

# *2022 Ozone Plan* for Attainment of the 2015 Federal 8-Hour Ozone Standard

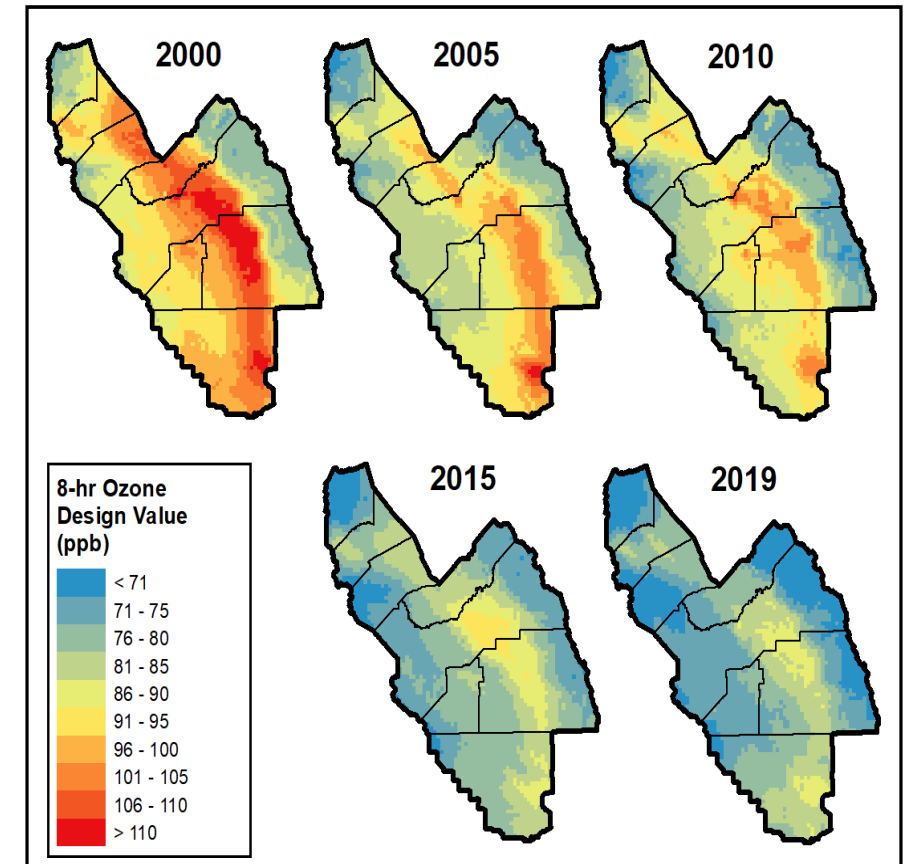
Technical Working Group:  
Projected Emissions Inventory, Modeling,  
and CARB State SIP Strategy

March 7, 2022

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

# Ongoing Valley Clean Air Efforts for Ozone

- District has adopted numerous attainment plans and control strategies to address federal standards and improve air quality and public health
  - Stationary source emissions reduced by over 90%
  - District/CARB strategies nation's toughest air quality program
- Despite significant progress, substantial further reductions in NO<sub>x</sub> emissions needed to attain new 2015 federal 8-hour ozone standard
  - Over 80% of remaining NO<sub>x</sub> emissions in Valley come from mobile sources under state and federal jurisdiction
- District required to adopt new *2022 Ozone Plan* by August 2022 for 2015 ozone standard (70 ppb)
  - Valley designated as “Extreme” nonattainment
  - Attainment deadline of 2037



# Emission Inventory

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California Air Resources Board

San Joaquin Valley Ozone SIP workshop 03/07/2022

# Mobile Source Emission Inventories

An emission inventory for a particular mobile sector accounts for:

- *Population* of equipment or vehicle
- How often it is used (*activity or miles travelled*)
- The equipment *model year* (newer is generally cleaner)
- The region where the equipment is used (generally by *county*)
- The total resulting *emissions* from the equipment or vehicle

CARB uses emissions inventories to understand where air pollution comes from and to create strategies for emission reductions.

