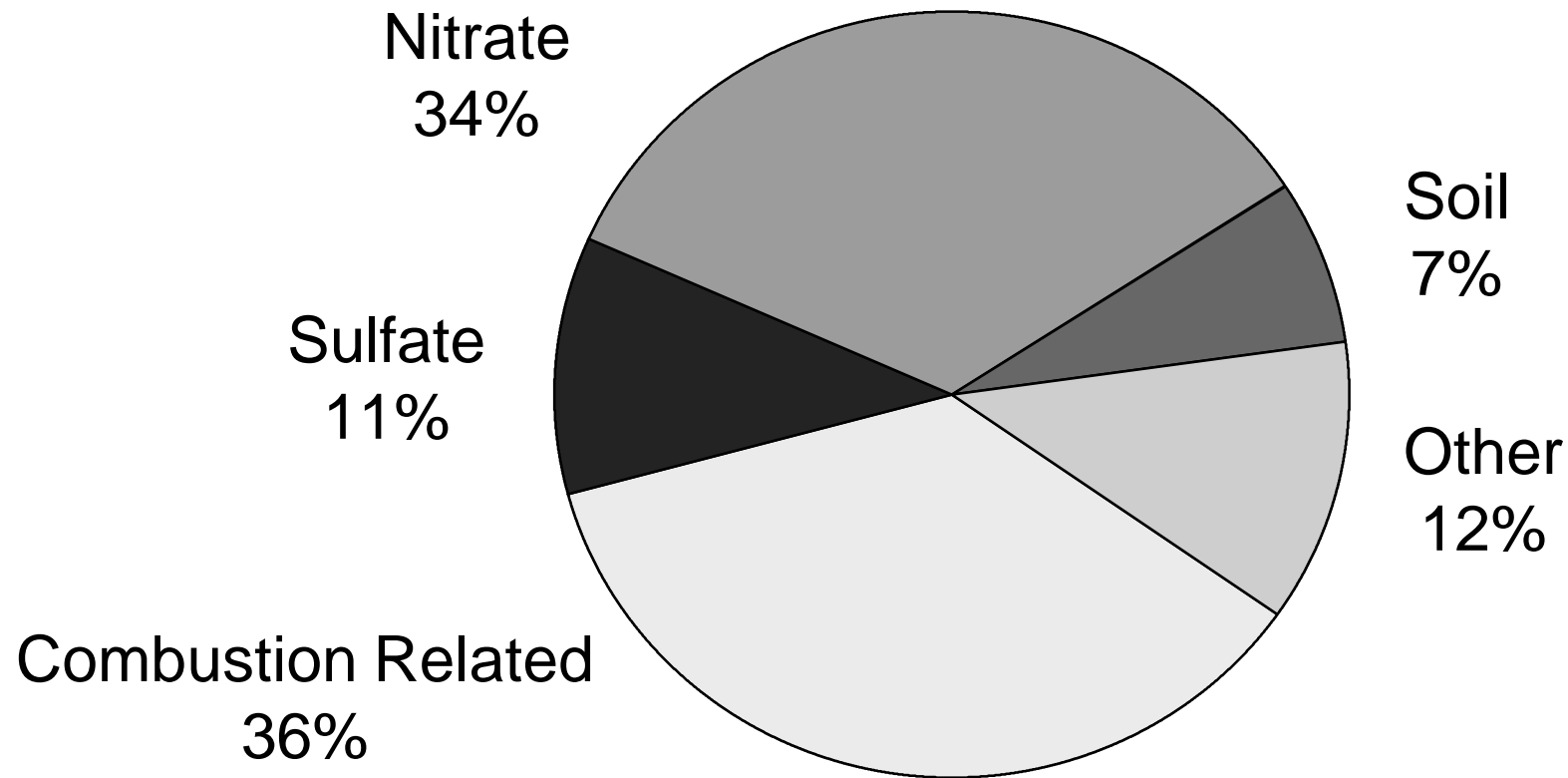
Source: EPA (June 1997) -- based on analysis of actual ambient air samples taken during 1992-1995 in Washington, DC.

Origin of PM_{2.5} in Arid Western City Surrounded by Desert and Agriculture -- Phoenix, AZ



Source: EPA (June 1997) -- based on analysis of actual ambient air samples taken during 1995-1996 in Phoenix, AZ.

Origin of PM_{2.5} in Western Agricultural/ Industrial Area -- San Joaquin Valley



Source: EPA (June 1997) -- based on analysis of actual ambient air samples taken during 1988-1989 in the San Joaquin Valley of CA.

Regional Haze

What is Regional Haze?

