BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Public Workshop / Webcast:

Analyzing & Reducing Particulate Matter in the SF Bay Area

September 14, 2012

Purpose of the Workshop

- Describe context for PM planning
- Explain approach for PM2.5 State Implementation Plan (SIP)
- Present draft PM2.5 emissions inventory
  - to comply with PM2.5 SIP requirement
- Present draft report on PM in the Bay Area:
  to guide Air District's long-term efforts to analyze & reduce PM emissions and population exposure in the Bay Area
- Solicit public comment and input on these documents

Overview of Presentation

Part 1: Progress to date

- PM basics
- PM impacts
- Current PM control program
- BAAQMD analytical work to date
- Current Bay Area status relative to PM standards

Break for questions & comments on Part 1

Overview of Presentation

Part 2: Looking Forward

- Federal PM planning requirements
- PM2.5 State Implementation Plan (SIP) submittal
- PM Report
- Next Steps

Questions, comments, discussion on Part 2

To participate on-line

1. Please sign-in by sending email with name & affiliation to: **PMplanning@baaqmd.gov**

2. Send questions via email to:

   PMplanning@baaqmd.gov

Acronyms Used

ARB - Air Resources Board

BAAQMD – Bay Area Air Quality Management District

CAP – Bay Area 2010 Clean Air Plan

CARE – Community Air Risk Evaluation program

CEQA – California Environmental Quality Act

CRRP – Community Risk Reduction Plan

EPA - U.S. Environmental Protection Agency

NOx - Oxides of nitrogen (precursor to ozone & PM)

NH3 – Ammonia

ROG – Reactive organic gases (precursor to ozone & PM)

SIP – State Implementation Plan (Federal air quality plan)

SO2 / SOx – Sulfur dioxide / Sulfur oxides

BAAQMD Objectives re: PM Planning

Protect public health by:

- Attaining applicable PM standards
- Complying with state & federal PM planning requirements

Continue our long-term effort to reduce PM in Bay Area:

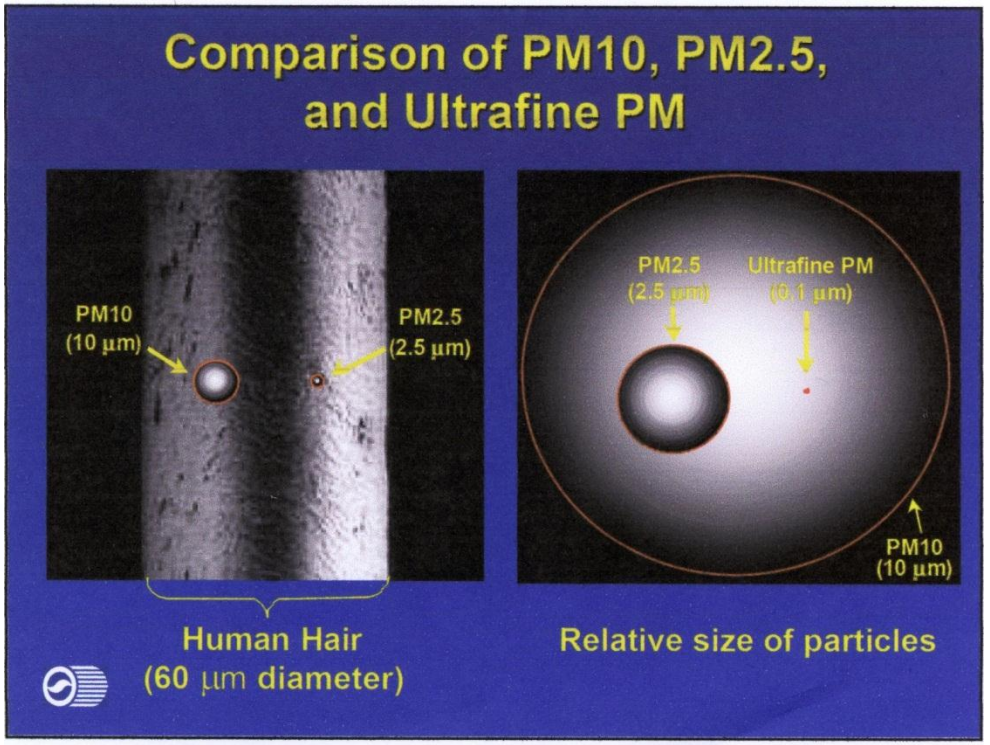
- Enhance our technical capabilities & understanding of PM
- Reduce population exposure to PM; protect public health
- Reduce PM impacts re:
  - heating of the climate
  - damage to ecosystems
  - visibility & haze

What is PM?

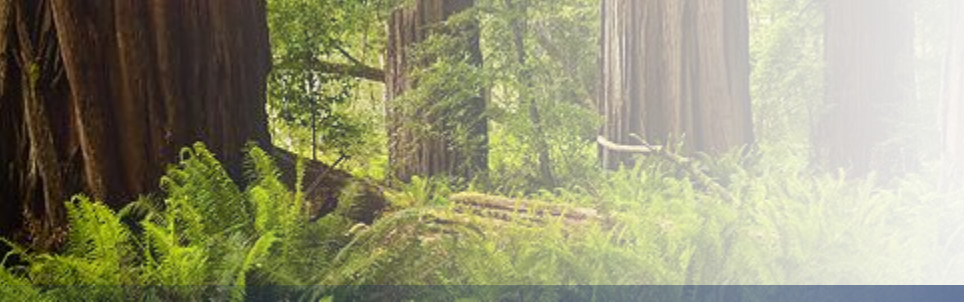
- Diverse mix of tiny airborne particles
- Particles differ in size, mass, chemical properties, toxicity, and how they behave in the atmosphere
- Wide range of emissions sources: natural and man-made
- Primary PM: emitted directly from tailpipe, stack, etc.
- Secondary PM: formed by interaction among precursor pollutants: ROG, NOx, SO2, NH3 (ammonia)
- PM levels vary both geographically and temporally
- Highest Bay Area PM levels occur during winter months