Emissions results: <https://arb.ca.gov/emfac/emissions-inventory>

## Emissions Inventory

This tool provides emissions from onroad and offroad mobile sources in California.

For the most recent updates, please be sure to clear your browser cache by selecting the gear icon following the banner's META Tool tab, then click 'Delete All Stored Data'.

Output ?

Onroad Emissions

Onroad Emission Rates

Offroad Emissions

# Mobile Source Emission Inventories

## Off-Road

Categories represent many different industries, each with unique operations:

Cargo Handling Equipment



Commercial Harbor Craft



Construction



Ocean Going Vessels



Agriculture



Transport Refrigeration Unit



Rail



Lawn and Garden Equipment



Pleasure Craft



Recreational Vehicle



Portable Fuel Tank



Portable Equipment



On-Board Marine Tank



Large Spark Ignited



## On-Road

Passenger Vehicles



Motorcycles



Pickups / Vans



Heavy-Heavy Duty Trucks



Medium Heavy Duty Trucks



School Buses

Transit Buses

Motorhomes



Passenger Vehicles

Heavy Duty Trucks  
(Above 8,500 lbs.)

Buses



# How Mobile Source Inventories Are Used

Emission inventories are more than just numbers. They are pictures of major industry sectors, and help us answer questions like these:



# Stationary Source Emission Inventories

- Point Sources

- Refineries
- Manufacturing
- Electric Utilities
- Oil and Gas Production
- Food Processing
- Chemical Production



- ✓ Estimates submitted by Districts

- Area-Wide Sources

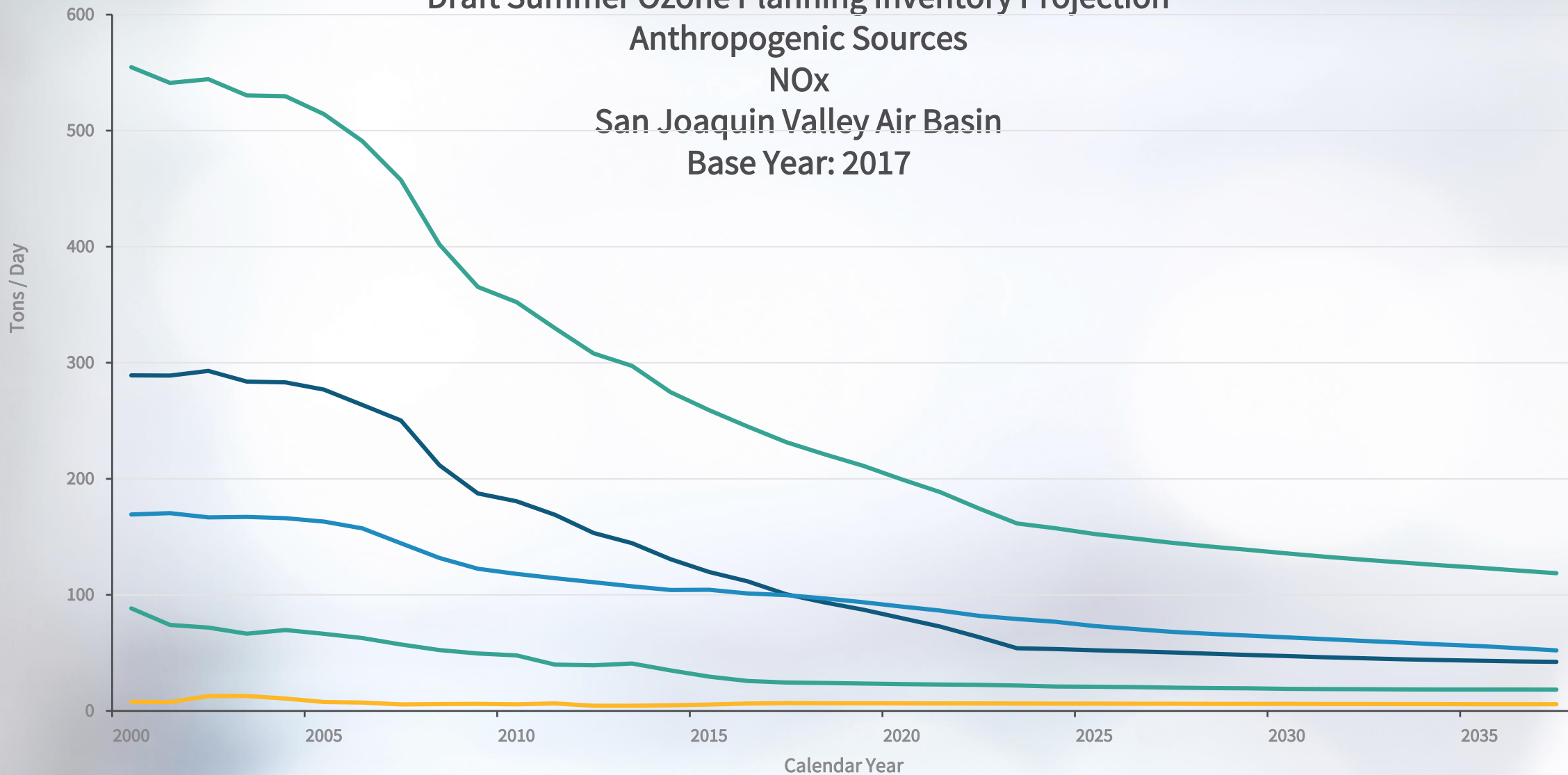
- Farming
- Paved and Unpaved Road Dust
- Solvents
- Consumer Products
- Open Burning



