

# Review of the California Ambient Air Quality Standards for Ozone



**Air Resources Board**



**Office of Environmental  
Health Hazard Assessment**

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**California Environmental Protection Agency**

# Purpose of the Workshop

- Present the staff recommendation for the State ozone standard
- Discuss the Air Quality Advisory Committee review of the Staff Report
- Receive public comments

# What is an Ambient Air Quality Standard?

- Legal definition of clean air
- Has four parts:
  - Pollutant definition
  - Concentration
  - Averaging time
  - Monitoring Method
- Based solely on health and welfare

# Standard Setting Does Not Include

- Attainment designation
- Feasibility of controls
- Cost of controls
- Implementation of controls
- Addressed by separate regulatory processes

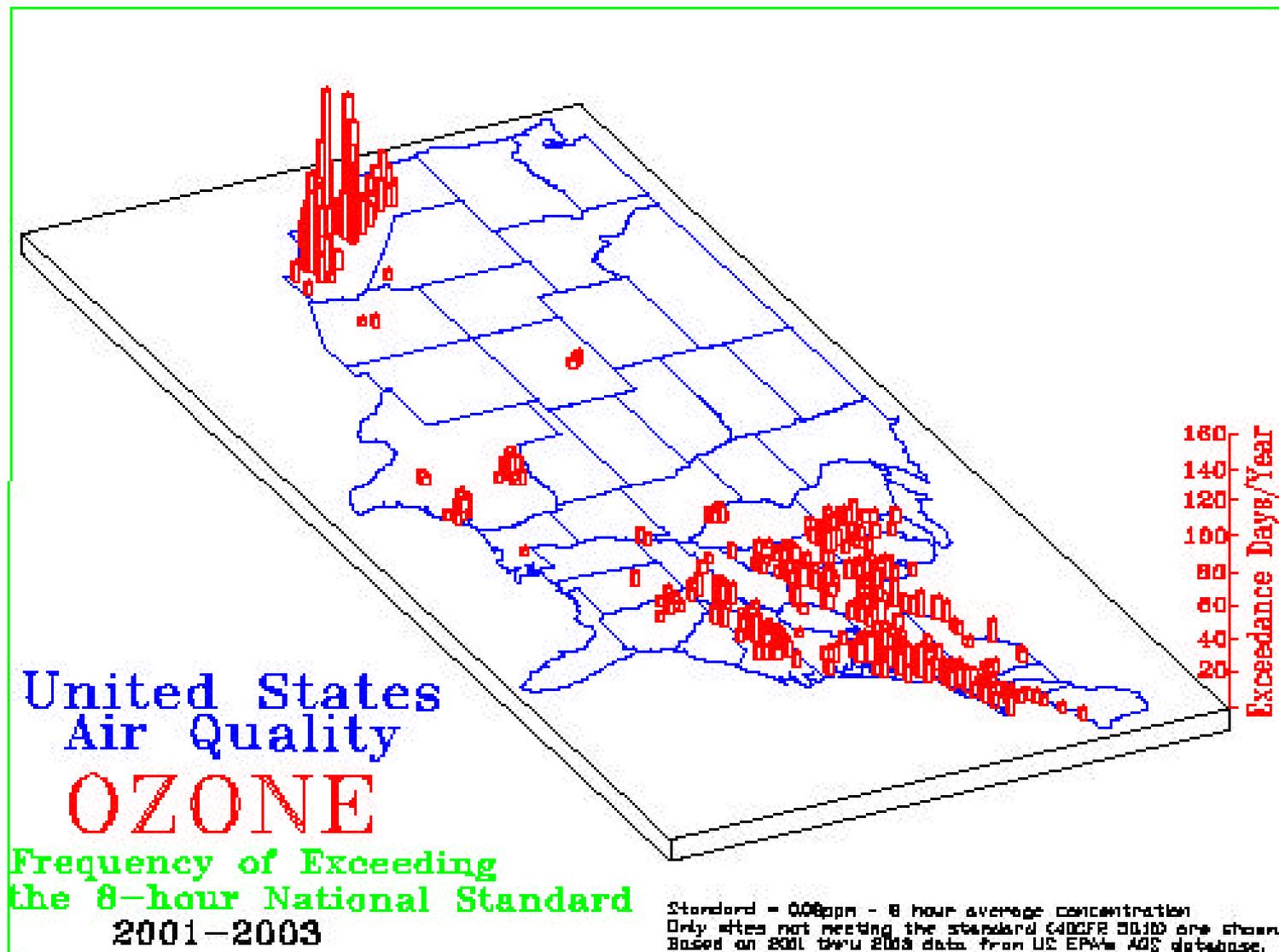
# Why Are We Reviewing the State Ozone Standard?