PM Size Ranges

- **Ultrafine PM**: 0.1 microns or less in diameter *
- **PM2.5**: fine PM - 2.5 microns or less in diameter
- **Coarse PM**: between 2.5 & 10 microns in diameter
- **PM10**: 10 microns or less in diameter
- AQ standards for PM2.5 & PM10, but <u>not</u> ultrafine PM



* *One million microns = one meter*



PM Health Effects

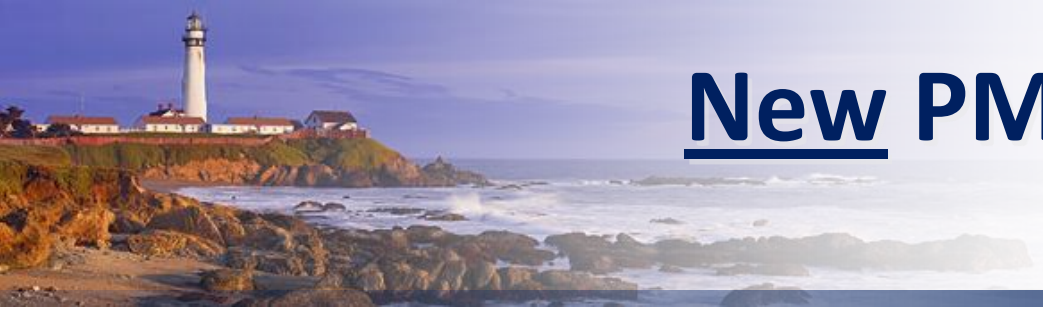
- Every breath we take contains millions of microscopic particles
- Smaller particles penetrate deeper into lungs; can enter bloodstream & key organs; cause damage at cellular level
- Exposure to PM (both short-term & long-term) is harmful
  - Children, elderly, people w existing health conditions are most at risk
  - Respiratory problems: asthma, bronchitis, impaired lung development
  - Cardiovascular problems: atherosclerosis, heart attacks, strokes
  - Premature mortality: EPA finds causal link btwn PM2.5 & mortality
  - Evidence of PM effects on the brain (cognition), diabetes, DNA
- Biological mechanisms include inflammation & oxidative stress

PM Health Effects in Bay Area

- Bay Area 2010 Clean Air Plan analyzed health impacts of ozone, air toxics & PM
- Identified PM as by far the most harmful air pollutant
- Bay Area PM concentrations & related health effects have been reduced by > 50% since 1990
- Reduction in premature deaths from PM has extended average life expectancy in Bay Area by ~ 6 months since 1990
- PM contributes to ~ 2,000 premature deaths per year in Bay Area
- PM accounts for ~ 90% of premature mortality related to air pollution in the Bay Area
- PM health impacts impose ~ $10 billion/year cost in Bay Area

Bay Area 2010 Clean Air Plan

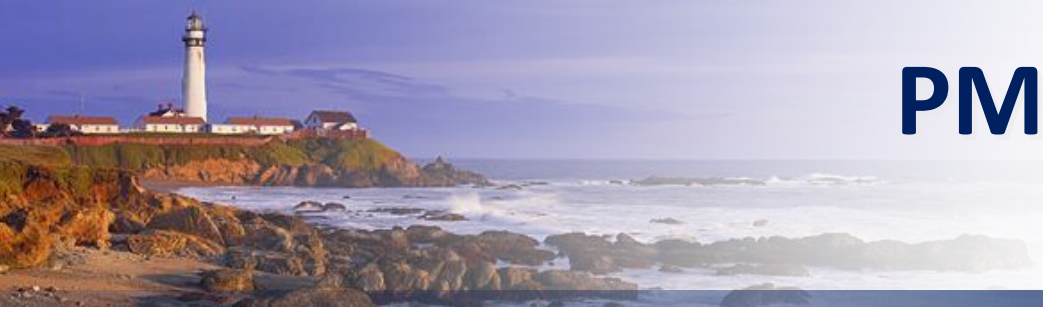
- Bay Area 2010 Clean Air Plan (CAP) was prepared in response to state ozone planning requirements
- But we took a multi-pollutant approach:
  CAP provides first Bay Area multi-pollutant control strategy to reduce ozone, PM, air toxics, and greenhouse gases
- In developing the control strategy in the 2010 CAP, we emphasized PM reductions and prioritized measures that reduce PM for early action in stationary source rule development schedule
- ***Control strategy in 2010 CAP is backbone of current BAAQMD program to reduce PM***



New PM Control Measures in 2010 CAP

Stationary Source Measures (SSM) under development:

- SSM 1: **Metal-Melting Facilities**: New draft Reg 12-13 & 12-14 to reduce PM from foundries & scrap recyclers (fall 2012)
- SSM 6: **General PM**: Amend Regulation 6-1 to reduce allowable PM emissions rate from all sources
- SSM 7: **Open Burning**: Amend Regulation 5 to limit amount that can be burned on permitted burn days
- SSM 9: **Cement Kilns**: Reduce NOx & SOx (Sept 2012)
- SSM 16: **New Source Review** amendments for PM2.5 (Nov 2012)
- SSMs 10, 11, 12, 13, 14 will reduce NOx; SSM 8 targets SOx



PM Control Measures in 2010 CAP

Also reductions in primary PM & PM precursors from:

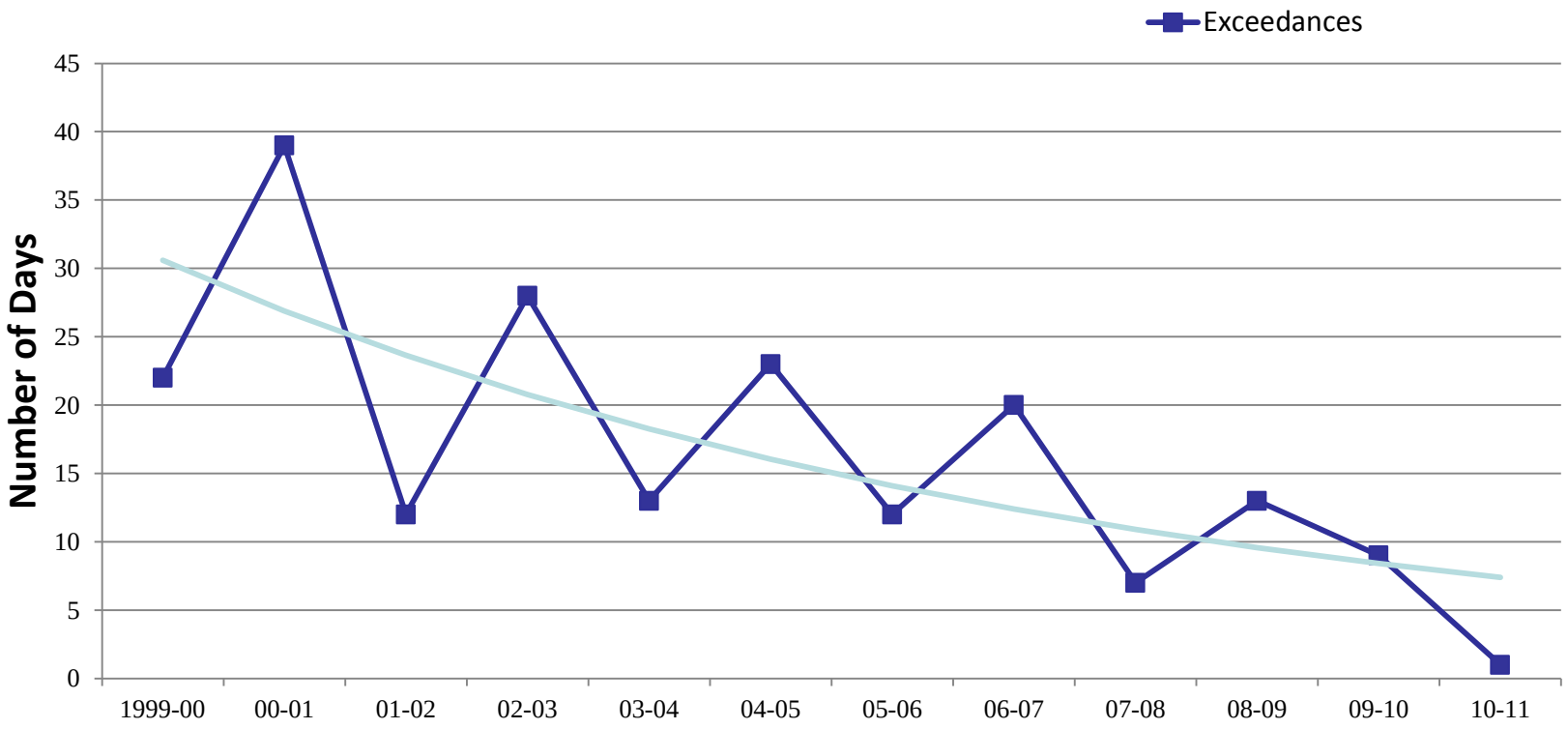
- **Mobile Sources Measures**: 10 measures to reduce vehicle emissions by promoting clean fuels & technologies
- **Transportation Control Measures**: 17 measures to reduce motor vehicle emissions by promoting transit, biking, walking, ridesharing, etc.
- **Land Use & Local Impacts Measures**: 6 measures to protect communities most impacted by air pollution

BAAQMD Analytical Capabilities

- **PM monitoring network**
  - regional monitoring network for PM10 & PM2.5
  - 4 ultrafine monitors recently deployed
- **Emissions Inventory**
  - Primary PM2.5 & PM10
  - Precursor pollutants: ROG, NOx, SO2, NH3
  - Ultrafine PM
- **Speciation**: analyzing filters to determine PM composition
- **Modeling & Exposure Assessment**
  - regional scale PM2.5 modeling (4 km grid)
  - estimates of PM health effects: regional & county scale
  - local scale to inform CARE program, CRRPs, CEQA analyses

Trends in PM2.5 Concentrations

Trend in # 24-hr PM2.5 Exceedances per Winter



PM Standards & Bay Area Status

Design values for 2009-2011 period:

Pollutant	Averaging Time	National / California	Current Standard	Bay Area Design Value
PM2.5	24-hour	National	35 µg/m^3	30 µg/m^3
	Annual	National	15 µg/m^3	10.3 µg/m^3
		California	12 µg/m^3	10.4 µg/m^3
PM10	24-hour	National	150 µg/m^3	72 µg/m^3
		California	50 µg/m^3	70 µg/m^3
	Annual	California	20 µg/m^3	20 µg/m^3

** Design Value is metric which describes a region's air quality relative to the standard. Design Value is based on the "form of the standard" – in this case, the 98th percentile reading at monitoring station with highest PM levels, calculated for 3-year average.*