*Carpet and Upholstery Cleaner*

- ✓ Area-Wide estimate methodologies are shared by CARB and Districts

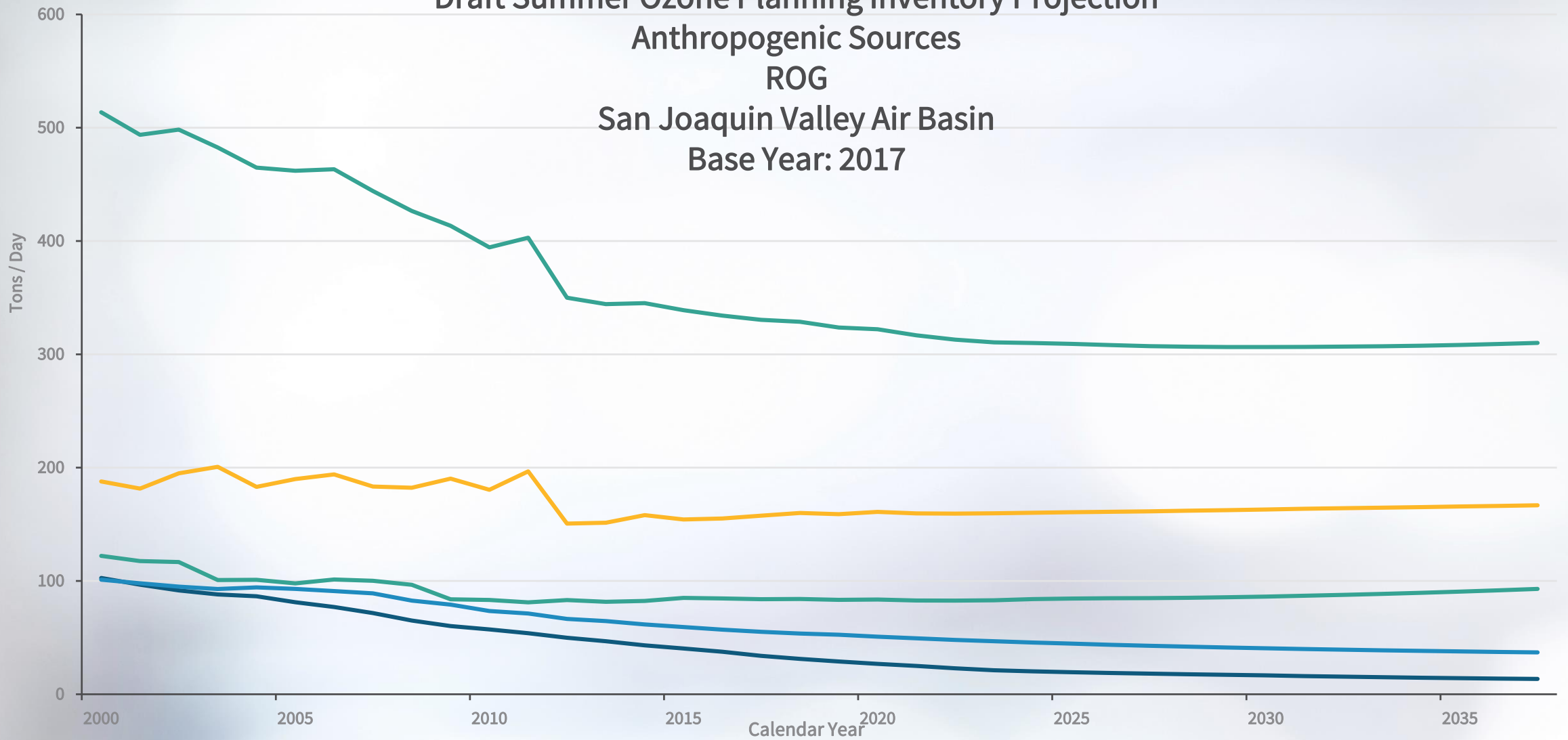
Draft Summer Ozone Planning Inventory Projection  
 Anthropogenic Sources  
 NOx  
 San Joaquin Valley Air Basin  
 Base Year: 2017



