

# Public Workshop to Discuss District 2017 PM2.5 Plan

March 9, 2017

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# Workshop Agenda

- Overview
- Valley's PM2.5 Progress & Attainment Challenges
- Federal Clean Air Act Mandates for PM2.5
- Air Quality Modeling
- Strategy for Attainment of PM2.5 Standards
- Public Engagement Process
- Next Steps



# Overview

- District preparing attainment strategy that addresses multiple PM2.5 standards under the federal Clean Air Act
  - 1997 PM2.5 Standard (24-hour 65  $\mu\text{g}/\text{m}^3$  and annual 15  $\mu\text{g}/\text{m}^3$ )
  - 2006 PM2.5 Standard (24-hour 35  $\mu\text{g}/\text{m}^3$ )
  - 2012 PM2.5 Standard (annual 12  $\mu\text{g}/\text{m}^3$ )
- Three PM2.5 plans due between now and Fall 2017
  - 5% Plan due Dec 2016 for 1997 PM2.5 Standard (due to EPA inaction)
  - Serious area attainment plan due August 2017 for 2006 PM2.5 Standard
  - Moderate area plan due October 2016 for 2012 PM2.5 Standard (plan submitted to ARB September 2016)
- District must also adopt plan to address 2015 Ozone Standard (70 ppb)
  - NOx strategy critical to address both PM2.5 and ozone standards
- Meeting new standards requires enormous reductions in emissions, particularly from mobile sources that make up 85% of Valley's NOx emissions



# Pursue Expedient Attainment

- 2006 PM2.5 Standard – Attainment Deadline 2019
- 2012 PM2.5 Standard – Attainment Deadline 2021
- District remains committed to leaving no stone unturned to find additional reductions from sources under our jurisdiction
- Work with ARB to ensure that State provides all possible mobile source control strategies that result in additional reductions in emissions
- District will not ask for attainment deadline extension or bump up in classification with delayed attainment unless finding is made by District and ARB that all available and reasonable mobile and stationary control measures are not adequate to achieve attainment by the prescribed deadlines

# Foundation for District PM2.5 Strategy



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# Foundation Includes Numerous Plans Already in Place

- *2007 PM10 Maintenance Plan* (1987 PM10 standard)
- *2007 Ozone Plan* (1997 8-hour ozone standard)
- *2008 PM2.5 Plan* (1997 PM2.5 Standard)
- *2012 PM2.5 Plan* (2006 PM2.5 Standard)
- *2013 Plan for the Revoked 1-hour Ozone Standard* (1979 1-hour ozone standard)
- *2015 PM2.5 Plan* (1997 PM2.5 Standard)
- *2016 Ozone Plan* (2008 Ozone Standard)
- *2016 PM2.5 Plan* (2012 PM2.5 Standard)



# District's Strategy has Significantly Improved Air Quality in the Valley

- District has adopted numerous attainment plans
  - Toughest air regulations in the nation
  - Adopted over 600 stringent rules and regulations
  - Groundbreaking rules serve as model for others
  - Over 80% reduction in stationary source emissions
- \$40 billion spent by businesses on clean air
- Strong incentive programs (\$1.6 billion in public and private investment reducing 130,000 tons of emissions)
- Public education and participation
  - Build public support for tough measures adopted
  - Urge air friendly behavior by public
- Through these combined efforts, Valley's air quality better than any other time on record



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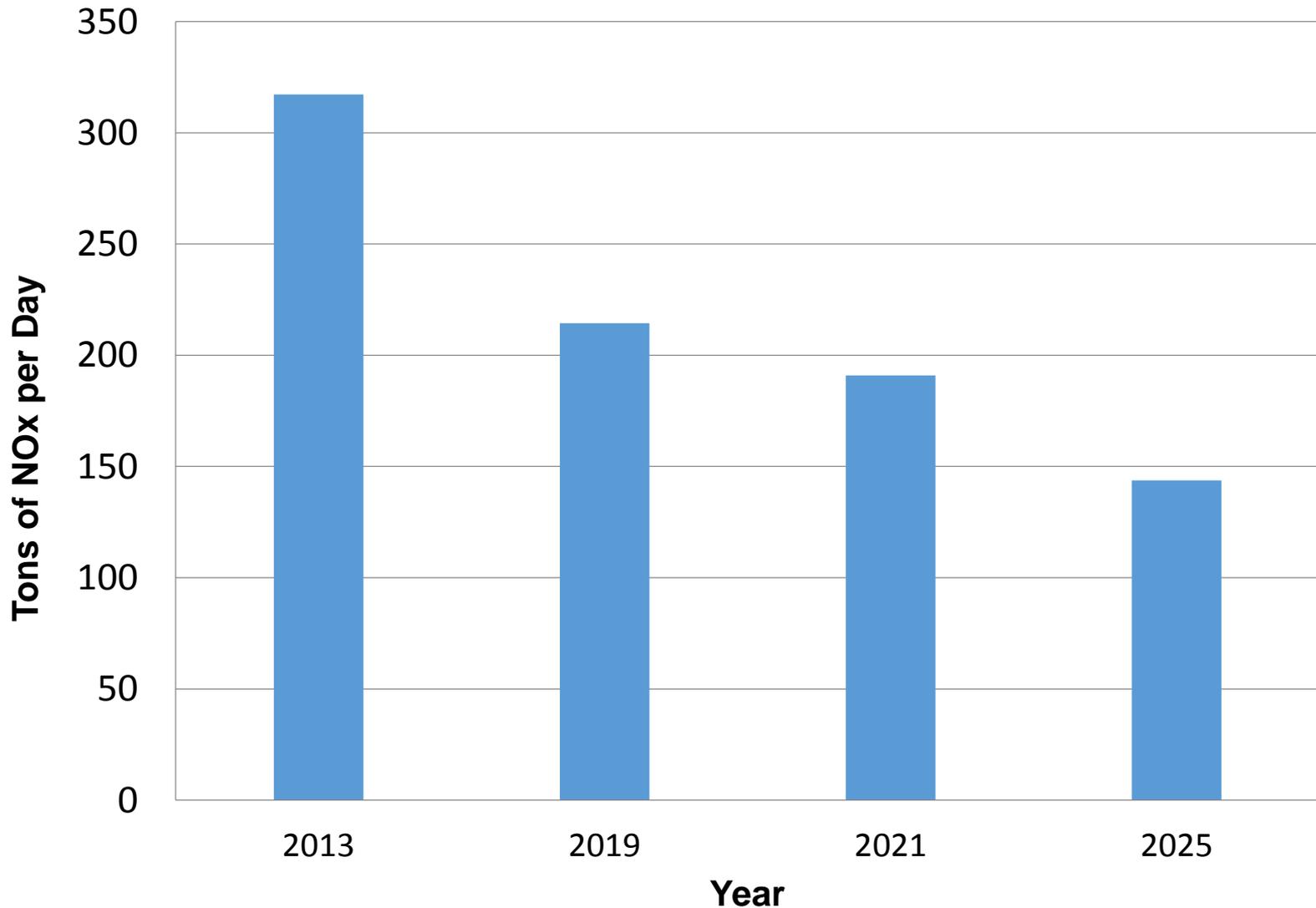
# District and State Control Strategy

## Most Stringent in the Nation

- Mobile Source Regulations (ARB)
  - Truck and Bus Regulation
  - Off-Road Regulation
  - Advanced Clean Cars
  - Expanded Passenger Vehicle Retirement
  - Smog Check Improvements
  - And more...
- Stationary/Area Source Regulations (District)
  - Combustion Devices
  - Industrial Processes
  - Coatings and Solvents
  - Oil and Gas
  - Managed Burning
  - Agricultural Processes
  - Residential and Commercial Sources
  - Waste Management
  - And more...



# Significant NOx Reductions in Valley From Current Strategy in Coming Years



# Progress Towards Attainment

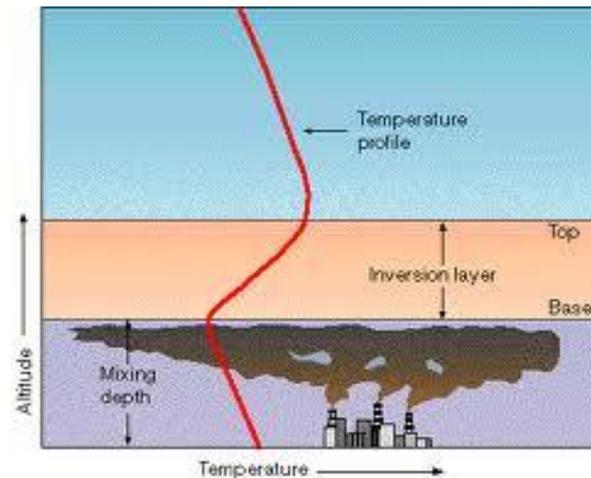
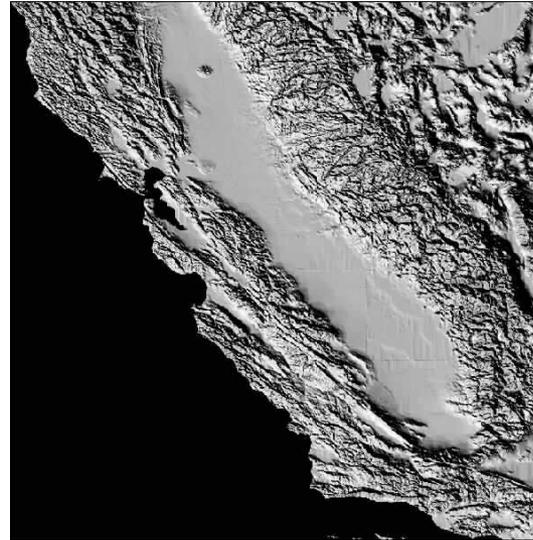


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# Valley PM2.5 Challenges

- Geography and meteorology
- Temperature inversions
- Biogenic emissions
- Air pollution transport
- Population increases
- Ongoing drought