- Regional haze occurs when visibility is impaired over large area.
 - » According to EPA, haze currently reduces natural visibility from 90 miles to between 14 and 24 miles in eastern U.S. and from 140 miles to between 33 and 90 miles in western U.S.
 - » Visibility impairment tends to be exacerbated in the eastern U.S. due to higher average humidity levels and higher levels of PM from manmade and natural sources.
- Components of haze include suspended smoke, dust, moisture, vapor and other fine particles.
- Regional haze and visibility impairment may occur hundreds or even thousands of miles away from sources of particles.

Regulating Regional Haze

- EPA established regional haze program under CAA to address visibility impairment in national parks and wilderness areas.
- CAA sets as national goal “the prevention of any future, and the remedying of any existing impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution.”

EPA's New Regional Haze Proposal

- EPA Administrator signed proposal for new regional haze program on 7/18/97.
- Proposal revises existing visibility program established in 1980; addresses visibility in the form of regional haze.
- Seeks to protect 156 "Class I" areas, including certain national parks, wilderness areas, national memorial parks and international parks.

Purposes of Regional Haze Proposal

- Would serve as important component of overall approach to protecting public welfare from effects of visibility impairment associated with PM.
- Would result in development of comprehensive visibility protection program under CAA.
- Would respond to recommendations made to EPA by Grand Canyon Visibility Transport Commission, based on 4 years of technical assessment and discussion.

Key Features of Regional Haze Proposal

- Given evidence that fine particles can be transported hundreds of miles, program would apply to all states, including those without Class I areas.
- Would impose “presumptive reasonable progress targets” for improving visibility in Class I areas; states may propose alternate targets.
- Would require states to revise plans for visibility within 12 months of issuance of final rule.

EPA's Decisions on the Ozone and PM Standards

EPA's November 1996 Proposals

- Proposed Revised Ozone Standard
- Proposed Revised PM₁₀ Standard
- Proposed New PM_{2.5} Standard
- Proposed PM_{2.5} Monitoring Strategy
- Proposed Interim Implementation Policy

Public Review of Proposals

- Proposals announced by EPA 11/27/96 and published in *Federal Register* 12/13/96.
- Four public hearings held in early 1997.
- Public comments accepted until 3/12/97.
- EPA received 57,000 comments at public hearing, through letters and via e-mail and telephone messages.

Final EPA Action

- Final standards for ozone and PM announced by EPA on 6/25/97.
- Final standards and PM monitoring rule signed by EPA Administrator Browner on 7/16/97 and published in *Federal Register* on 7/18/97.
- All three actions take effect 9/16/97, unless Congress acts.

Ozone

Existing One-Hour Ozone Standard

- 1-hour standard of 0.12 ppm, with no more than 3 exceedances allowed over 3-year period.
- Established in 1979.
- Last review completed in 1989; existing standard reaffirmed in 1993.

EPA's Ozone Proposal (11/96)

- Level of Standard -- Decreased from 0.12 ppm to 0.08 ppm.
- Averaging Time -- Increased from 1 hour to 8 hours to protect against longer exposures.
- Form of Standard -- Changed from exceedance based to concentration based (3-year average of 3rd highest daily concentration at a monitoring site).

EPA's Final Ozone Standard (7/97)

EXISTING

0.12 ppm

1-hour std.

Exceedance-
Based Form:

No more than
1 exceed. per
year, averaged
over 3 years

PROPOSED

0.08 ppm

8-hour std.

Concentration-
Based Form:

3-year avg.
of **3rd** highest
daily concent.
at a site

FINAL

0.08 ppm

8-hour std.

Concentration-
Based Form:

3-year avg.
of **4th** highest
daily concent.
at a site

Determining Compliance: An Example

<u>Year</u>	<u>1st High Daily Concent.</u> (ppm)	<u>2nd High Daily Concent.</u> (ppm)	<u>3rd High Daily Concent.</u> (ppm)	<u>4th High Daily Concent.</u> (ppm)
1997	0.105	0.103	0.103	0.102
1998	0.104	0.103	0.092	0.091
1999	0.103	0.101	0.101	0.097
Avg.				0.097*

*Area is n.a. because 3-yr. avg. of 4th highest daily 8-hr. concentration exceeds 0.08 ppm.

Health Benefits of Final Ozone Standard

- According to EPA, the new standard:
 - » better reflects real-world effects of ozone on human health;
 - » extends health protection to 113 million people -- 35 million more than are protected by existing standard; and
 - » will result in 1 million fewer incidences annually of decreased lung function in children.