Stationary Area-Wide On-Road Mobile Off-Road Mobile Total Inventory



Draft Summer Ozone Planning Inventory Projection  
 Anthropogenic Sources  
 ROG  
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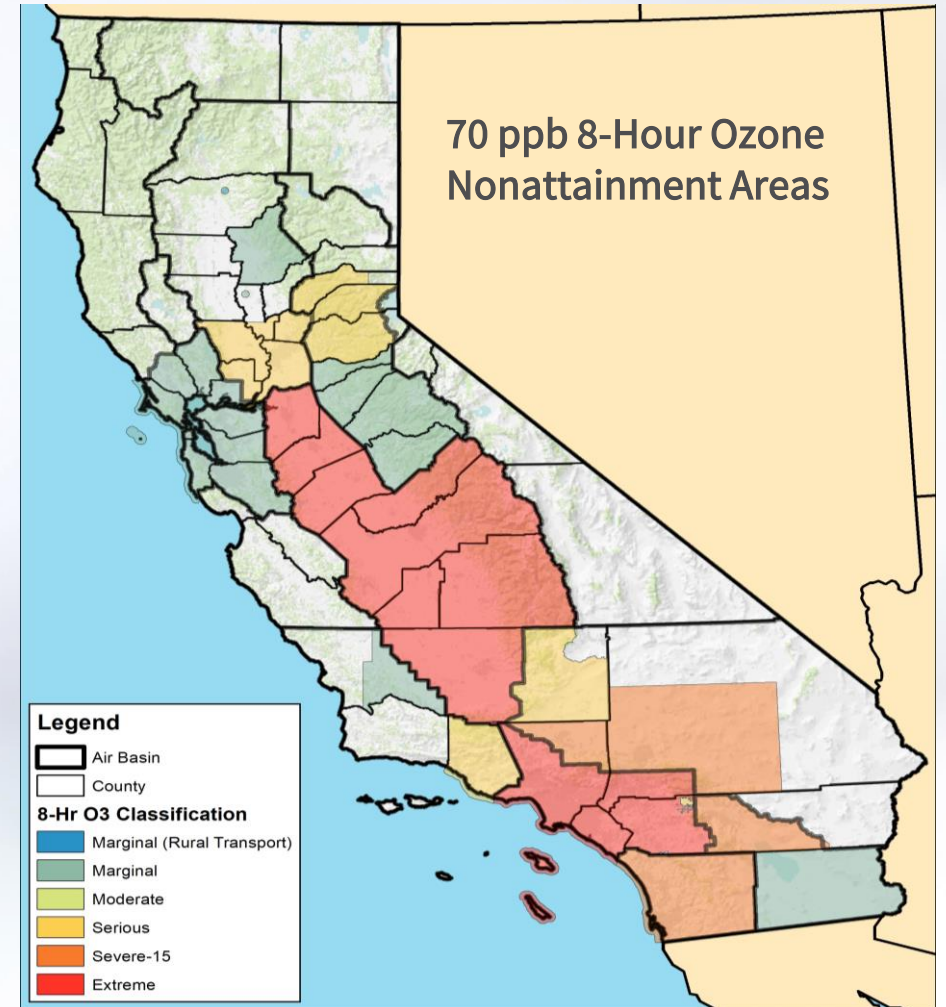
# 2022 State SIP Strategy