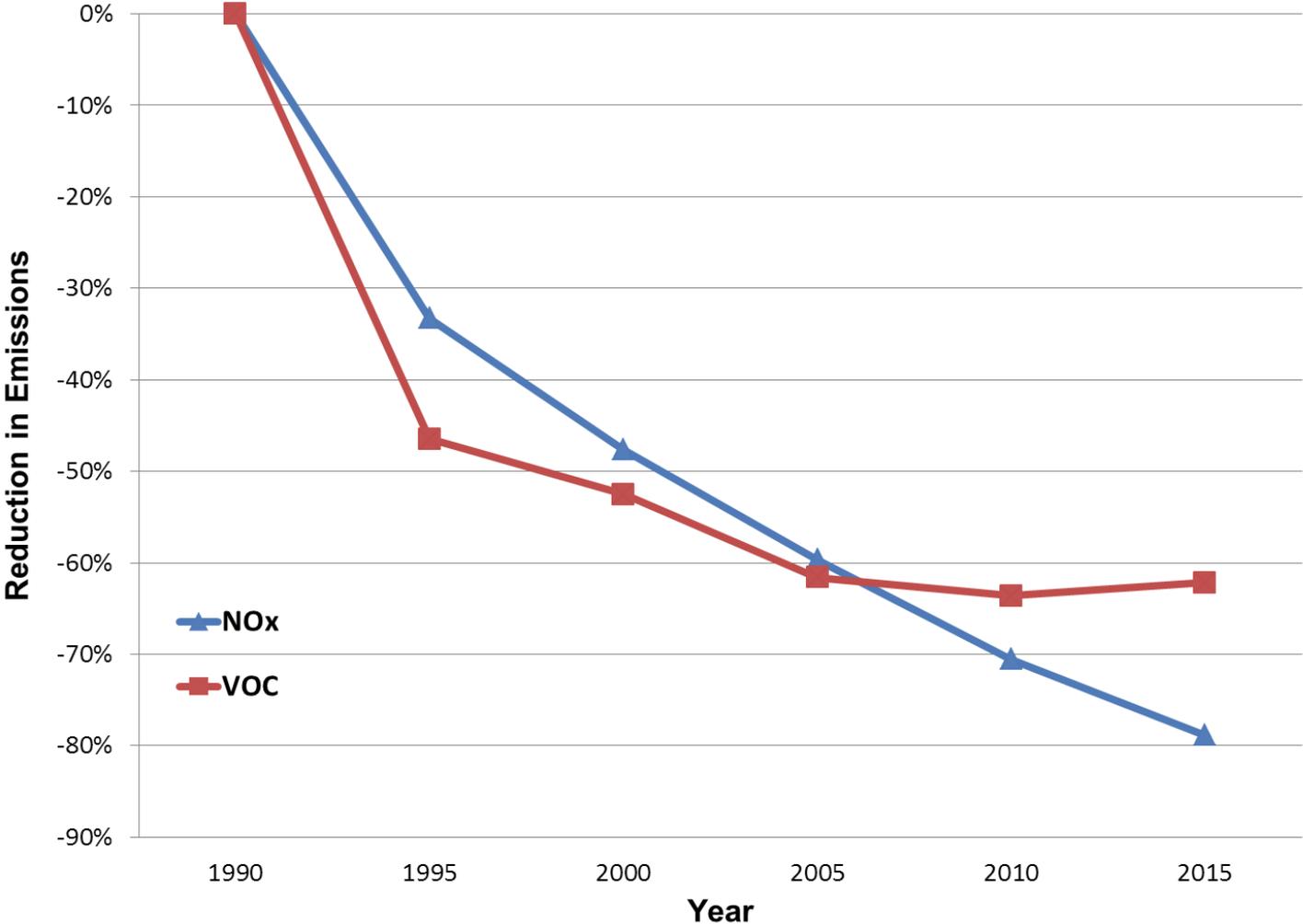
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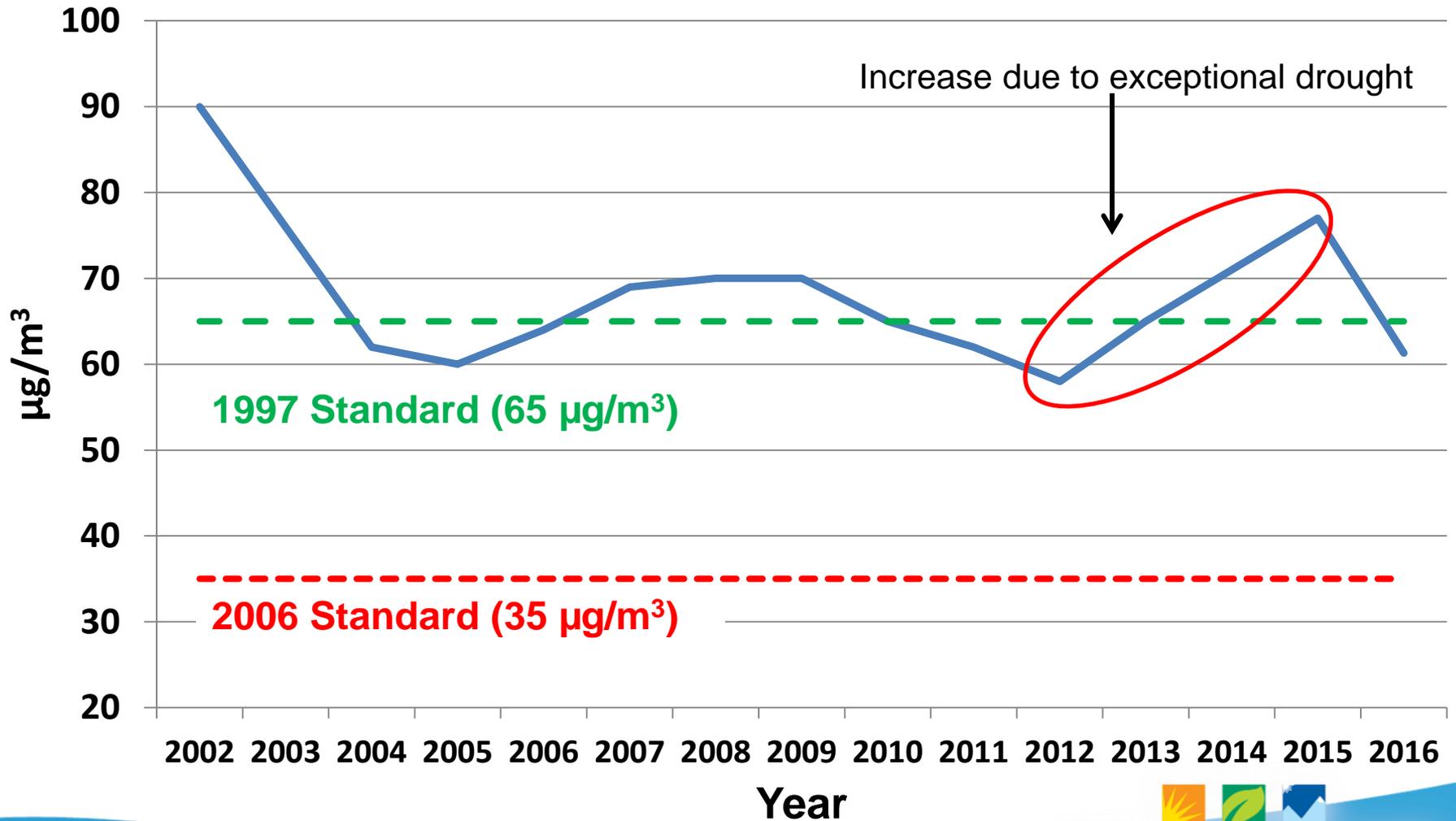
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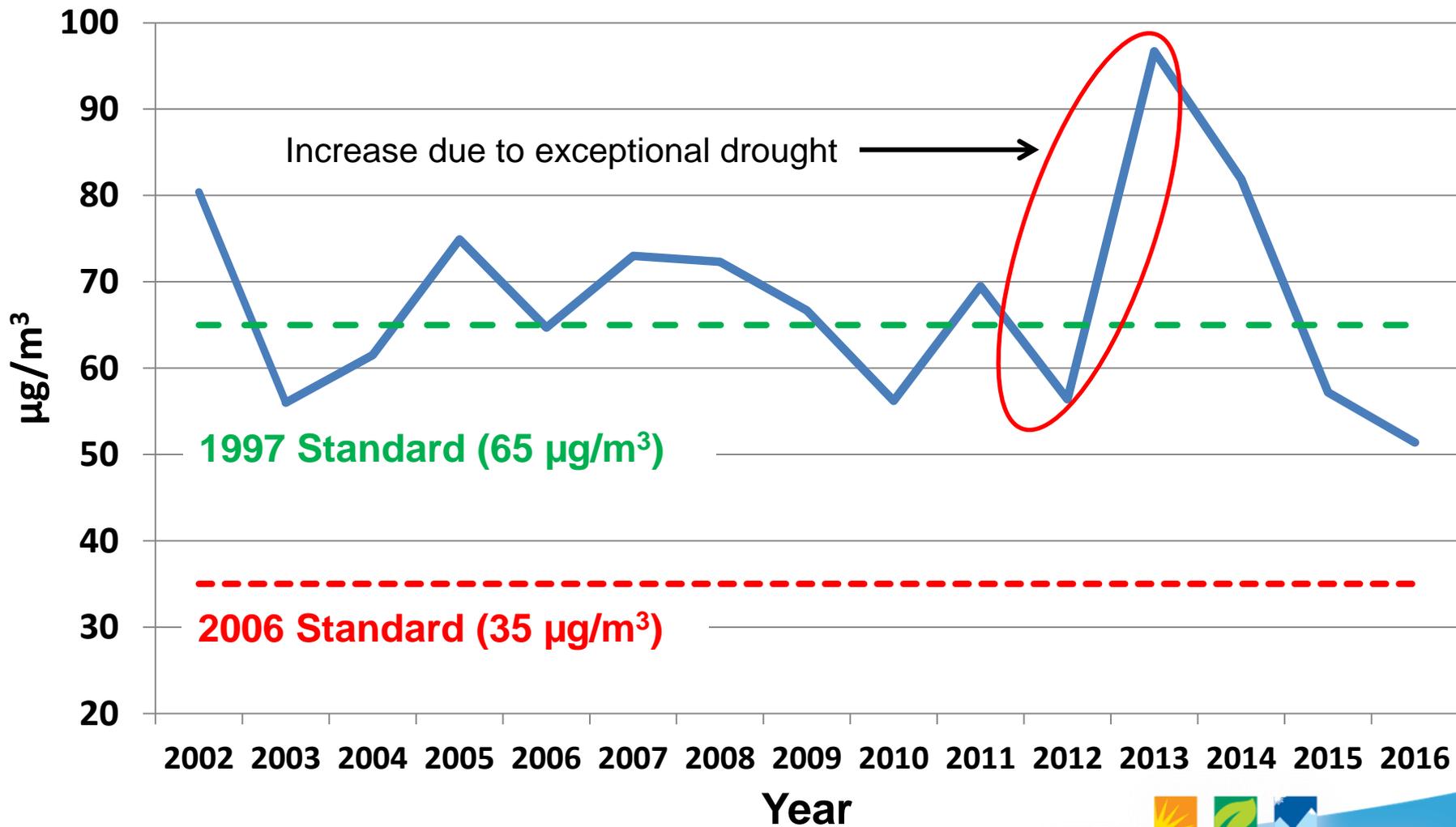
# Decrease in Stationary Sources Emissions



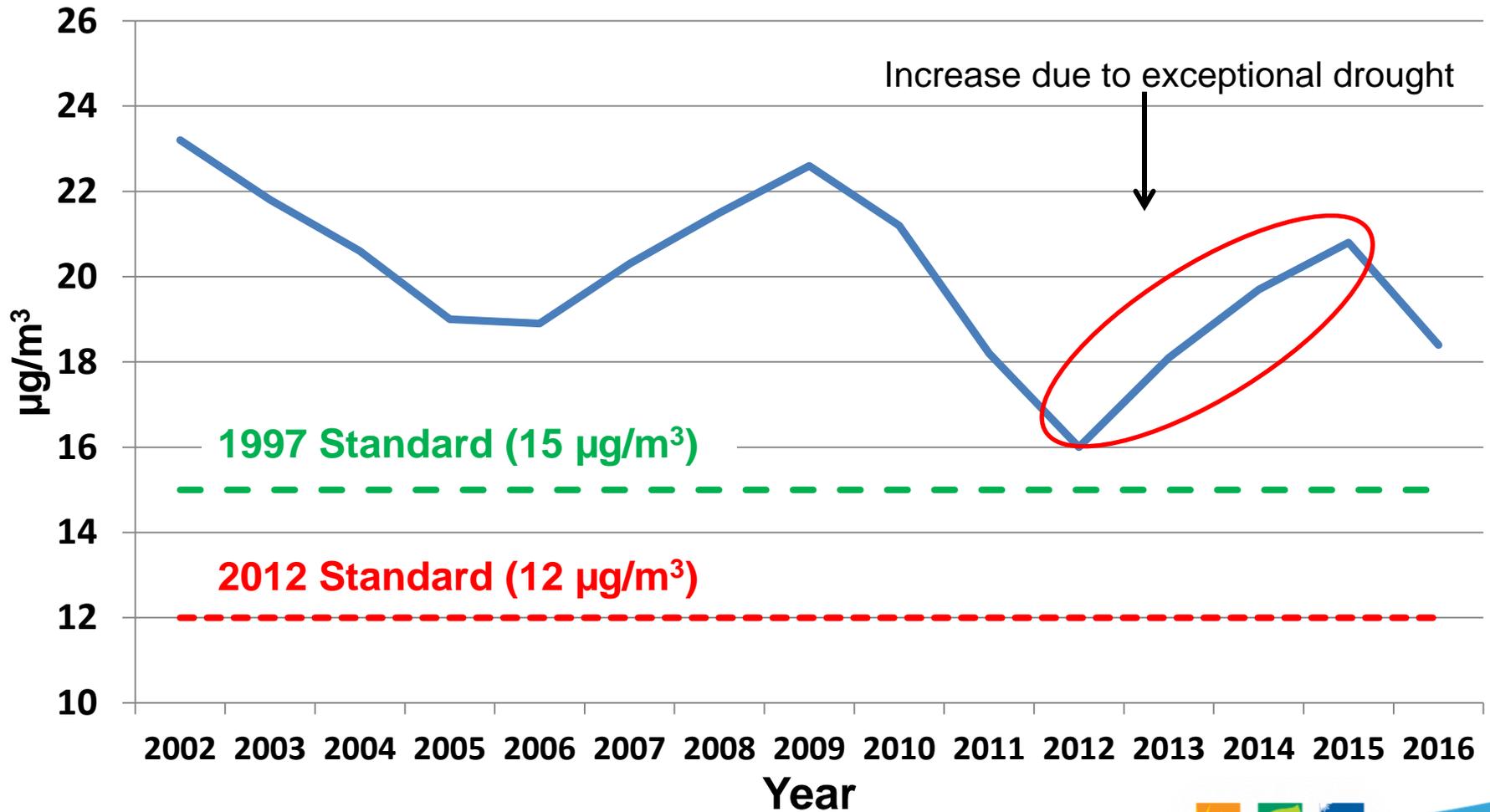
# Trend in Valley's 24-hour PM2.5 Design Value



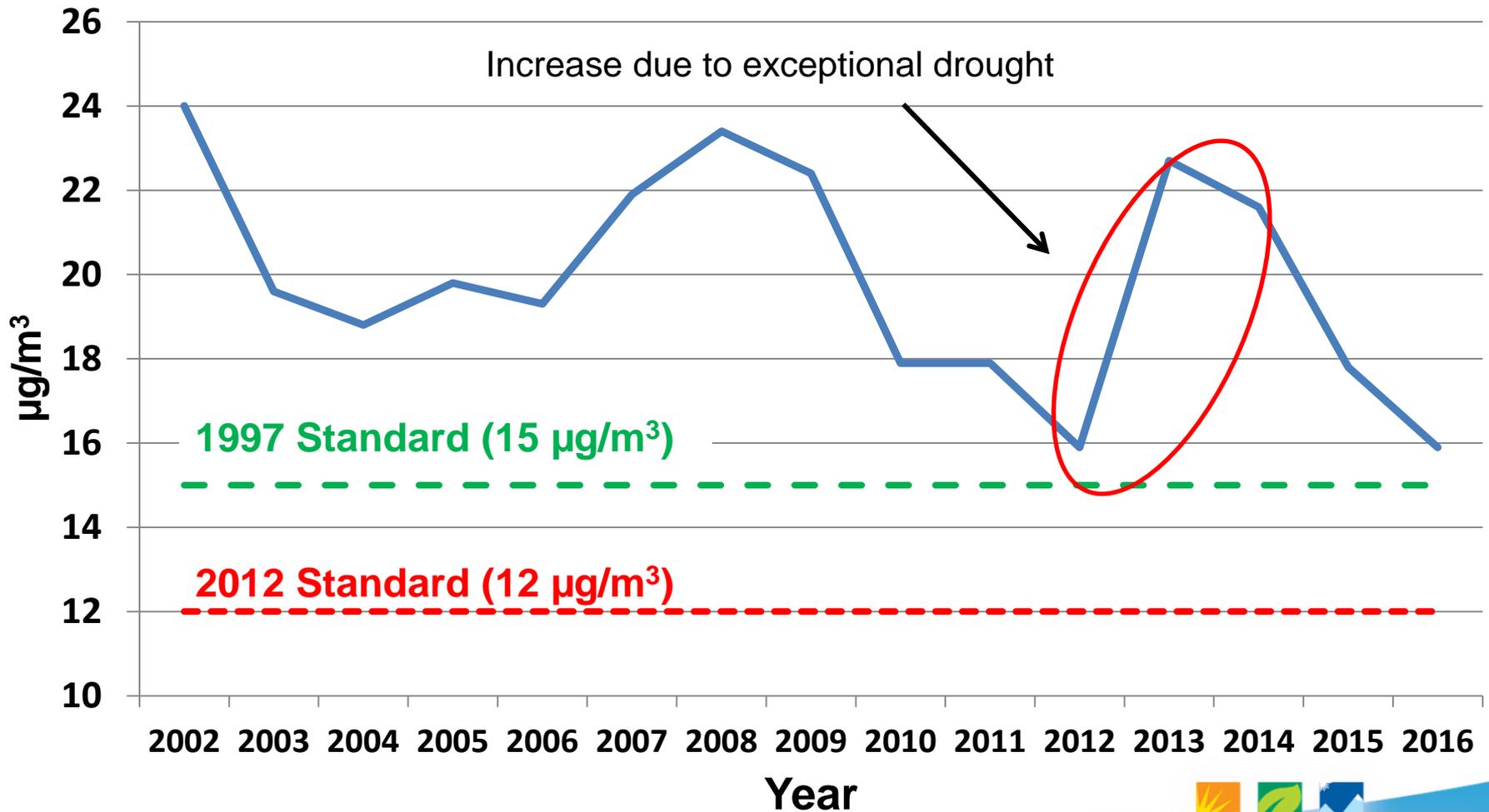
# Trend in Valley's 24-hour PM2.5 98<sup>th</sup> Percentile Values