- Health effects are significant
- Body of evidence is substantial
- Exposure is high in California
- Children may be particularly vulnerable

# Nature of Public Health Risk Associated with Ozone

- Primarily an outdoor pollutant
- Risk proportional to inhaled amount of ozone
  - Ozone concentration most important
- Greatest risk to people who are active outdoors
  - Adults who exercise or work outdoors
  - Children

# National 8-Hr O<sub>3</sub> Standard Exceedances



# Nonattainment Area Classification Map California 1-Hr Ozone Standard



# Current Ozone Standards (ppm)

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	1-Hour	8-Hour
California (1987)	0.09	--
US EPA (1996)	0.12	0.08*
WHO for Europe	--	0.06
Canada	0.082	--

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\*selected from a range of 0.07 to 0.09 ppm

# Where Are We in the Standard Review Process?



# Air Quality Advisory Committee (AQAC) Review

- Required by State law
- Appointed by University of California President
- Purpose of AQAC review:
  - Assess adequacy of scientific basis for proposed standards
  - Assess adequacy of proposed standards to protect public health

# Findings of the AQAC Review

- Scientific conclusions and findings are consistent with the available data
- Staff recommendations are scientifically sound, and well justified
- Suggested clarifications, additional papers and/or more detail in some sections of the report
- Revised Staff Report responded to the AQAC review

# Recommendation to Revise the California Ozone Standard

- Retain ozone as the pollutant definition
- Establish a new 8-hr standard of 0.070 ppm, not to be exceeded
- Retain the current 1-hr standard of 0.09 ppm, not to be exceeded
- Retain the UV monitoring method

# What Are the Health Effects of Ozone?

- Reduced lung function
- Respiratory symptoms
- Airway inflammation
- Increased hospital and ER usage
- Increased school absenteeism
- Asthma induction in active children (needs confirmation)

# Controlled Human Studies (1 to 3 Hours): Lowest Concentrations Showing Effects

- Lung Function Decrements: 0.12 ppm
- Increased Respiratory Symptoms: 0.12 ppm
- Increased Airway Resistance: 0.18 ppm
- Airway Inflammation: 0.20 ppm

# Studies of Multi-Hour Ozone Exposures: Lowest Concentrations Showing Effects

- Lung function decrements: 0.08 ppm
- Increased respiratory symptoms: 0.08 ppm
- Increased airway reactivity: 0.08 ppm
- Airway inflammation: 0.08 ppm
- No effects reported at 0.04 ppm

# Influence of Demographics and Ethnicity on Responsiveness

- Few studies conducted
- Factors Investigated
  - Gender
  - Age
  - Socioeconomic Status
  - Ethnicity
- Insufficient data to draw conclusions

# Findings From Animal Studies

- Acute responses similar to humans:
  - Increased airway resistance
  - Airway inflammation
- Repeated injury-repair cycles can cause fibrosis (> 0.25 ppm)
- Changes in airway architecture with chronic exposure to high O<sub>3</sub> concentrations (> 0.20 ppm)

# Findings From Epidemiologic Studies

Ambient concentrations of ozone have been associated with:

- Respiratory hospital admissions
- Emergency room visits
- Asthma exacerbation
- School absences and respiratory symptoms
- New onset of asthma (with exercise)
- Reduced lung function with long term exposure
- Premature death

# New Evidence for an Association between Ozone and Mortality

- Study of 29 cities in Europe implicates summer ozone (Gryparis et al. 2004)
- Study of 95 largest U.S. cities implicates both summer and all-year ozone (Bell et al. 2004)
  - Study also controls for PM10 and weather
  - Reports effects for all age groups