PM_{10}

STAPPA/ALAPCO

Existing PM₁₀ Standards

- Existing indicator for PM is PM₁₀, which addresses coarse particles.
- Current PM₁₀ standards set in 1987.
- Annual Standard: 50 ug/m³, based on 3-year average of annual arithmetic mean concentrations.
- Daily Standard: 150 ug/m³, based on 1 expected exceedance per year, averaged over 3 years.

EPA's PM₁₀ Proposal (11/96)

- Annual Standard: Retain current standard, both numeric level and form.
- Daily Standard: Retain current numeric level, but revise form from exceedance based -- 1 per year averaged over 3 years -- to concentration based -- 3-year average of 98th percentile of monitored concentrations.

EPA's Final PM₁₀ Standards (7/97)

EXISTING

Annual:

- 50 ug/m³
- 3-yr avg. of annual arith. mean concent.

Daily:

- 150 ug/m³
- 1 exceed/year, avgd over 3 yrs

PROPOSED

Annual:

- 50 ug/m³
- 3-yr avg. of annual arith. mean concent.

Daily:

- 150 ug/m³
- 3-yr avg of **98th** percentile of monitored concent.

FINAL

Annual:

- 50 ug/m³
- 3-yr avg. of annual arith. mean concent.

Daily:

- 150 ug/m³
- 3-yr avg of **99th** percentile of monitored concent.

$PM_{2.5}$

EPA's PM_{2.5} Proposal (11/96)

- Annual Standard: 15 ug/m³, based on 3-year average of annual arithmetic mean concentrations.
- Daily Standard: 50 ug/m³, based on 3-year average of 98th percentile of monitored concentrations.

EPA's Final PM_{2.5} Standards (7/97)

PROPOSED

Annual:

- 15 ug/m³
- 3-yr avg of annual arith mean concent.

Daily:

- **50** ug/m³
- 3-yr avg of 98th percentile of monitored concent.

FINAL

Annual:

- 15 ug/m³
- 3-yr avg of annual arith mean concent.

Daily:

- **65** ug/m³
- 3-yr avg of 98th percentile of monitored concent.

Monitoring PM_{2.5}

Deployment of PM_{2.5} Monitoring Network

- New comprehensive, nationwide air quality monitoring network needed for PM_{2.5}.
- Network to be deployed between 1998 and 2000.
- EPA to seek Congressional appropriation for full funding (>\$100 million) of 1,500-monitor PM_{2.5} network.
- State and local agencies required to collect 3 full years of data by no later than 2003.

EPA's Final PM_{2.5} Monitoring Requirements

- Final PM monitoring rule establishes new method (“Federal Reference Method”) for monitoring PM_{2.5}, as well as procedures for identifying equivalent methods.
- Compliance with annual standard to be based on community-oriented or “core” monitors, representative of average community-wide exposure; spatial averaging may be used.
- Compliance with daily standard to be based on single population-oriented monitoring site with highest measured values.

Where Will Monitors Be Placed?

- In 1998, all metro areas with population of 500K or more required to have at least 1 core monitor; each state required to have at least 2 additional monitors.
- Monitoring areas will be selected by state based on likelihood of high PM_{2.5} concentrations and size of affected population.
- PM_{2.5} monitors to be collocated in some ozone nonattainment areas.
- Special Purpose Monitors will also be sited; some monitors will conduct chemical speciation.

Implementation of the New Standards

Presidential Memo to EPA on Implementation

- President Clinton published memo to EPA Administrator in *Federal Register* on 7/18/97.
- To serve as “road map for areas to attain standards and protect public health without sacrificing economic growth.”
- Calls for standards to be implemented in most flexible, reasonable, and least burdensome manner; calls upon federal government to work with state and local governments and other interested parties to this end.

Provisions of Memo

- Maximize common sense, flexibility and cost effectiveness.
- Maintain current progress and respect agreements already made by states, communities and businesses to clean up air.
- Reward early action to reduce air pollution.
- Address transported pollution; minimize burden on areas where problems are regional, not local.
- Encourage control strategies that keep costs under \$10,000 per ton.

New Review of PM_{2.5} Standards

- Memo requires EPA to begin new review of PM_{2.5} standards immediately (proposed review schedule due October 1997).
- To be completed, including CASAC review, by July 2002 -- prior to designations under PM_{2.5} standards and imposition of control measures.
- EPA to continue to sponsor research on effects of fine particles on human health.

Ozone Implementation Issues

Current EPA Thinking on Ozone Implementation

Three Categories of Areas:

- 1 - Current ozone nonattainment areas.
- 2 - Current attainment areas that will violate new ozone standard, but be able to attain through implementation of regional transport strategy.
- 3 - Current attainment areas that will violate new ozone standard, but for which regional transport strategy not applicable or not sufficient.