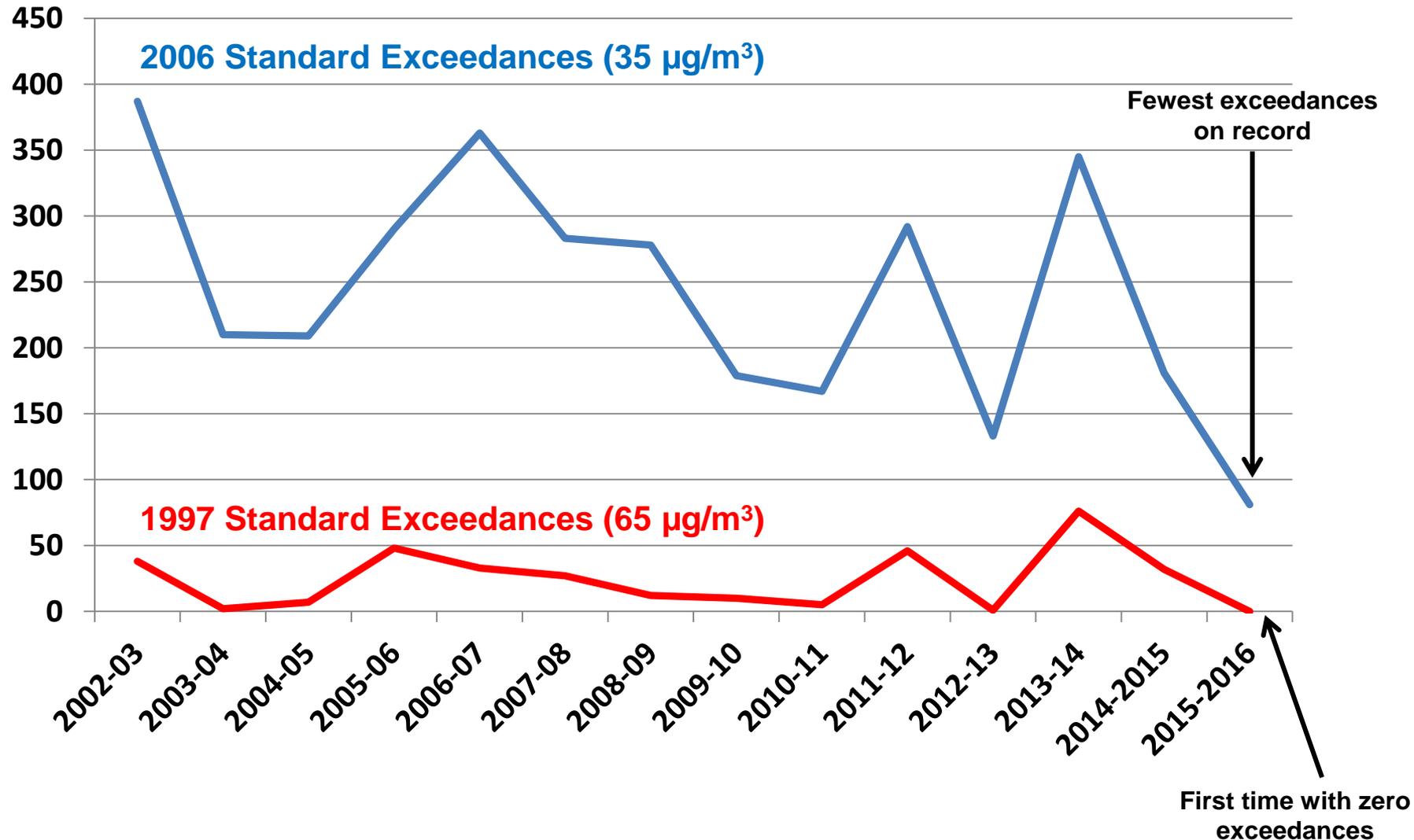
# Trend in Valley's Annual PM2.5 Design Value



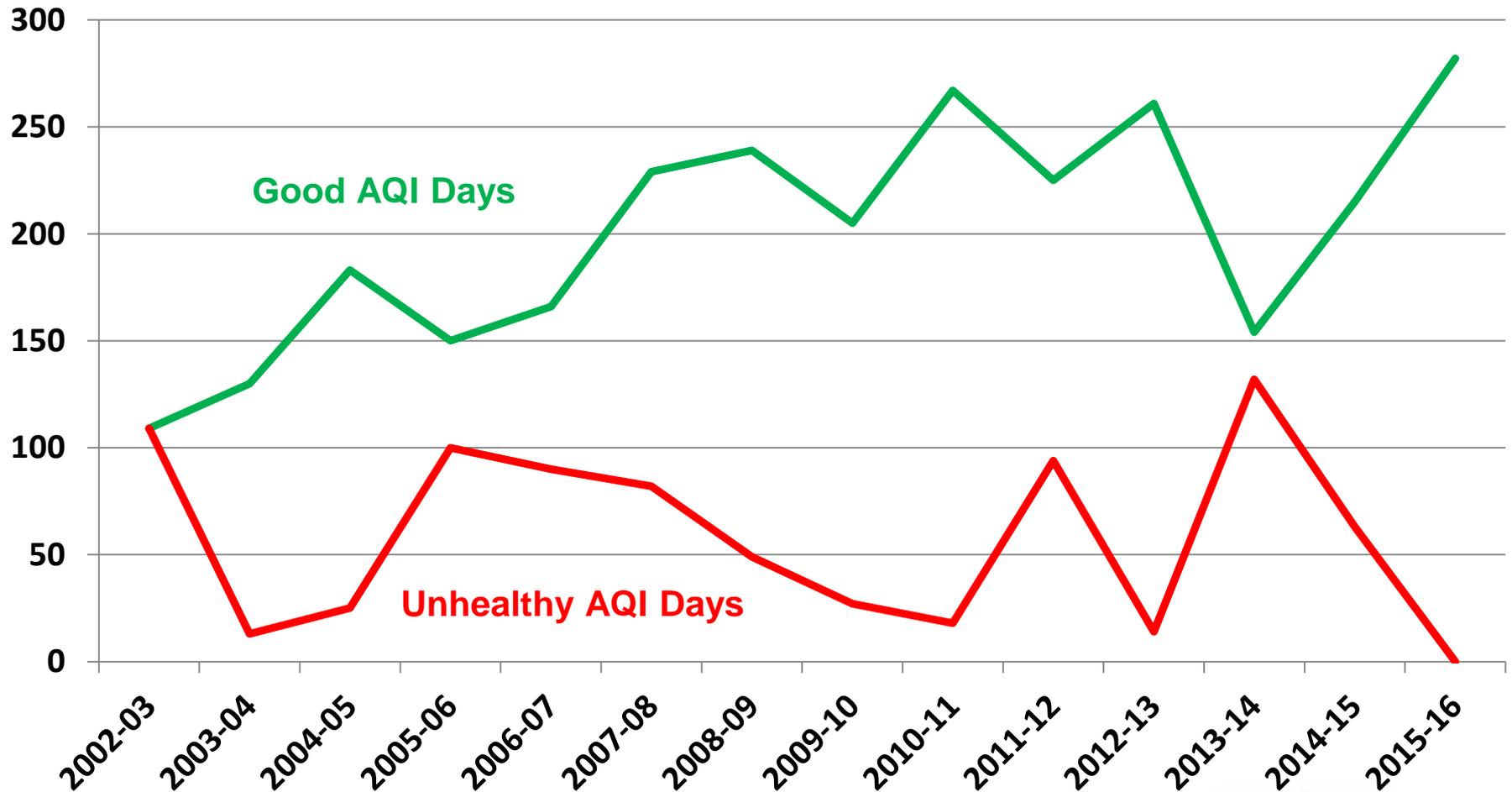
# Trend in Valley's Annual Average PM2.5 Values



# Trend in County-Days Exceeding 24-hour PM2.5 Standards per Winter Season (Nov-Feb)



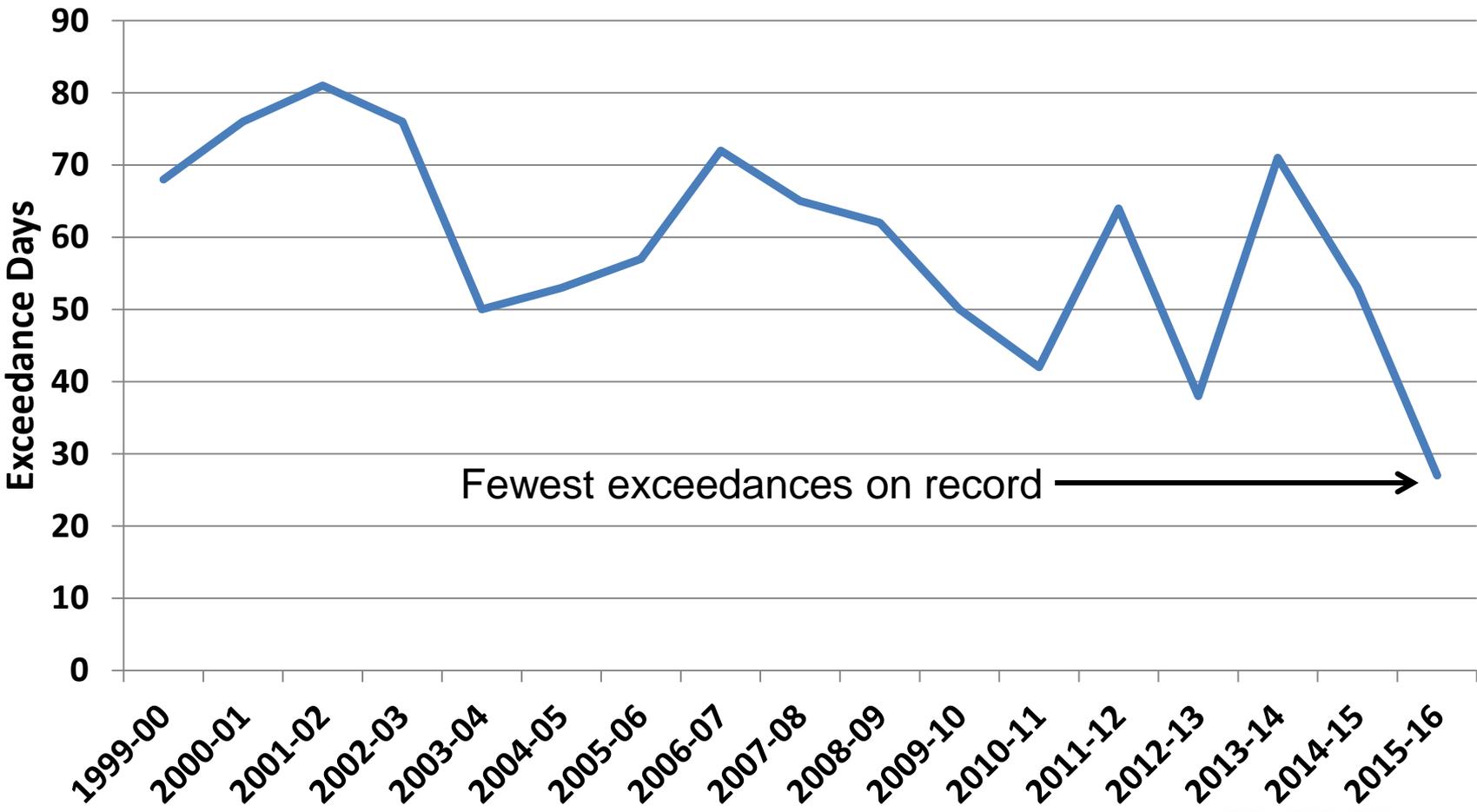
# Trend in PM2.5 Good and Unhealthy AQI County-Days per Winter Season (Nov-Feb)



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# Days Valley Exceeded 35 $\mu\text{g}/\text{m}^3$ Standard during Wood-Burning Season (Nov-Feb)