# Basis for 1-Hour Standard Recommendation

## Retain the current 1-hr standard of 0.09 ppm

- Controlled human exposure studies report lung function and symptoms effects at 0.12 ppm
- Epidemiologic studies suggest adverse effects below 0.12 ppm, but difficult to determine relevant averaging time and concentration
- Studies on ER visits suggest a lowest effect level in the range of 0.075 to 0.11 ppm

# Basis for 1-Hour Standard (cont.)

- Includes a safety margin to protect children and other susceptible groups
- Protects against airway inflammation
- Protects against peak exposures

# Basis for 8-Hour Standard Recommendation

## Establish an 8-hr standard of 0.070 ppm

- Controlled human exposure studies report symptoms, lung function changes, and airway responsiveness effects at 0.08 ppm
- Some individuals exhibited large changes with 6.6 hr exposure to 0.08 ppm
- Epidemiologic studies suggest adverse effects at 8-hr concentrations less than 0.08 ppm

# Basis for 8-Hour Standard (cont.)

- Studies on ER visits suggest a lowest effect level in the range of 0.065 to 0.09 ppm
- Includes a safety margin for highly responsive individuals, children and other susceptible groups
- Increases protection in areas that meet 1-hr 0.09 ppm but still have 8-hr averages between 0.07 and 0.08 ppm

# Findings on Infants and Children Under SB 25

- No evidence that children respond to lower O<sub>3</sub> concentrations than adults
- Exposure patterns:
  - Frequent high exposures due to outdoor activity
  - Greater exposure per unit lung surface than adults
- Susceptibility: Early exposure may:
  - Affect lung development
  - Reduce adult lung function
  - Induce asthma

# Findings on Infants and Children (cont.)

- No evidence for interactions between pollutants
- Adverse health outcomes reported include:
  - Asthma exacerbation and ER visits
  - Hospital admissions
  - School absenteeism
  - Upper and lower respiratory symptoms
  - Possible onset of asthma
  - Decreased lung function in young adults raised in high ozone areas

# Summary:

## Staff Recommendation

- Retain ozone as the pollutant definition
- Establish a new 8-hr standard of 0.070 ppm, not to be exceeded
- Retain the current 1-hr standard of 0.09 ppm, not to be exceeded
- Retain the UV monitoring method

# Quantifying the Health Benefits of Reducing Ozone Exposure

Estimated impact on health is the product of:

- Changes in ozone concentrations
- Population exposed
- Baseline incidence of health outcomes
- % change in health outcome per unit increase in ozone based on evidence from epidemiologic studies

# Uncertainties in the Health Benefits Assessment

- Concentration-response functions selected
- Possible confounding by other air pollutants
- Appropriateness of weather modeling
- Existence of an effect threshold
- Air quality rollback methodology
- Baseline rates for the endpoints examined
- Adequacy of the exposure assessment

# Health Benefits of Attainment of the Proposed Standards

## *Estimated reductions:*

- 580 (290 - 870) premature deaths
- 3,800 (2200 - 5400) hospitalizations for respiratory diseases
- 600 (360 - 850) emergency room visits for asthma for children under 18 years of age
- 3.3 million (430,000 - 6,100,000) school absences among children 5 to 17 years of age
- 2.8 (1.2 - 4.6) million minor restricted activity days for adults above 18 years of age

# Background Ozone

- Sources:
  - Natural emissions of NO<sub>x</sub> and VOCs
  - Stratospheric intrusion
  - Transport
- Averages about 0.04 ppm
- Exceptional events
  - Can be identified
  - Can be excluded from attainment designation process
  - Policy in place to address

# Timeline for Ozone Review

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June 21, 2004	Release of Draft Report
July, August 2004	Public Workshops
Sept. 1, 2004	Public Comments Due
Jan. 11-12, 2005	AQAC Meeting
March 11, 2005	Release of revised Staff Report
<b>April 2005</b>	<b>Public Workshops</b>
April 28, 2005	Final recommendations to Board

# Contact Information

- Ozone standard review website:  
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