## San Joaquin Valley Ozone Plan Workshop

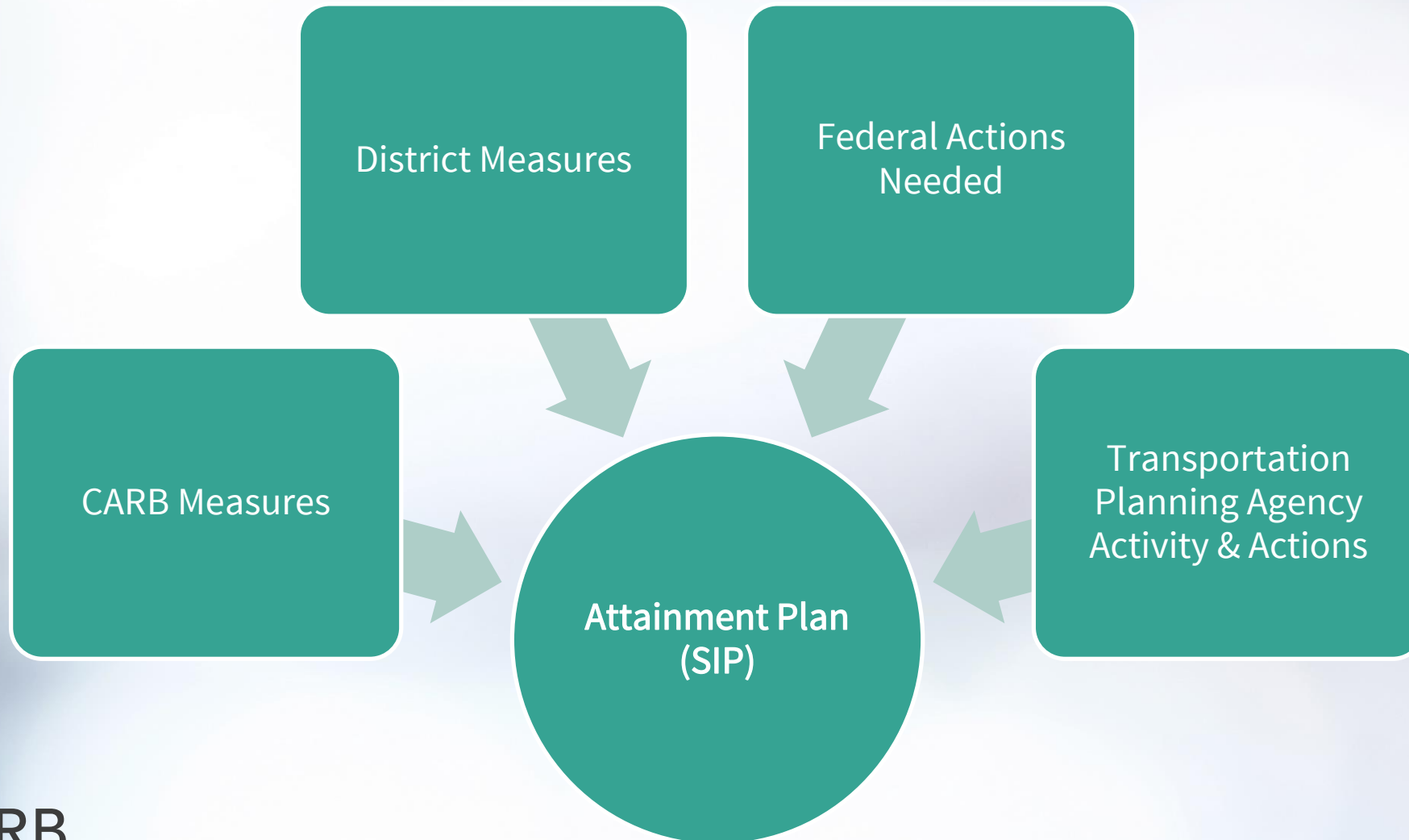
March 7, 2022

# 70 ppb Challenge Across the State

- U.S. EPA revised the 8-hour ozone standard to 70 ppb in 2015
- 19 nonattainment areas in California
  - Attainment years 2020-2037
- 10 areas must submit SIPs
- San Joaquin Valley one of most challenging but other areas will also need commitments
- SIPs due August 2022
- Continue to identify and implement measures for 75 and 80 ppb



# Attainment Plans and 2022 State SIP Strategy



# 2022 State SIP Strategy

- Draft Released on January 31, 2022