Fewest exceedances on record →

# Federal Clean Air Act Mandates for PM<sub>2.5</sub>



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# PM2.5 Deadlines and Mandates

## 1997 Standard 24-hr ( $65 \mu\text{g}/\text{m}^3$ ) and annual ( $15 \mu\text{g}/\text{m}^3$ )

- Serious Attainment Deadline: 2015
- 5% Plan required under Clean Air Act §189(d) for areas that fail to attain PM2.5 standard
- Required due to EPA's inaction on District's plan/extension request (District misled into thinking attainment deadline would be extended to 2020)
- Requires 5% reduction in PM2.5 or precursor emissions annually until attainment
  - Preliminary calculations indicate current strategy will have sufficient emission reductions to satisfy 5% requirement

# PM2.5 Deadlines and Mandates

## 2006 Standard 24-hr (35 $\mu\text{g}/\text{m}^3$ )

- Serious Attainment Deadline: 2019
- Plan due August 2017
  - Attainment demonstration requires clean data finding for 3 consecutive years 2017-2019 (must essentially reach attainment this year)
- 5 year extension available (2024)
  - District will only ask for extension if finding made by District and ARB that reasonable mobile and stationary control measures are not adequate to achieve attainment

# PM2.5 Deadlines and Mandates

## 2012 Standard annual (12 $\mu\text{g}/\text{m}^3$ )

- Moderate Attainment Deadline: 2021
- District adopted a Moderate Area Plan with impracticability demonstration and request for reclassification to Serious with 2025 deadline
  - ARB tabled adoption of plan and directed staff to return (Feb. 2017) with additional measures to reduce mobile and stationary source emissions in the pre-2025 timeline
- 5 year extension to 2030 available
  - District will only ask for extension if finding made by District and ARB that reasonable mobile and stationary control measures not adequate to achieve attainment

# Federal Clean Air Act Requirements

- Plan must satisfy applicable federal mandates, including:
  - Attainment Demonstration
  - Emissions Inventory
  - Precursor Demonstration
  - Reasonable Available Control Measures (RACM)
  - Reasonable Further Progress (RFP)
  - Quantitative milestones
  - Requirements for Major Sources
  - Best Available Control Measures (BACM)
  - Most Stringent Measures (MSM)
  - Contingency measures

# Attainment Demonstration

- Clean Air Act requires attainment plan to provide for attainment of standard as expeditiously as practicable
- Plan must include specific enforceable emissions reductions necessary to demonstrate attainment by the applicable deadline in order to be approvable
- Plan emissions reductions must occur in sufficient quantity and time to achieve a future year design value that meets the applicable federal standard
  - Requires 3 consecutive years of clean data (e.g., 2019 attainment deadline requires 2017-2019 clean data finding)



# Precursor Demonstration

- EPA provides three approaches for demonstrating that a particular precursor is not a significant contributor to ambient PM<sub>2.5</sub> levels that exceed the standard
  - Comprehensive Precursor Demonstration
  - Major Stationary Source Precursor Demonstration
  - Nonattainment New Source Review Demonstration
- EPA recently issued new guidance in August 2016 outlining requirements for evaluating precursor significance

# Contingency Measures

- Contingency measures are to be implemented if the area fails to meet progress targets (RFP) or attain by the applicable attainment date
- Contingency measures are extra emissions reductions that go into effect without further regulatory action
- Must start occurring automatically, without any further regulatory action
- Contingency measures difficult if not impossible to identify for areas like the San Joaquin Valley with mature air quality programs
  - Can lead to delayed cleanup if measures are delayed for later implementation as contingency

# Air Quality Modeling



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# Air Quality Modeling

- Modeling based on foundation of emissions inventories
  - Best available estimates of the amount of pollutants and precursors being emitted from each source type
  - Future-year inventories account for both growth and control
  - Inventories continuously improved
- Plan's inventory is a snapshot reflecting best information at the time for use in modeling & control measures evaluation
- District coordinates closely with ARB to ensure accuracy



# Air Quality Modeling (cont'd)

- Modeling necessary to project future air quality under current control strategy, and under proposed control strategy for attainment of air quality standards
- Modeling informs the attainment planning process on what emissions reductions are needed to attain an air quality standard
  - Provides a target for needed emissions reductions
  - Places a focus on which emissions sources could be targeted for further emissions reductions

# Air Quality Modeling (cont'd)

- Air quality modeling uses highly complex computer programs, sophisticated computer hardware, and large databases to predict ambient pollution concentrations given future emission inventory and meteorological scenarios
- These models simulate air quality concentrations in the Valley in a “computerized laboratory” that brings together:
  - Science of emissions generation through spatial/temporal gridding
  - Dynamics of meteorological transport
  - Atmospheric photochemistry
- Air quality modeling fundamental to understanding the Valley’s complex air quality problems
- Many inputs and algorithms in SJV modeling derived from San Joaquin Valleywide Air Pollution Study Agency research (CRPAQS, CCOS)



# Scientific Foundation for PM2.5 Planning

- Study Agency dedicated resources and effort to further develop understanding of PM2.5 in Valley
  - Over \$50 million invested
  - Technical projects began in 1993 and continued through 2014
- California Region Particulate Air Quality Study (CRPAQS) occurred from December 1999 through February 2001
  - Study Agency provided \$23.5 million for field campaign and research
  - Large regional PM study across Valley and surrounding regions
- CRPAQS study accomplishments:
  - Improved understanding of PM emissions, composition, and the dynamic atmospheric processes surrounding them
  - Established a strong scientific foundation for informed decision making
  - Developed methods to identify the most efficient and cost-effective emission control strategies to achieve the PM10 and PM2.5 standards in Central California

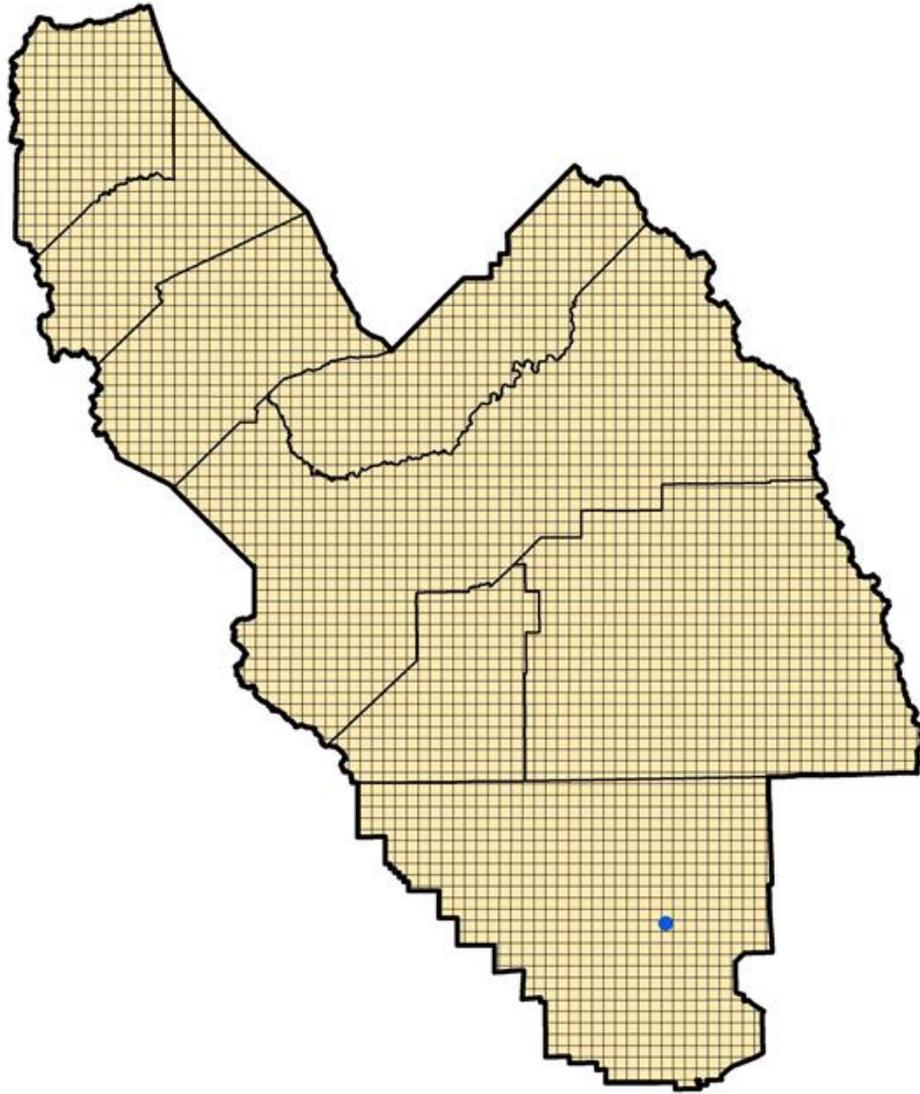
# Scientific Foundation for PM2.5 Planning (cont'd)

- Resulting dataset supports future modeling work and attainment plan strategy development
  - Studied by researchers around the world
  - Hundreds of professional papers published based on analysis of resulting CRPAQS data
- Understanding of PM2.5 developed through CRPAQS used in modeling assumptions for past Valley attainment plan development, including the current development of the *2017 PM2.5 Plan*
- CRPAQS research will continue to inform PM planning for the Valley in the future, along with more recent field campaigns:
  - CalNex (2010) – NOAA and ARB
  - DISCOVER-AQ (2013) – NASA

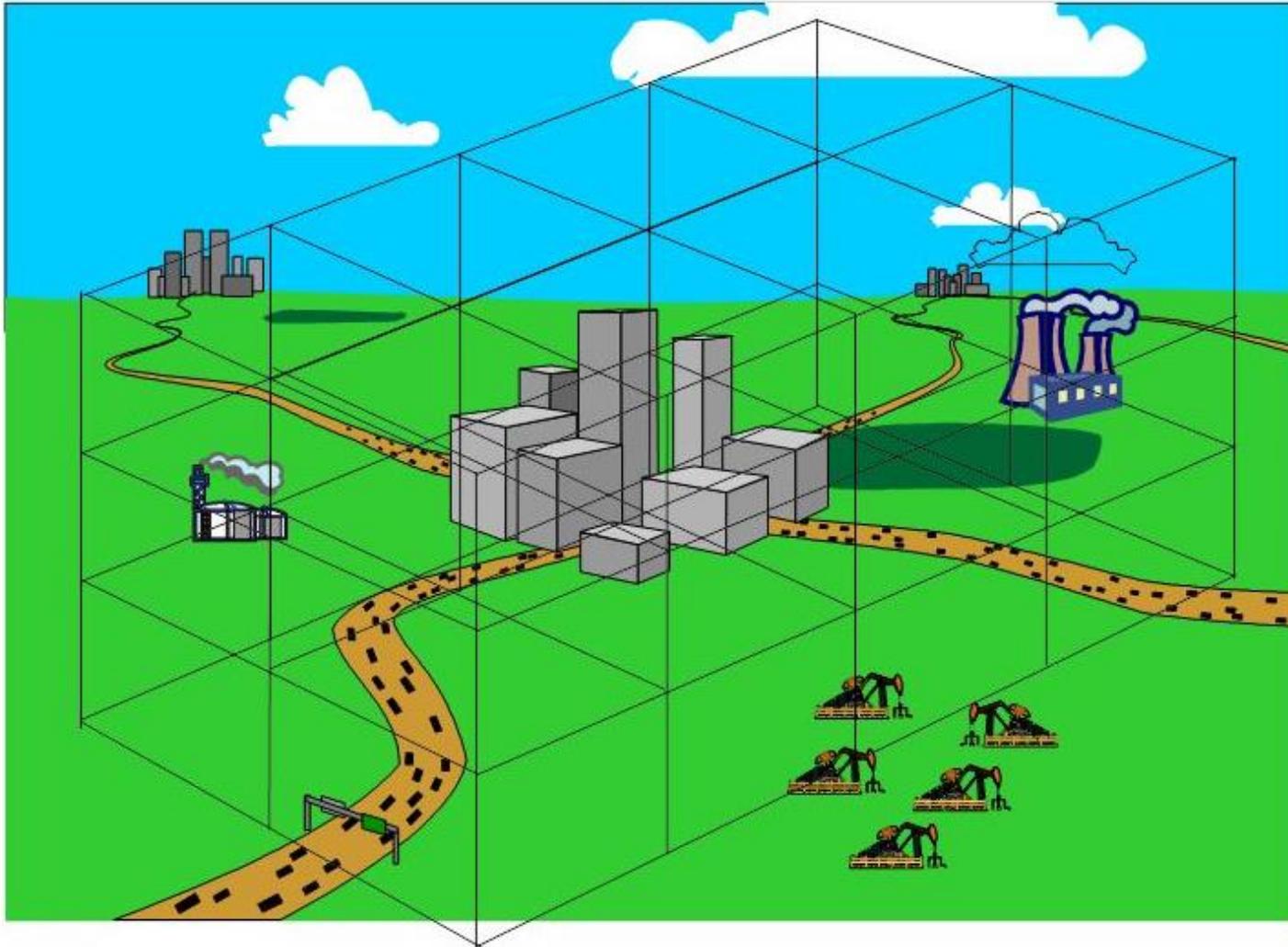
# Scientific Foundation for PM2.5 Planning (cont'd)