Current Ozone Nonattainment Areas

- Designate under new standard in 2000, based on data from 1997-1999; areas that attain 1-hr std. by 2000 may qualify for “transitional” status.
- Retain existing ozone nonattainment designations/classifications until existing standard met; CAA provisions for “bump ups” retained.
- Continue attainment efforts; SIP for new standard due in 2003 (need not include new obligations under new standard until existing standard met).
- Attainment required by 12 years following designation (2012).

New Nonattainment Areas Helped by Regional Strategy

- Areas able to attain new standard through regional transport strategy submit plan addressing transport to EPA in 2000.
- Also in 2000, EPA designates as “transitional” those areas needing few or no reductions in addition to regional strategy (modified NSR, offsets and conformity to apply).
- Reductions from transport strategy to be achieved by 2004; effectiveness assessed in 2007.
- Areas have up to 12 years following designation (2012) to attain new standard.

Regional Transport Strategy

- EPA expects most new ozone nonattainment areas will attain with regional strategy alone.
- EPA to pursue regional utility NO_x strategy in eastern U.S., as recommended by Ozone Transport Assessment Group (OTAG).
- OTAG = Recently completed 2-year stakeholder process to develop recommendations to address ozone transport in 37-state region of eastern U.S.

Other New Nonattainment Areas

- Areas to be designated in 2000, based on data from 1997-1999.
- SIPs to be developed and approved 3 years following designation.
- Areas designated nonattainment must attain by 12 years following designation (2012).
- Areas not subject to regional strategy may be classified as “transitional” if they develop and submit, and EPA approves, SIP with sufficient measures prior to 2000.

Ozone Implementation Schedule

“Transitional” Areas

2000: States submit plans addressing transport; EPA designates “transitional” areas.

2004: Regional reductions achieved.

2007: Effectiveness of reg. reducts. assessed.

2012: Areas to attain w/in 12 yrs. from desig.

Other N.A. Areas

2000: EPA designates nonattainment areas.

2003: States submit plans for attaining std. (for existing n.a. areas, ongoing efforts enough).

2004: Implementation of plans begins.

2012: Areas to attain w/in 12 yrs. from desig.

PM Implementation Issues

PM_{2.5} Implementation Schedule

1997-2002: EPA conducts new review of PM_{2.5} health effects.

1998-2000: PM_{2.5} monitoring network deployed.

1998-2003: Monitoring data collected.

2002-2005: PM_{2.5} n.a. areas designated based on 3 yrs of data.

2005-2008: States submit and begin implementing SIPs.

2012-2017: Nonattainment areas to reach attainment (12 years following designation).

Regional Strategies for PM_{2.5}

- EPA estimates nearly 1/3 of areas projected to violate PM_{2.5} standard (primarily in east) could comply as result of regional SO₂ reductions now required by CAA acid rain program.
- Where problems are regional and areas are carrying out regional reduction programs, no new local requirements to be imposed.
- Other regional strategies for reducing PM_{2.5} to be analyzed; EPA to encourage market-based regional approaches where further regional reductions needed to attain.

What's Next?

Possibilities for Congressional Action

- Congress allowed 60 legislative days under Small Business Regulatory Enforcement Fairness Act (SBREFA) to review final standards.
 - » May hold hearings and/or take a vote.
 - » If standards voted down, President may veto; 2/3 congressional vote necessary to override veto and repeal final standards.
- May also pursue legislative recourse, such as appropriations rider or targeted legislation; not subject to 60-day time period.

EPA Development of Implementation Strategies

- Interim Implementation Policy -- to address period between promulgation and SIP approval -- proposed in 11/96.
- Final Interim Implementation Policy expected in 9/97.
- More detailed implementation strategy to be proposed by end of 1997.

Development of Implementation Approaches

- EPA has convened stakeholder process under Federal Advisory Committee Act to develop recommendations related to integrated implementation of new standards and forthcoming new regional haze program.
 - » FACA Subcommittee for Ozone, PM and Regional Haze Implementation Programs.
 - » Integrated implementation can lead to more cost-effective and efficient control strategies.

Sources of Additional Information

Internet Web Sites

- STAPPA/ALAPCO's web site --
<http://www.4cleanair.org>
- EPA's Air Links web site --
<http://ttnwww.rtpnc.epa.gov/naaqsfm/>

STAPPA/ALAPCO

Publications

- Controlling Particulate Matter Under the Clean Air Act: A Menu of Options -- July 1996.
- Controlling Nitrogen Oxides Under the Clean Air Act: A Menu of Options -- July 1994.
- Controlling Volatile Organic Compounds Under the Clean Air Act: A Menu of Options -- September 1993.