Summary of Progress

Major progress in reducing Bay Area PM levels in recent years - fewer exceedances of standards, lower peak values

Bay Area meets current national PM standards and is close to meeting state PM standards

Lower PM levels mean less population exposure, fewer health effects… thus providing significant health & economic benefits to the region (valued in multiple $ billions per year)

Because PM has adverse health impacts even at moderate levels, we need to continue efforts to reduce exposure to PM

For additional info, see *Trends in Bay Area Ambient Particulates* report (Nov. 2011) on District website

Questions & Comments on Part 1

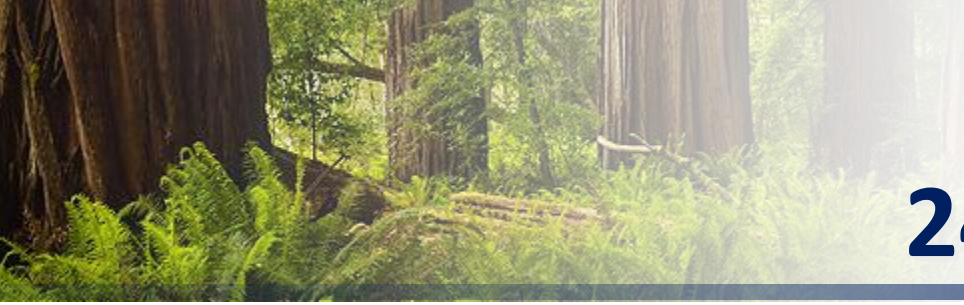
Send questions & comments via email to:

PMplanning@baaqmd.gov

Part 2: Looking Forward

- Bay Area attainment status for 24-hour PM2.5 standard
- Federal PM planning requirements
  - State Implementation Plan (SIP) submittal
- PM Report
- Next Steps

Questions, comments, discussion on Part 2



Bay Area status: 24-hr PM2.5 standard

- In 2006 US EPA reduced 24-hr PM2.5 standard from 65 µg/m^3 (micrograms per cubic meter) to 35 µg/m^3
- Although Bay Area barely exceeded the standard, we were designated **non-attainment** in Dec '09 based on monitoring data for years 2006-2008
- But monitoring data for 2008-2010 & 2009-2011 show that Bay Area attained the standard during both periods
- Current Bay Area design value ~ 30 to 31 µg/m^3, below the 35 µg/m^3 standard

Federal Planning Requirements

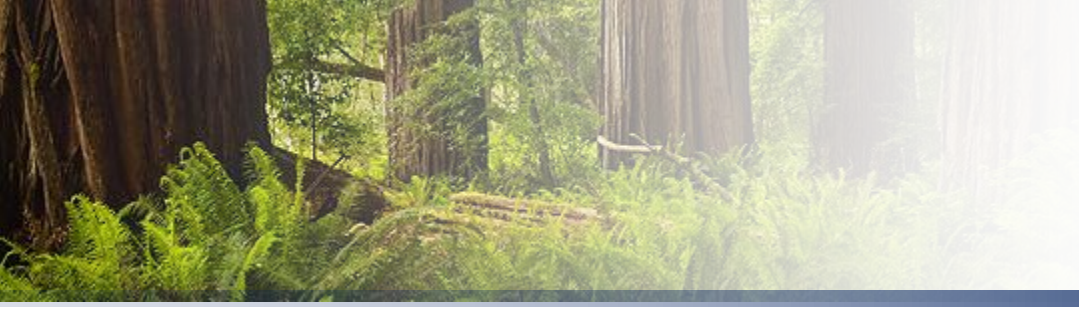
- US EPA requires preparation of State Implementation Plan (SIP) for any area designated as non-attainment for national air quality standards
- Purpose of SIP:
  - Determine emissions reduction needed to attain the standard
  - Lay out a control strategy to attain the standard by target date (December 2014 for 24-hr PM2.5 standard)

"Clean Data" SIP Options

- EPA guidelines provide two options for regions that have met the 24-hr PM2.5 standard since 2009:
  1. Submit redesignation request & maintenance plan to show how region will continue to attain standard for 10 years
     or
  2. Submit "clean data finding" based on quality-assured monitoring data showing attainment for the most recent 3-year period & prepare an abbreviated "clean data" SIP

Proposed Course of Action

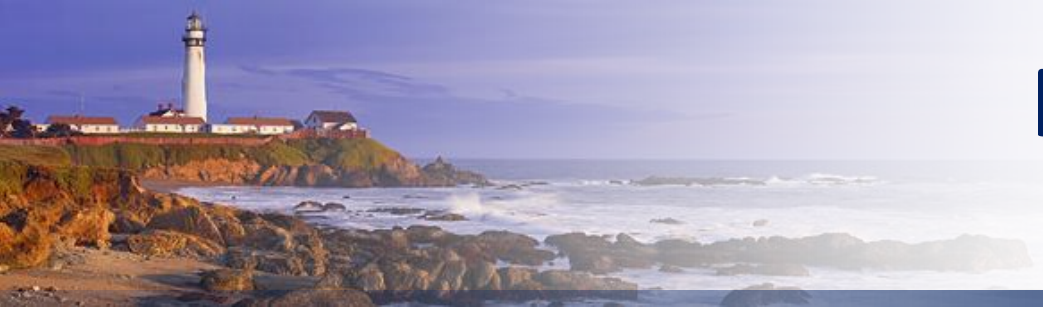
- Premature for Bay Area to submit a redesignation request at this time:
  - PM levels can fluctuate due to year to year variation in (winter) weather patterns
  - Make sure that Bay Area continues to attain standard as economy recovers
- **Therefore, pursue "clean data finding"**
  - ARB submitted request to EPA Region 9 on behalf of Bay Area in December 2011
  - Request currently under review by EPA: we expect EPA to issue "clean data determination" in near future