- PM2.5 formation in the Valley is highly complex
- Direct PM2.5, NOx, and SOx are primary contributors to the Valley's PM2.5 levels
  - NOx emissions primarily from mobile sources (85% of emissions)
  - Reductions in directly emitted PM2.5 emissions from various sources do not provide equal benefit in reducing PM2.5 concentrations at the Valley's design value monitoring stations
  - Neighborhood-level direct PM2.5 emissions contribute to PM2.5 levels and have adverse health impacts
- Modeling and studies have demonstrated that ammonia reductions do not achieve significant PM2.5 benefits
  - NOx and directly emitted PM2.5 emissions reductions much more effective in reducing PM2.5 concentrations
  - EPA recently proposed new guidance on November 17, 2016 outlining requirements for evaluating precursor significance

# Grid Modeling for the Valley



# Grid Modeling for the Valley

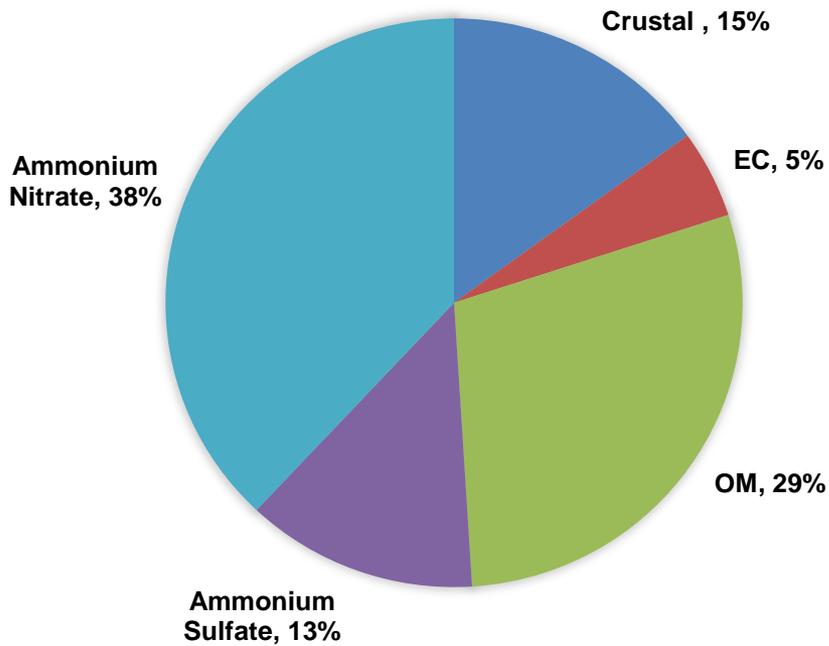


# Composition of PM2.5 in the Valley

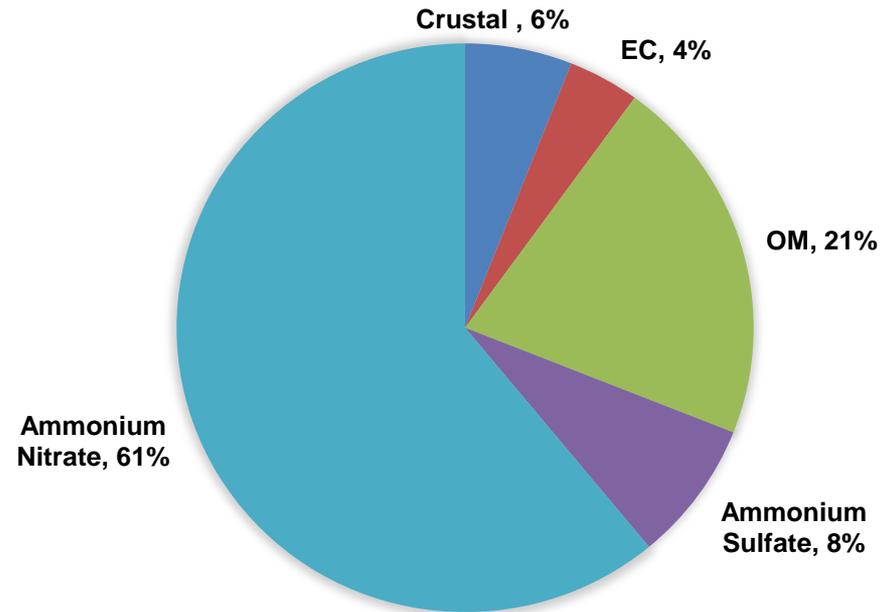
- **Organic Matter:** also called combustion carbon or organic carbon (ex: residential wood, agricultural burning, cooking, direct tailpipe)
- **Elemental Carbon:** also called soot or black carbon; incomplete combustion (ex: diesel engines)
- **Geologic:** road dust and soil dust
- **Trace metals:** brake wear, fireworks, etc.
- **Ammonium Nitrate:** reaction of ammonia and nitric acid
- **Ammonium Sulfate:** reaction of ammonia and sulfuric acid

# Bakersfield PM2.5 Speciation (Average of 2011 to 2013)

## Annual Average

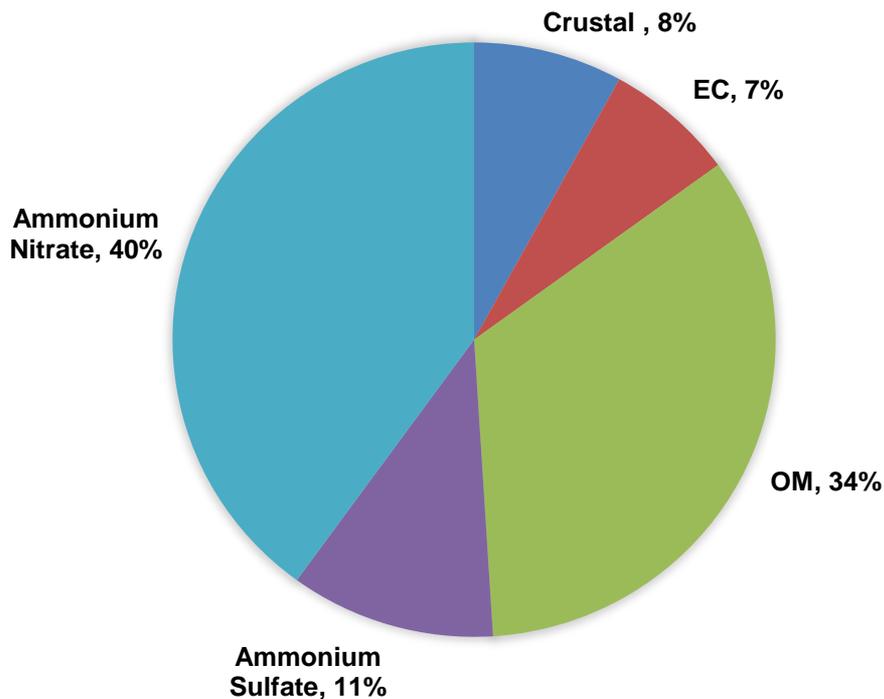


## Average of Top 10% Days

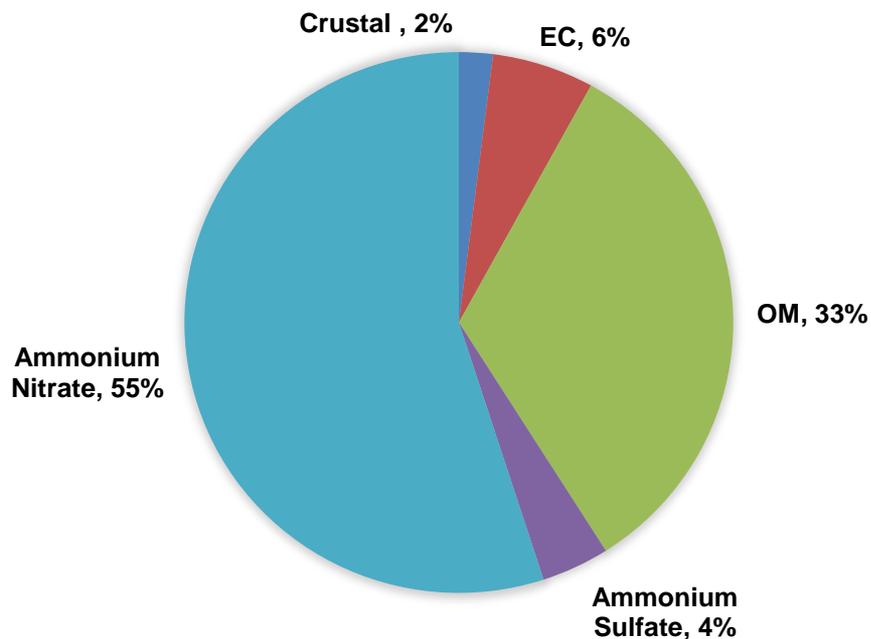


# Fresno PM2.5 Speciation (Average of 2011 to 2013)

## Annual Average

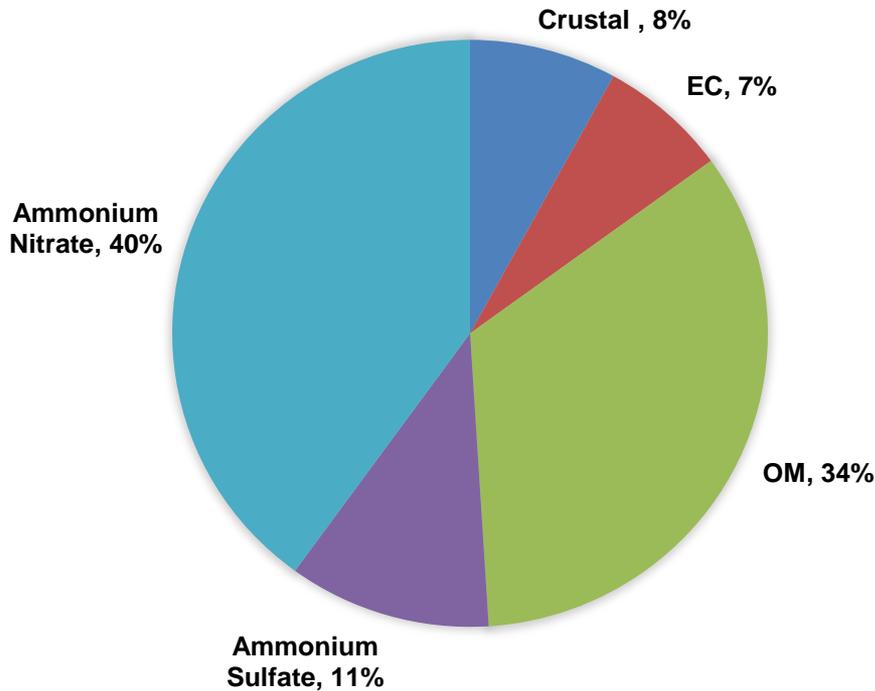


## Average of Top 10% Days

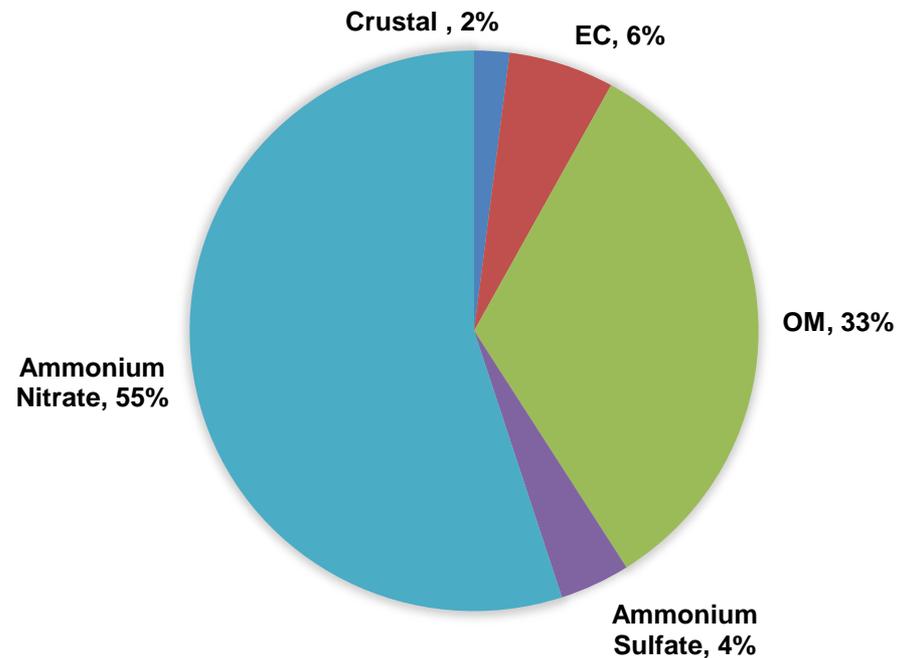


# Modesto PM2.5 Speciation (Average of 2011 to 2013)

## Annual Average

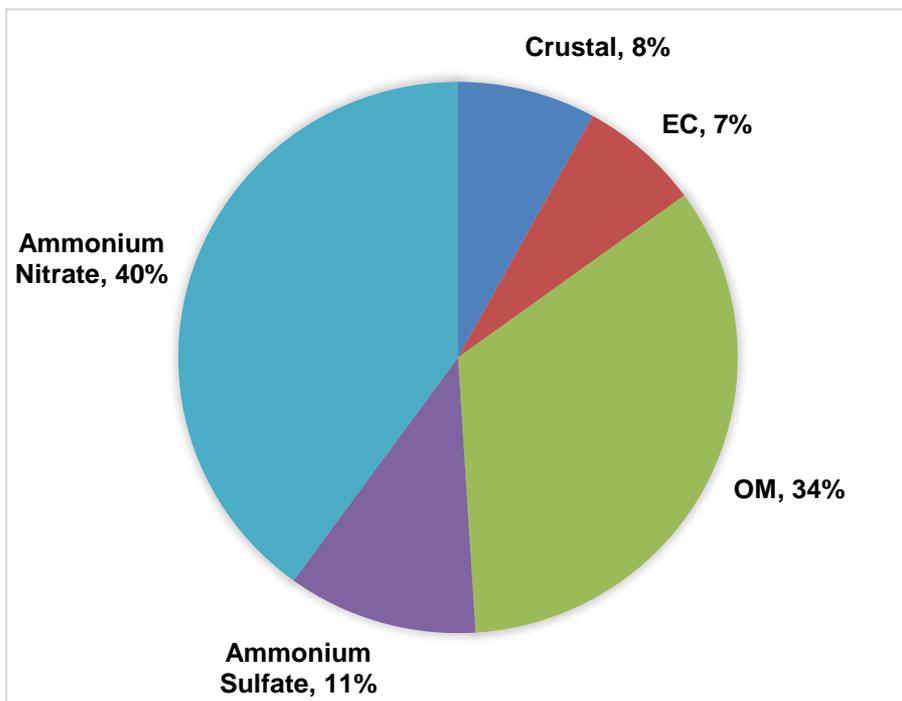


## Average of Top 10% Days

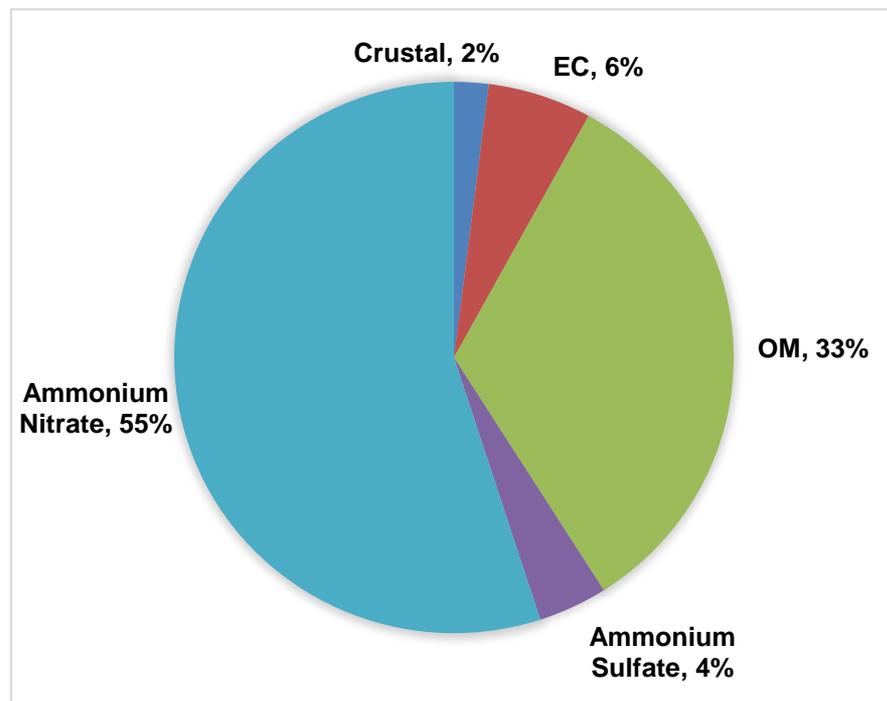


# PM2.5 Breakdown in Bakersfield 2025

## Annual Average

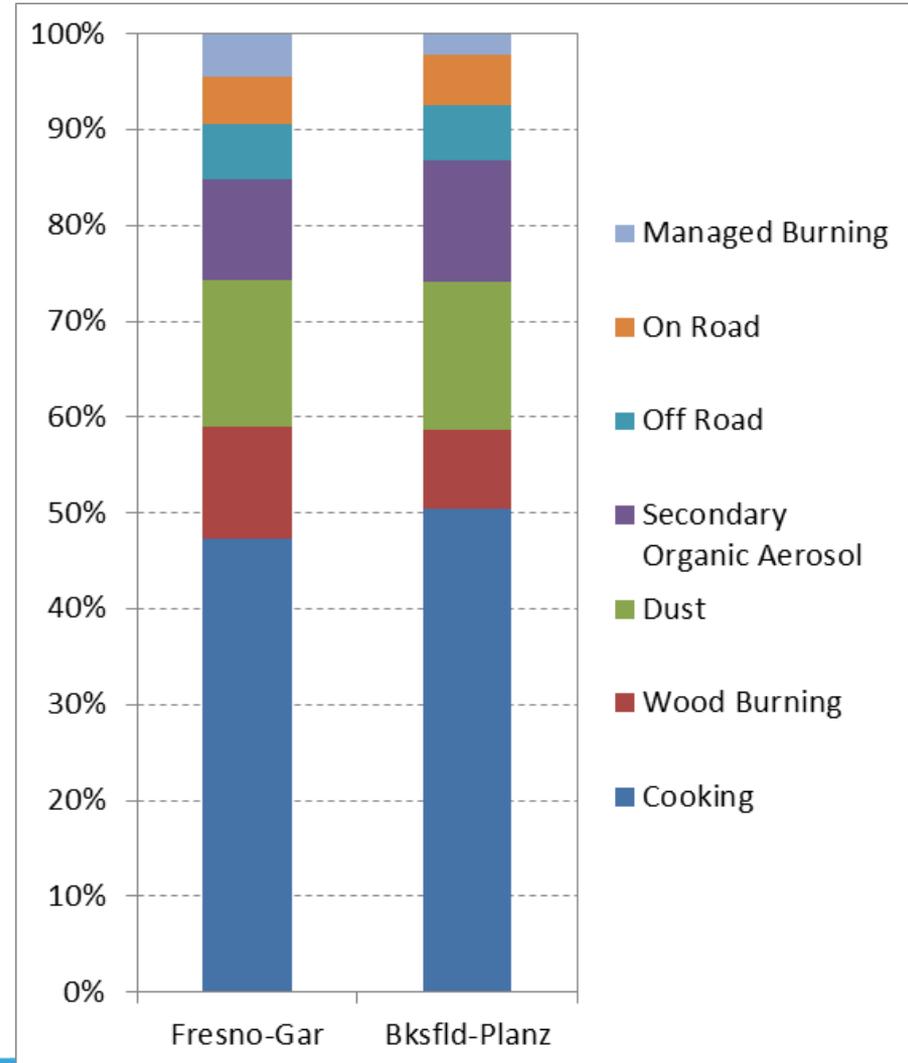
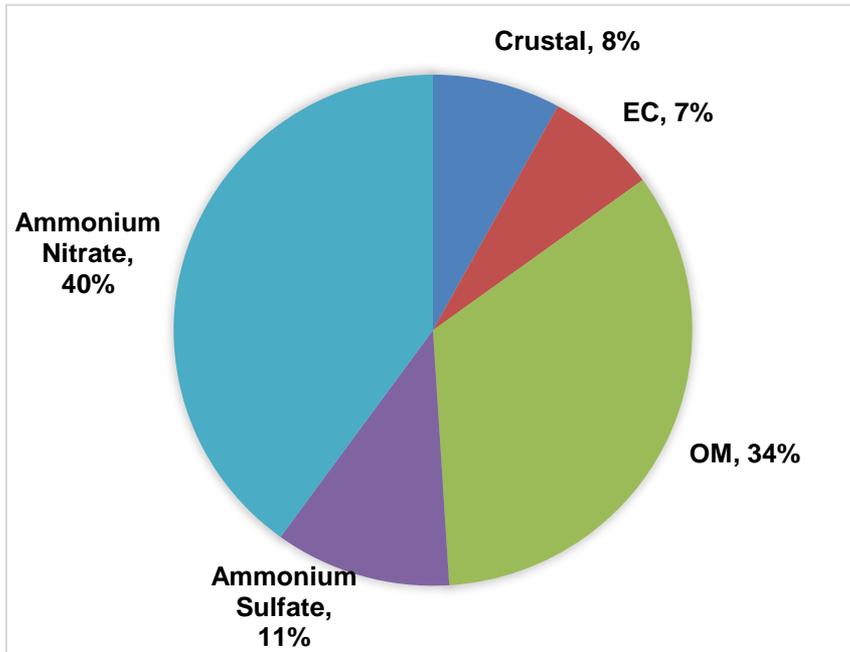


## Average of Top 10% Days



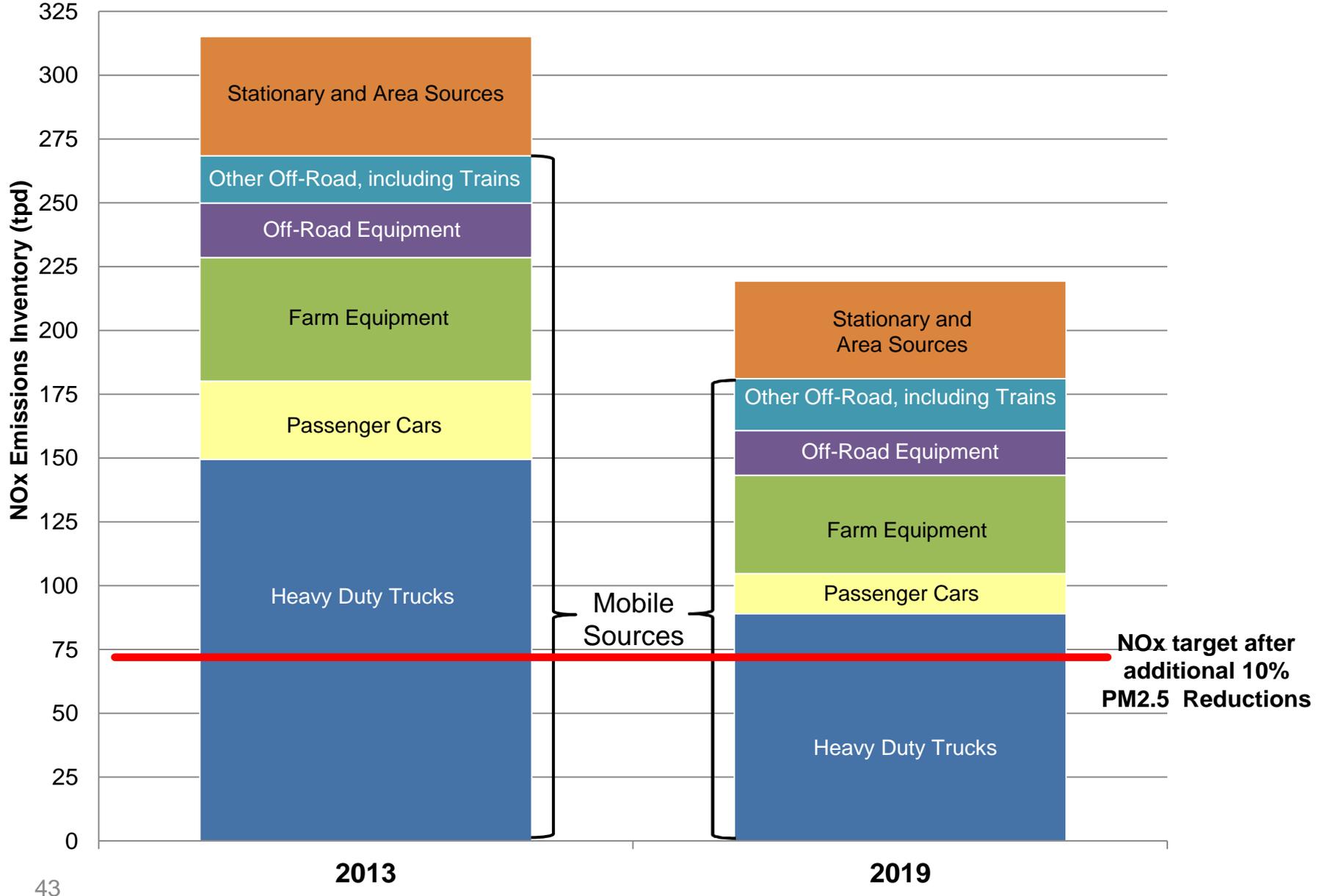
# OM Source Contributions in Bakersfield 2025 (ARB model)