"Clean Data" SIP

If EPA approves "clean data finding":

- Bay Area will continue to be designated as **non-attainment** (until a redesignation request & maintenance plan are submitted & approved by EPA)
- The following SIP requirements will be **suspended** as long as monitoring data continues to show attainment:
  - Attainment Demonstration / AQ Modeling for PM2.5
  - Reasonably Available Control Measures (RACM) Analysis
  - Reasonable Further Progress (*make steady progress*)
  - Mid-Course Review
  - Contingency Measures



Remaining Federal Requirements

Federal PM2.5 requirements that still apply if “clean data finding” is approved:

- Submit emissions inventory for direct PM2.5 & PM2.5 precursors for the “attainment year”
- Amend New Source Review (NSR) rule to address PM2.5

Draft Emissions Inventory

PM2.5 Emissions Inventory for 2010 (attainment year) - includes peak (winter) season emissions by emission source category:

- **Table 1** provides emissions of:
  - primary (directly-emitted) PM2.5, and
  - precursors pollutants: ROG, NOx, and SO2
- **Table 2** provides emissions for ammonia (NH3)
- Inventory uses ARB's new EMFAC 2011 emission factors
- Both tables are available for review on the Air District's website: www.baaqmd.gov/pmplanning

New Source Review (NSR) Rule Amendments

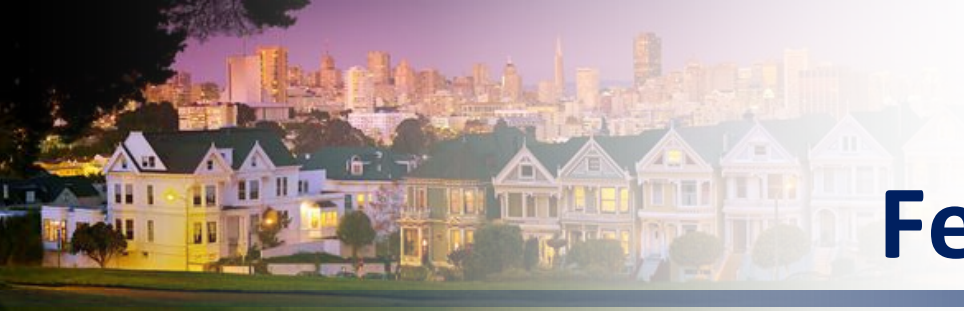
NSR applies to new & modified stationary facilities that require an Air District permit.

NSR rule amendments will address:

- New permit requirements for PM2.5 & greenhouse gases
- "Prevention of Significant Deterioration" permit regulations
- Revisions to clarify regulatory language

Proposed NSR rule amendments & CEQA document will be considered by Board of Directors: November 7, 2012

For information re: NSR rule amendments, see:
www.baaqmd.gov/Divisions/Engineering/Proposed-Reg-2-Changes.aspx



Beyond Federal Requirements

Air District staff has prepared a draft PM report: *Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area*

- Report is intended to complement "clean data" SIP
- Considers all types, sizes & sources of PM
- Synthesizes latest information re: PM & its impacts
- Provides foundation for future technical enhancements and policy actions to reduce PM
- PM report is not a SIP document and does not set forth a formal PM control strategy

Overview of PM Report

- Introduction
- Section 1: PM Impacts
- Section 2: PM Technical Information
- Section 3: PM AQ Standards & Trends
- Section 4: Existing PM Control Program
- Section 5: Looking Forward

Section 1: PM Impacts

Health Effects of PM:

- Synthesis of research on health effects & biological mechanisms
- Which particle types, sizes, sources are most harmful

Population exposure to PM:

- Roadway exposure
- Key micro-environments
- Indoor v. outdoor

PM & Climate:

- Black carbon

Other impacts:

- Ecosystems, visibility, etc.

Section 2: PM Technical Information

PM characteristics

- Particles sizes
- Primary PM / Secondary PM

PM formation & dynamics in Bay Area; modeling results

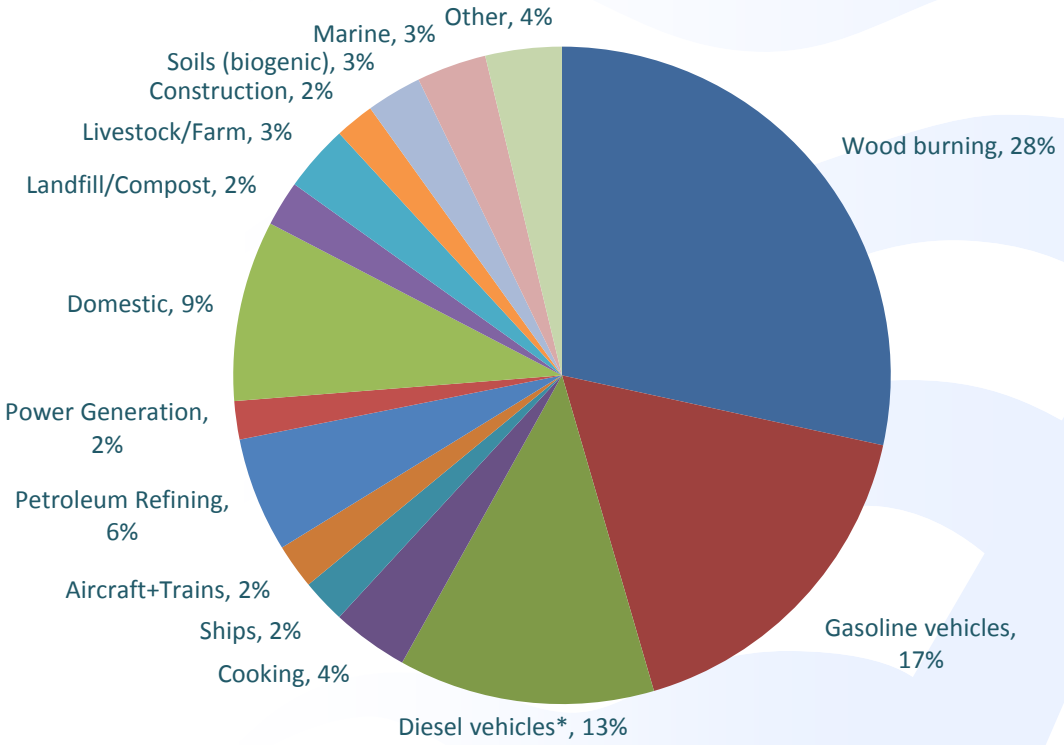
Source contributions to ambient PM concentrations

Emissions inventory for years 2010 to 2030:

- Primary PM2.5 & PM10
- PM precursors: ROG, NOx, SO2, NH3

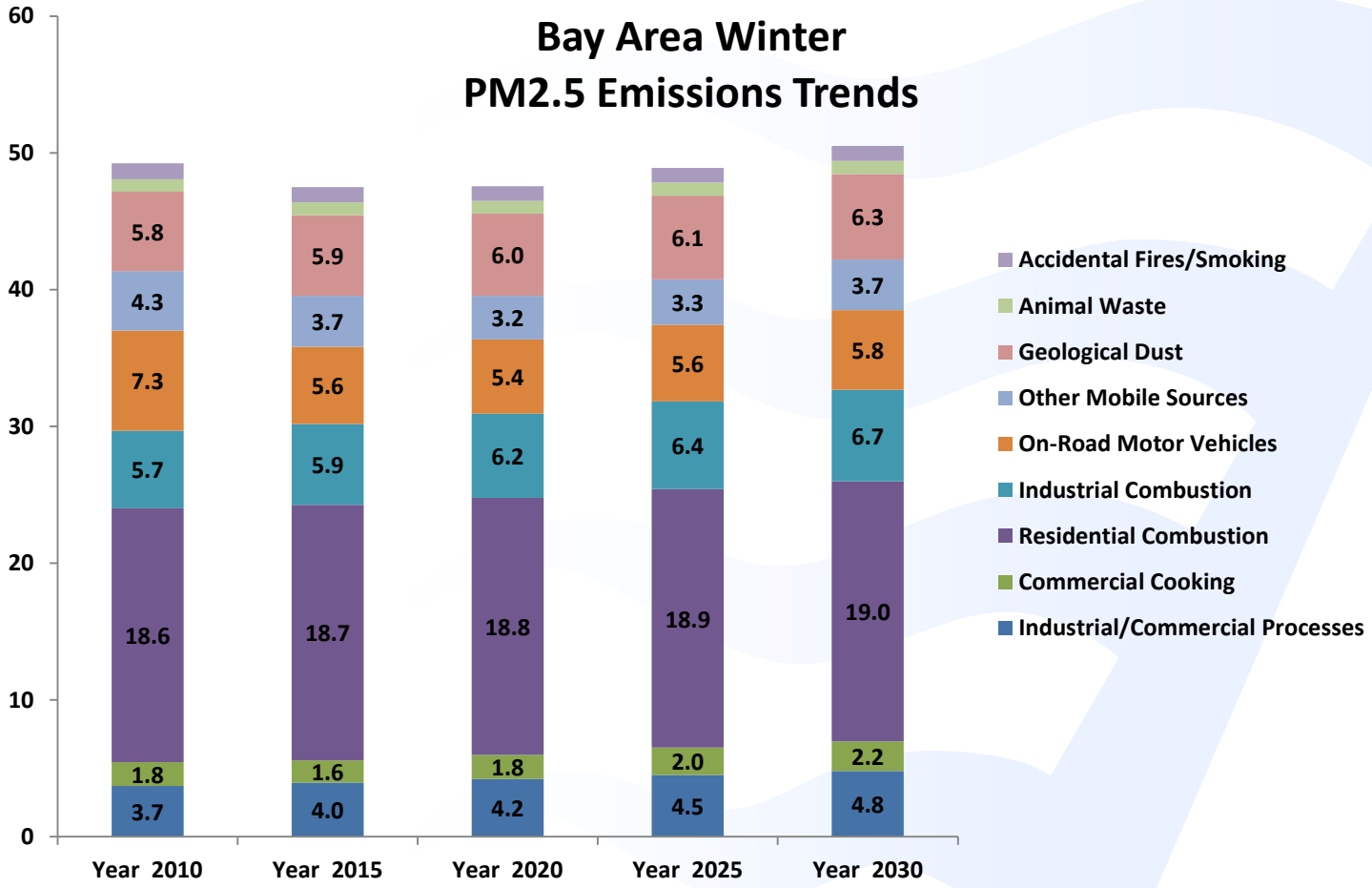
Source Contributions

Estimated Source Contributions to Peak PM2.5 Concentrations
(includes both primary & secondary contribution)