## Annual Average



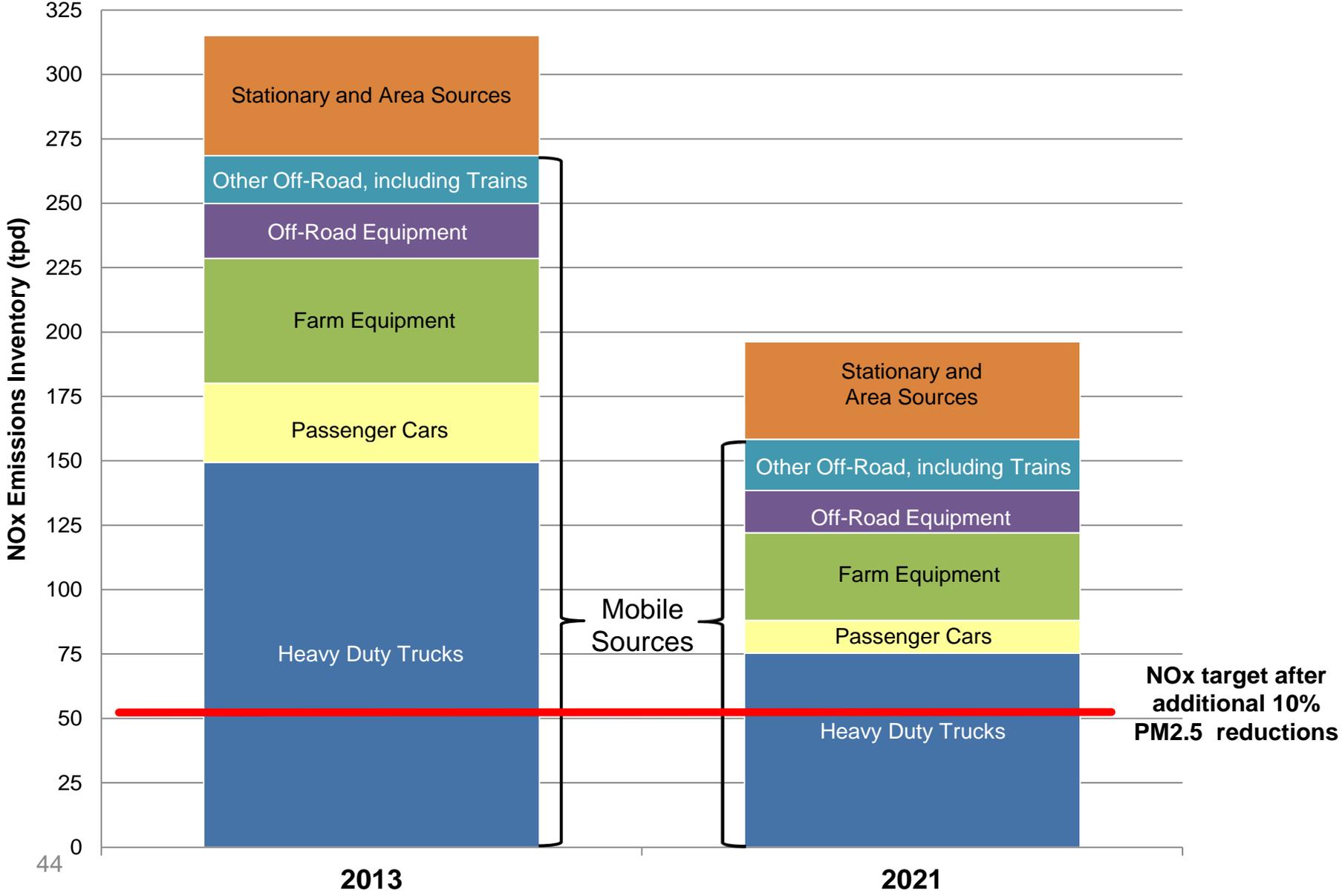
# Projected Emissions Reductions Required for Attainment

(2006 24-hr PM2.5 Standard)



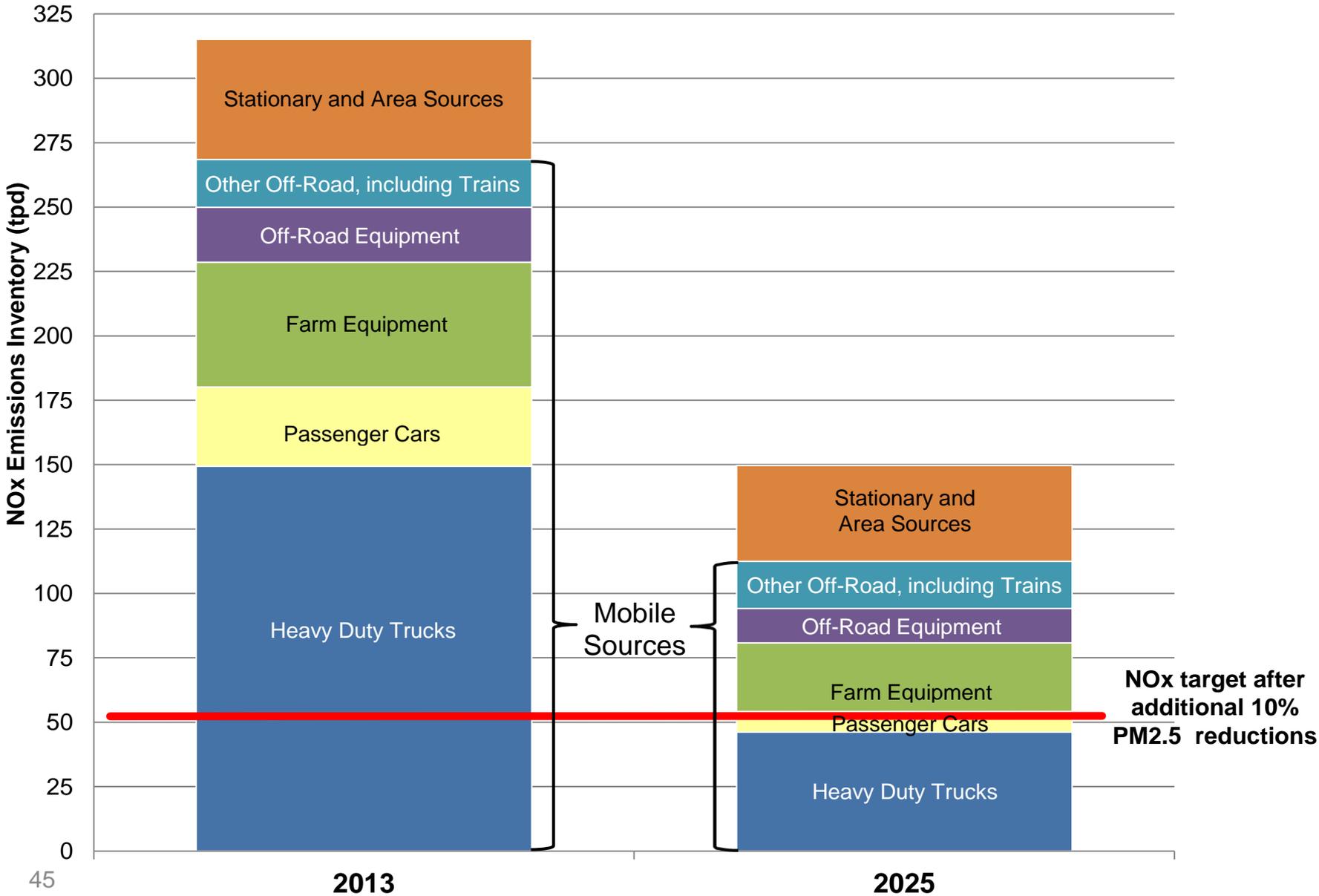
# Projected Emissions Reductions Required for Attainment

## (2012 Annual PM2.5 Standard)



# Projected Emissions Reductions Required for Attainment

## (2012 Annual PM2.5 Standard)



# More Precise Modeling Underway

- Generalized assumptions not reliable for complex PM2.5 attainment planning
  - Broad percentage cuts in emissions do not represent proportional reductions in concentrations at Valley peak stations
  - In establishing Valley's needed NOx emission reductions to reach attainment, must incorporate expected reductions in direct PM2.5 and precursor emissions from potential measures under consideration to estimate actual benefits of those measures

# More Precise Modeling Underway (cont'd)

- District working closely with ARB to ensure air quality modeling for plan accounts for the following characteristics:
  - Location of emissions
  - Seasonality and temporal patterns of emissions
  - Particulate matter speciation
  - Current control programs that include episodic curtailment based on meteorological conditions
  - Air quality changes at peak air monitoring sites due to emissions reductions from sources in remote locations
- At beginning of planning process, District estimates indicated that in addition to significant reductions in PM<sub>2.5</sub> emissions, another 140 tons per day of NO<sub>x</sub> reductions are necessary by 2019
- ARB's initial NO<sub>x</sub> projections assumed 25% cut in direct PM<sub>2.5</sub> concentrations (organic matter and dust) at peak sites irrespective of specific measures
- More recent modeling conducted by District reflecting expected emissions reductions from potential measures indicates that needed NO<sub>x</sub> reductions might be even greater
  - Awaiting ARB review and verification of District's recent modeling



# DISTRICT MEASURES UNDER CONSIDERATION



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# Potential District Measures

## Leaving No Stone Unturned

- District has conducted extensive review of potential emission reduction opportunities
- District has identified preliminary measures for discussion purposes
- Final scope, design and effectiveness of measures to be considered subject to comments expected from Valley businesses and residents through the public participation process



# Boilers, Steam Generators, & Process Heaters > 5.0 MMBtu/hr (Rules 4306 & 4320)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
NOx	1.80	1.39	1.31	1.14

- Initial rule for this category adopted December 1993
  - Sources found in oil/gas sector, food/agriculture, and other industrial processes
- Amended multiple times to implement more stringent limits as technologies became feasible
- Rule 4320 (October 2008) supplementary rule to Rule 4306
- NOx emissions reduced approximately 96% from this source category
- Direct PM2.5 emissions relatively small and sources do not significantly contribute to peak ambient PM2.5 concentrations
  - Sources have been forced to transition from high sulfur diesel fuels to inherently low PM2.5 emitting natural gas
- Potential measures: Enhanced NOx control requirements for boilers, steam generators, and process heaters
  - Assess lower NOx emission limits based on recent installations and latest technologies



# Boilers, Steam Generators, & Process Heaters 2.0 MMBtu/hr to 5.0 MMBtu/hr (Rule 4307)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
NOx	0.45	0.35	0.33	0.29

- Adopted December 2005 to establish emission limits for boilers, steam generators, and process heaters sized 2-5 MMBtu/hr; subsequently amended three times
  - Sources found in oil/gas sector, food/agriculture, and other industrial processes
- NOx emissions have been reduced by over 84%
- Direct PM2.5 emissions relatively small and sources do not significantly contribute to peak ambient PM2.5 concentrations
  - Sources have transitioned from high sulfur diesel fuels to clean natural gas
- Potential measures: Explore additional NOx control requirements for boilers and steam generators with a total rated heat input less than or equal to 5 MMBtu/hr



# Flares (Rule 4311)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
NOx	0.57	0.54	0.53	0.52

- Adopted June 2002, and amended in 2009 to add Flare Minimization Plan requirements to the rule
  - Sources include oil and gas, landfills, waste water treatment, etc.
- District has most stringent rule
  - Rule compared to other regions (North Dakota, Santa Barbara, etc.)
- Potential measures: Enhanced NOx control requirements for flares
  - Amend rule to include additional ultra-low NOx flare emission limitations for existing and new flaring activities at Valley facilities to the extent that such controls are technologically achievable and economically feasible, by Dec 31, 2017
  - Amend rule to include additional flare minimization requirements to the extent that such controls are technologically achievable and economically feasible, by Dec 31, 2017



# Non-Ag IC Engines (Rule 4702)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
NOx	2.76	2.39	2.28	2.14

- Amended 12 times since May 1992
  - Lowered emission limit for lean-burn engines by 98.5% from 740 ppmv to 11 ppmv
  - Lowered emission limit for rich-burn engines by 98.3% from 640 ppmv to 11 ppmv
- Valley businesses have invested millions of dollars to comply and reduce 19 tons NOx/day since 2000 through extensive retrofits and replacements
- Potential measures: Explore additional NOx controls for non-ag IC engines

# Ag IC Engines (Rule 4702)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
NOx	10.17	4.06	3.69	3.00

- Ag IC engines regulated under Rule 4702 since 2005
- Emissions reduced over 80% (14.2 tons/day) through significant investments by ag industry to retrofit and replace thousands of irrigation pump engines
- Ag operations still facing looming compliance deadlines
- Potential measures: Regulatory and incentive-based strategies to electrify ag irrigation pump engines in areas impacting peak Valley PM2.5 sites and where access to electricity is available
  - Need to assess economic feasibility of lowering NOx limits for ag engines (limits higher than non-ag in recognition of rural operation and other limitations)
  - Need additional local, state, and federal incentive funding to accelerate transition

# Ag Open Burning (Rule 4103)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
PM2.5	2.27	2.24	2.23	2.21

- Valley, pursuant to SB705 (2003 Florez), has toughest restrictions on ag open burning
  - No burning of field crops (except rice), most prunings and most orchard removals
- Smoke Management System only allows limited amounts of burning on days with favorable meteorology
- Restrictions reduced open burning by 80%, until 2014
- Exceptional drought conditions and demise of biomass power industry has resulted in increase in open burning and threatens District's ability to maintain broad restrictions on open burning of ag waste into the future

# Healthy Soils Initiative

- “Healthy Soils” helps to promote conservation practices that reduce emissions and enhance soil organic matter content
  - Increase in soil water retention and reduction of soil erosion
  - Improvement in plant growth and yields
  - Reduction in criteria pollutants and GHGs
  - Reduced effects of toxic substances in soil
- Potential measure: Work with Valley growers to develop San Joaquin Valley Healthy Soils Initiative aimed at reducing directly emitted particulate matter while enhancing crop yield
  - Incentive-based approach (identify potential funding mechanisms)
  - Evaluate practices that minimize dust from wind erosion and soil disturbances while improving soil health

# Conservation Management Practices (Rule 4550)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2000	2013	2019	2021	2025
PM2.5	29.45	20.47	19.96	19.80	19.46

- Adopted in 2004, first rule of its kind
  - Received EPA Region IX “2005 Environmental Award for Outstanding Achievement”
  - PM10 emissions reduced by 35.3 tons per day
  - Helped Valley reach attainment of federal PM10 air quality standard
  - Reduces emissions from over 3.2 million acres of Valley farmland
- Potential measures: Enhanced Conservation Management Practices (CMP) for ag operations to reduce directly emitted particulate matter
  - Evaluate all feasible opportunities for additional emission reductions

# Commercial Charbroilers (Rule 4692)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2002	2005	2019	2021	2025
PM2.5	3.36	2.75	3.16	3.25	3.46

- Adopted March 2002, amended in 2009 to expand applicability
  - Applicable to chain-driven charbroilers that cook  $\geq 400$  pounds of meat per week (e.g., Red Robin, Burger King, etc.),
  - Reduced emissions by over 85%
  - Restaurants comply through use of catalytic oxidizers
- Underfired charbroilers exempt (e.g., BBQ restaurants, etc.)
- Potential measures: Continue to develop commercially available and working control technologies for underfired charbroilers
  - Technologies not fully tested; need further evaluation/demonstration
  - Board approved \$750,000 to fund demonstration projects
  - Despite efforts, District faces difficulty identifying technologies and finding restaurants willing to participate
  - No other regions have adopted successful regulations or deployment of technology