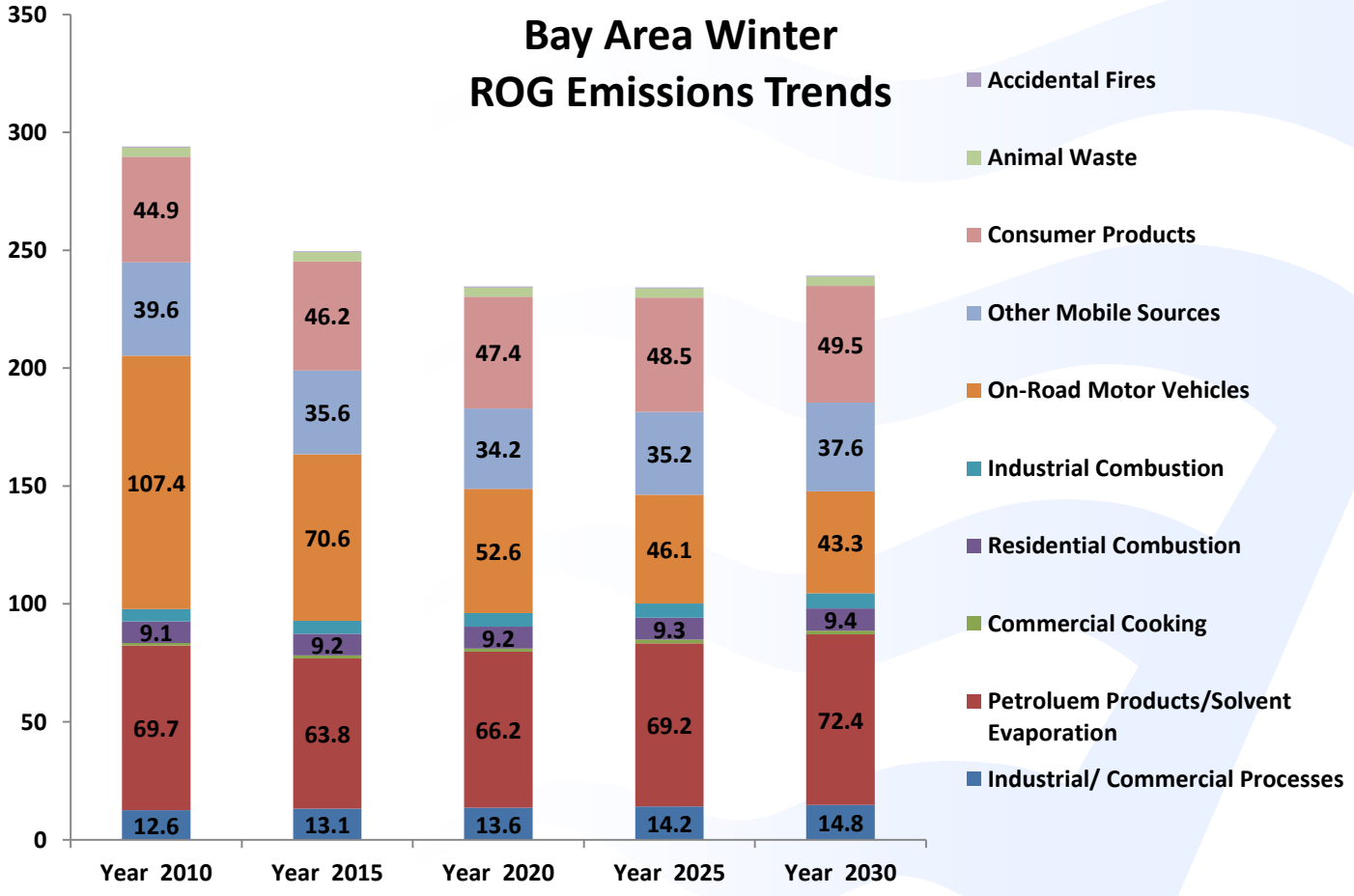


*Except farm and construction equip.