# Residential Wood-Burning Program

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2000	2013	2019	2021	2025
PM2.5	8.66	3.26	2.81	2.81	2.81

- District Rule 4901
  - 20  $\mu\text{g}/\text{m}^3$  No Burn threshold for dirty units responsible for 95% of emissions
  - Ban open hearth fireplaces in most new developments
  - Require EPA certified units at property transfer
  - Allows more burn days for use of registered clean-burning devices
    - < 2,000 registered units; only 90 registered units in Kern County
- Reduces health impacts when and where most needed
- Strong outreach and enforcement
- Financial incentives to replace old high polluting devices
- Achieves PM2.5 emissions reductions even on burn days
- Potential measures: Explore feasibility of prohibiting wood-burning devices in new homes on parcels with  $\leq 2$  homes per acre



# Ag Open Burning (Rule 4103)

- Potential measures: Given decline of biomass industry that has served as cleaner alternative for open burning of agricultural waste, continue to identify and develop other alternatives to open burning
  - Avoid relaxing prohibitions on agricultural burning where no feasible alternatives are available
  - Explore use of pyrolysis/gasification to convert biomass to syngas, biochar, or other forms of energy
  - Explore use of biomass as mulch/land application/soil incorporation/compost
- Central Valley Summit on Alternatives to Open Burning of Agricultural Waste
  - Bringing together Valley growers, researchers/experts, representatives from the biomass power industry, representatives from new and developing technology vendors, and Valley stakeholders
  - Summit in late May or early June of 2017



# Glass Melting Furnaces (Rule 4354)

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2000	2013	2019	2021	2025
NOx	8.73	6.21	3.30	3.41	3.50
SOx	4.43	2.00	1.68	1.73	1.76

- Adopted in 1994 and amended six times
- Industry invested millions of dollars; reduced 70-80% NOx
- Potential measures: Explore tighter NOx controls for Valley glass plants matching levels already achieved in practice
  - District rule limit: 1.5 lb-NOx/ton of glass pulled
  - Valley facilities currently meeting 0.6-0.8 lb/ton of glass pulled
  - South Coast RECLAIM level not comparable to District's enforceable limits
- Potential measures: Explore additional SOx controls for glass plants
  - Evaluate the potential for additional reductions from the use of scrubbing or other technologies



# Public Fleets

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
NOx	7.23	4.84	4.17	3.06

- Over past 20 years, District and ARB have adopted a number of regulatory and incentive-based strategies to reduce emissions from public fleet vehicles
  - Public fleets include public transit, commercial airport ground access, public agencies and utilities, solid waste collection, and school bus
  - Emissions from public fleets significantly reduced and represent 2% of Valley’s NOx emissions by 2025
- Potential measures: Enhance public fleet regulations allowing for near-zero emissions technologies to achieve near-term reductions
  - Work with ARB to identify additional emissions reductions through regulatory and/or incentive-based measures

# Almond Harvest Technology Incentive Program

## ARB Emissions Inventory (annual average tons per day)

Pollutant	2013	2019	2021	2025
PM2.5	6.67	6.54	6.50	6.41

- Almond harvest emissions occur from shaking, sweeping, and pickup activities
  - 76% of total almond harvest emissions from pickup activities
  - Lower emitting technologies have been developed in recent years
- Potential measures: Development of new grant program to provide local funding to deploy clean ag harvesting technology with focus on areas impacting peak sites in Valley
  - Studies show control efficiencies range from 30-70%, depending on harvester technology

# Preliminary Projected Reductions

Measures/Strategies	Estimated Reductions
<b>PM2.5</b>	
Prohibit wood-burning devices in new homes on low density parcels	TBD
Enhanced CMPs for agricultural operations aimed at reducing directly emitted PM	<b>2019:</b> 3.00 tpd PM2.5
San Joaquin Valley Healthy Soils Initiative	TBD
<b>SOx</b>	
Install additional SOx control technology on Valley glass plants	TBD
<b>NOx</b>	
Lower NOx limit from container glass plants by 2019	TBD
Lower NOx limits from non-ag engines as feasible by 2019	<b>2019:</b> 0.43 tpd NOx
Lower NOx from boilers/steam generators > 5 MMBtu/hr as feasible by 2019	<b>2019:</b> 0.49 tpd NOx
Lower NOx from boilers/steam generators < 5 MMBtu/hr as feasible by 2019	<b>2019:</b> 0.12 tpd NOx
Install ultra-low NOx flare technology and require additional flare minimization practices by 2019	TBD

# ACHIEVING ADDITIONAL NEEDED REDUCTIONS



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# Valley Requires Immense Additional Emissions Reductions to Reach Attainment

- Through robust public process, District identified 10 measures to reduce estimated 6.3 tons per day PM<sub>2.5</sub> emissions by 2025
- Based on recent modeling incorporating optimistic reductions from potential measures, remaining NO<sub>x</sub> emissions needed to reach attainment by 2019 and 2025 are massive
  - ARB's initial NO<sub>x</sub> projections assumed 25% cut in direct PM<sub>2.5</sub> concentrations (organic matter and dust) at peak sites irrespective of specific measures
  - Awaiting ARB review and verification of District's recent modeling
- Regulations alone not enough to achieve required reductions in short timeframe allowed under federal law (pre-2025)
- Total cost to achieve significant additional reductions estimated at \$51.2 billion (assuming technology is commercially available, sufficient quantities of vehicles/equipment, etc.)
- In combination with regulatory measures, robust incentive-based strategy necessary to achieve enormous reductions



# ARB Mobile Source Strategy

- Intended to address State SIP and climate change mandates
- May 2016, ARB released their draft Mobile Source Strategy – focused on long term climate change mandates and South Coast needs by 2031
- October 2016, ARB committed to work with District to identify mobile and stationary measures needed in Valley by 2025

Measures/Strategies	Estimated Reductions (2025)
ARB On-Road Heavy Duty Low NOx Requirement	2
Small Off-Road Engines Requirements	0.2
Off-Road Equipment Low-Emission Diesel Requirements	1
Innovative Clean Transit Initiative	< 0.1
Last Mile Delivery	< 0.1

# Potential Measures and Costs

- District has conducted extensive review of emission reduction opportunities
- District has identified preliminary measures for discussion purposes
- Final scope, design and effectiveness of measures to be considered subject to comments expected from Valley businesses and residents through the public participation process



# Potential Measures and Cost

Measures/Strategies	Estimated Reductions	Estimated Total Cost
<b>Under-fired Charbroilers</b>		
Install PM control technology by 2019 on larger under-fired charbroiler units installed within the last 10-15 years (360 out of a total of 1800)	<b>2025:</b> 0.38 tpd PM2.5	\$60,000,000
<b>Ag Engines</b>		
Electrify 1,053 ag pumps (50% of total) in areas impacting peak PM2.5 sites where access to electricity available	<b>2025:</b> 2.03 tpd NOx	\$84,200,000
<b>Residential Wood-burning Devices</b>		
Replace 7,876 residential wood-burning devices with cleaner devices by 2019	<b>2019:</b> 0.36 tpd PM2.5	\$33,754,016
Replace 5,251 residential wood-burning devices in 2020 through 2021	<b>2021:</b> 0.24 tpd PM2.5	\$22,502,677
Replace 10,501 residential wood-burning devices in 2022 through 2025	<b>2025:</b> 0.48 tpd PM2.5	\$45,005,354

# Potential Measures and Cost (cont'd)

Measures/Strategies	Estimated Reductions	Estimated Total Cost
<b>Almond Harvesters</b>		
Replace 650 almond harvesters by 2019 with new almond harvester technologies capable of 50% PM2.5 control efficiency	<b>2019:</b> 1.8 tpd PM2.5 <b>2019:</b> 0.04 tpd NOx	\$57,850,000

# Potential Measures and Cost (cont'd)

Measures/Strategies	Estimated Reductions (tpd)	Estimated Total Cost
<b>Public Fleets</b>		
Replace 181 public transit buses with 0.02 g/bhp-hr by 2019	<b>2019:</b> 0.47	\$108,600,000
Replace 222 solid waste collection trucks with 0.02 g/bhp-hr by 2019	<b>2019:</b> 0.25	\$73,260,000
Replace 617 school buses with 0.02 g/bhp-hr by 2019	<b>2019:</b> 0.25	\$114,145,000
Replace 977 public agencies and utilities fleet vehicles with 0.02 g/bhp-hr by 2019	<b>2019:</b> 0.27	\$175,860,000

# Potential Measures and Cost (cont'd)

Measures/Strategies	Estimated Reductions	Estimated Total Cost
<b>Light Duty Vehicles (Passenger Cars, SUVs, Pick-up Trucks, etc.)</b>		
Replace 320,000 light-duty cars and trucks by 2019 with zero-emission vehicles	<b>2019:</b> 5.03 tpd NOx	\$6,400,000,000

# Potential Measures and Cost (cont'd)

Measures/Strategies	Estimated Reductions	Estimated Total Cost
<b>Light Heavy-duty Trucks (LHD)</b>		
Replace 89,237 LHD Trucks with 0.02 g/bhp-hr by 2019	<b>2019:</b> 7.6 tpd NOx	\$5,354,220,000
Replace 5,330 LHD Trucks with 0.02 g/bhp-hr through 2020-2021	<b>2021:</b> 0.05 tpd NOx	\$319,800,000
Replace 8,369 LHD Trucks with 0.02 g/bhp-hr through 2022-2025	<b>2025:</b> 0.05 tpd NOx	\$502,140,000
<b>Medium Heavy-duty Trucks (MHD)</b>		
Replace 110,000 MHD Trucks with 0.02 g/bhp-hr by 2019	<b>2019:</b> 15.02 tpd NOx	\$13,200,000,000

# Potential Measures and Cost (cont'd)

Measures/Strategies	Estimated Reductions (tpd NOx)	Estimated Total Cost
<b>Natural Gas Infrastructure</b>		
Install 2,622 natural gas fueling stations as necessary to deploy 75,536 HHD 0.02 g/bhp-hr natural gas trucks by 2025	N/A	\$3,146,400,000
<b>Heavy Heavy-Duty Trucks (HHD)</b>		
Replace 68,851 HHD Trucks by 2019 with 0.02 g/bhp-hr	<b>2019:</b> 56.39	\$13,770,200,000
Replace 2,784 HHD Trucks between 2020 to 2021 with 0.02 g/bhp-hr	<b>2021:</b> 1.25	\$556,800,000
Replace 3,277 HHD Trucks between 2022 to 2025 with 0.02 g/bhp-hr	<b>2025:</b> 1.47	\$655,400,000



# Potential Measures and Cost (cont'd)

Measures/Strategies	Estimated Reductions (tpd NOx)	Estimated Total Cost
<b>Agricultural Equipment</b>		
Replace 22,692 Agricultural Tractors/Other Equipment with Tier 4 by 2019	<b>2019:</b> 25.67	\$ 2,950,059,800
Replace 9,666 Agricultural Tractors/Other Equipment with Tier 4 through 2020-2021	<b>2021:</b> 4.50	\$ 1,460,933,400
Replace 4,210 Agricultural Tractors/Other Equipment with Tier 4 through 2022-2025	<b>2025:</b> 2.00	\$ 809,930,000



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# Potential Measures and Cost (cont'd)

Measures/Strategies	Estimated Reductions (tpd)	Estimated Total Cost
<b>Locomotives</b>		
Replace 76 Locomotives with Tier 4 by 2019	<b>2019:</b> 7.96	\$227,250,000
<b>Off-Road Equipment</b>		
Replace 18,000 Vehicles with Tier 4 by 2019	<b>2019:</b> 15.50	\$1,440,000,000

Total NOx Reduced (tpd)	Total Estimated Cost by 2025
<b>2025:</b> 87.0	\$51.2 Billion

# Public Engagement Process



# Extensive Public Outreach Process

- District's public process provides multiple opportunities for public and stakeholders to provide comments, ask questions, and request additional information
  - Conduct public workshops
  - Hold multiple Public Advisory Workgroup meetings
  - Provide monthly updates at public meetings of the District Governing Board, Citizens Advisory Committee, and Environmental Justice Advisory Group

# Extensive Public Process

- Under guidance of District Board, APCO formed Public Advisory Workgroup committee consisting of representatives from regulated entities (industry, farms, dairy families and municipalities), community advocates, and advisors from EPA and ARB
  - January 11, 2017 - Air Quality Modeling
  - January 25, 2017 - ARB Mobile Source Measures
  - February 9, 2017 - District measures
- Public Workshops
  - December 1, 2016 - ARB workshop
  - December 7, 2016 - District Scoping Public Workshop
  - March 9, 2016 - District Public Workshop

# Next Steps in Plan Development Process

- Continue extensive public outreach process
- Continue to work with ARB to conduct in-depth air quality modeling that more precisely and accurately predicts PM<sub>2.5</sub> concentrations at peak monitoring sites
- Work with ARB to ensure that the State provides all possible mobile source control strategies including incentive-based measures that result in additional reductions in emissions beyond those included in the current control programs
- Continue to evaluate potential emission reduction opportunities that the District could pursue



# Additional Information

- Up-to-date information available at [www.valleyair.org/2017-pm25-plan](http://www.valleyair.org/2017-pm25-plan)
- PM Plans email sign up available at <http://www.valleyair.org/lists/list.htm>
- Receive email updates on the development of this plan and future air quality attainment plans
- Email comments to [airqualityplans@valleyair.org](mailto:airqualityplans@valleyair.org)



# Comments and Discussion

[webcast@valleyair.org](mailto:webcast@valleyair.org)