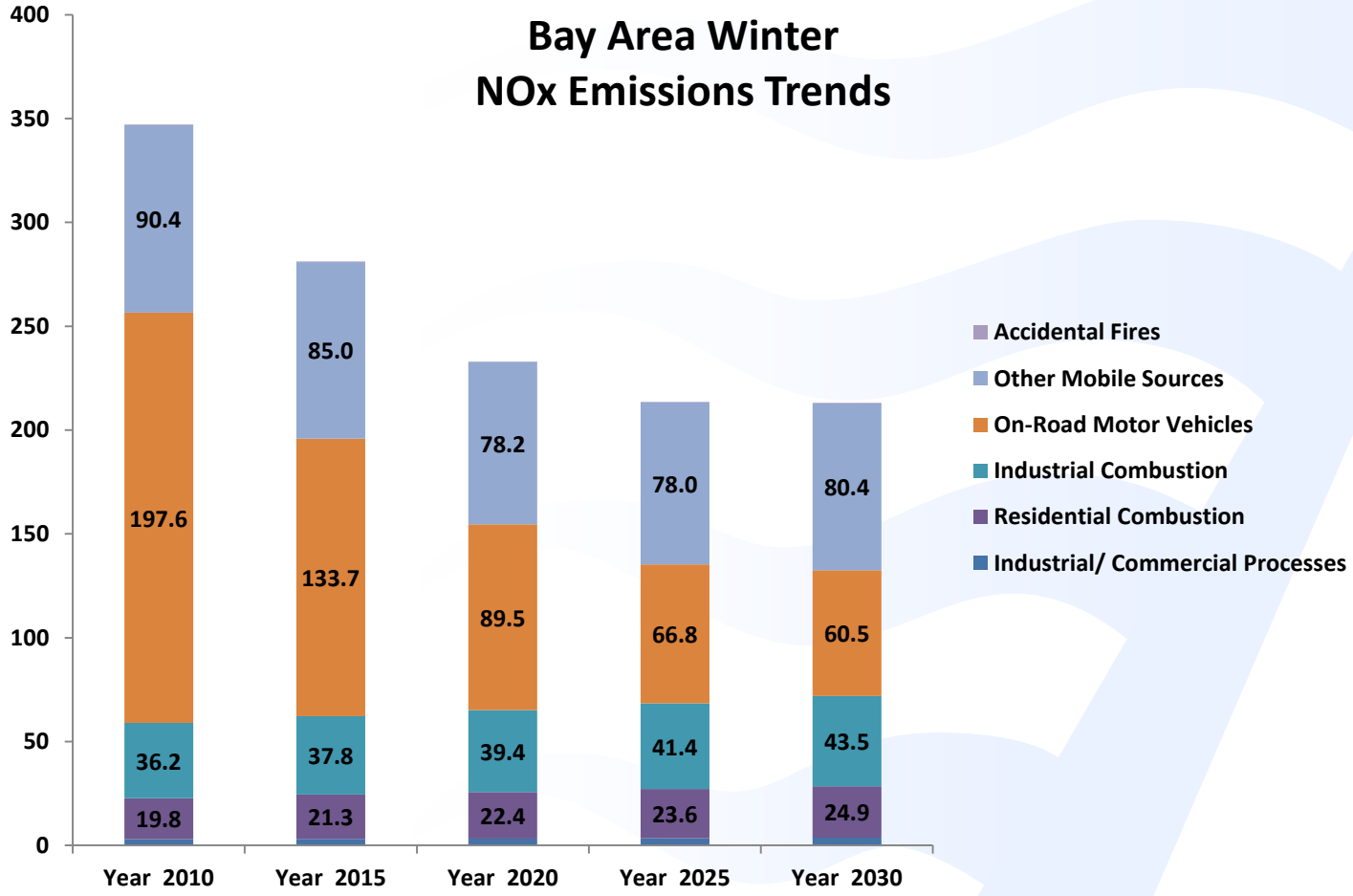
PM2.5 Projected to 2030



ROG Projected to 2030



NOx Projected to 2030



Section 3:
PM Standards & Trends

- Bay Area PM monitoring network
- PM Standards & Bay Area attainment status
- Trends in PM concentrations

Section 4: Current PM Control Program

BAAQMD measures to reduce PM

- Wood smoke program
- Control measures in 2010 Clean Air Plan
- Mobile Source Compliance Plan
- Grants & Incentives to achieve “surplus” emission reductions
- Reducing population exposure:
  - Community Air Risk Evaluation (CARE) program
  - Community Risk Reduction Plans
  - Promoting health focused development

ARB control program to reduce emissions from mobile sources: both diesel & gasoline vehicles

Section 5: Looking Forward

- Why it's important to continue our efforts to reduce PM
- Challenges
- Policy principles to guide future PM reduction efforts
- Technical enhancements
- How Bay Area residents can reduce their personal exposure to PM

Why We Need To Do More

Despite major progress in reducing PM levels:

- PM still damages public health
- Bay Area does not yet attain the State 24-hour PM10 standard
- Health impacts occur at levels below current standards
- PM standards may be tightened in the future
- Some communities are exposed to higher PM levels
- Increasing concern about impacts of ultrafine PM
- Need to better understand PM and its impacts on public health, climate, and ecosystems

Challenges

- PM levels vary at local scale (both spatially and temporally)
- Which particle types are most harmful?
- Evidence increasingly points to ultrafine particles, but we're just getting started: no standards, little data, few health studies
- PM emission sources are diffuse; some are hard to regulate
- Transport from Central Valley contributes to winter peak levels
- Focused growth will help improve regional AQ & reduce greenhouse gas emissions. But we need to promote infill development that protects health of new & existing residents.

Technical Enhancements

Emissions inventory:
- develop estimates of condensable emissions of PM
- improve ammonia inventory
- improve ultrafine PM inventory

Monitoring:
- increase density of PM2.5 monitoring network
- monitor near roadways
- improve ability to measure impacts from episodic events
- expand ultrafine PM monitoring network

Photochemical modeling:
- perform add'l PM2.5 modeling
- perform ultrafine PM modeling on region-wide basis

Population Exposure: improve methods to estimate exposure to PM

Next Steps

- Present PM docs to Board Executive Committee: October 15
- Board hearing **November 7** to consider:
  - Amendments to New Source Review rule & related CEQA doc (action item)
  - PM2.5 emissions inventory for 2010 attainment year (action item)
  - PM report (informational item)
- ARB submits PM2.5 SIP to US EPA by December 2012

Summary

- We've made major progress in reducing Bay Area PM levels and health impacts in recent years

- BAAQMD is committed to further reducing PM levels and population exposure to PM to protect public health

- Going forward, BAAQMD will:
  - Continue to monitor latest scientific PM research
  - Pursue technical enhancements identified in PM report
  - Continue to implement control measures in 2010 CAP
  - Consider new control measures to reduce PM in preparing next update to Bay Area Clean Air Plan

Documents available for review

PM planning docs: www.baaqmd.gov/pmplanning

- PM2.5 Emissions Inventory for 2010 attainment year: Tables 1 and 2
- Full PM report
- Summary of PM report (15 pages)

New Source Review:
www.baaqmd.gov/Divisions/Engineering/Proposed-Reg-2-Changes.aspx

Add' l technical reports on PM in the Bay Area:
www.baaqmd.gov/Divisions/Planning-and-Research/Research-and-Modeling/Publications.aspx

Providing Your Input

- We welcome your input & suggestions
- Staff will post summary of comments received on PM Planning webpage: www.baaqmd.gov/pmplanning
- Please submit written comments via email by **September 24** to: **PMplanning@baaqmd.gov**

End of presentation

Questions & Comments on Part 2

Send questions & comments via email to:

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