- Unprecedented variety of new measures to reduce emissions using all mechanisms available
- Level of action is necessary to meet all air quality standards and protect public health
- Drives pace and scale of CARB rulemakings
- Prioritizes near-term reductions for earlier SIP deadlines

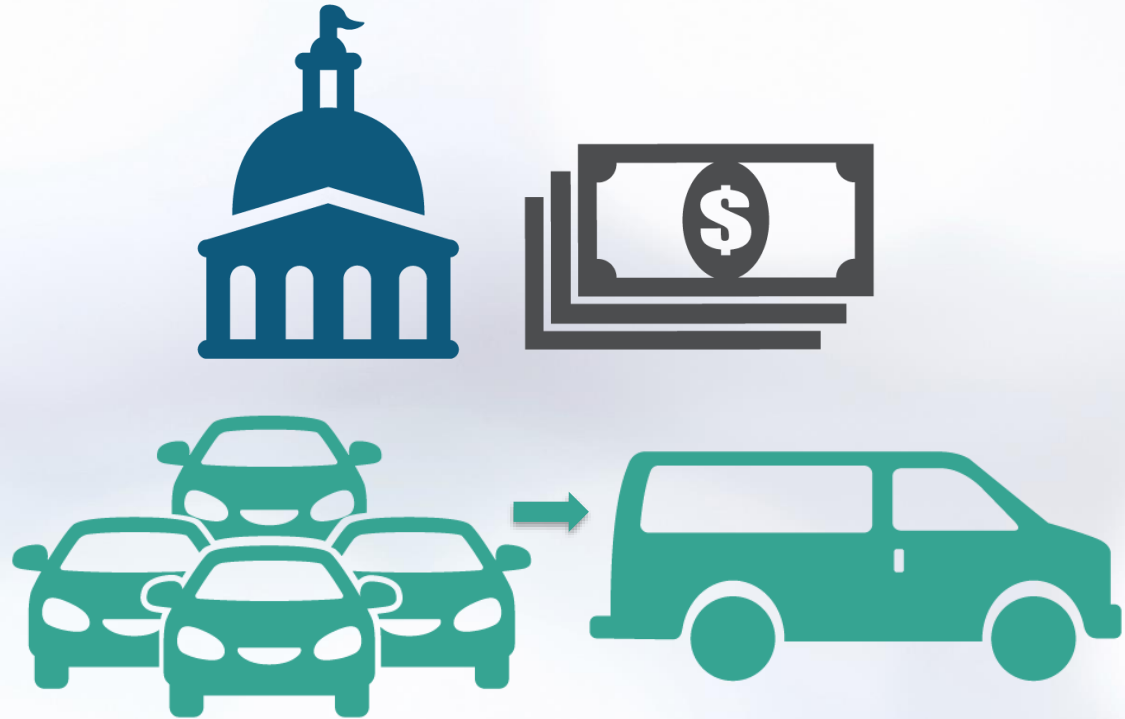
Draft  
2022 State Strategy for the State  
Implementation Plan  
January 31, 2022





# Strategy Overview

- Transition away from combustion and reduce emissions to levels modeling predicts will support attainment of the 70 ppb standard
- Drive to Zero through:
  - regulations,
  - incentives, and
  - voluntary programs



# Public Process to Date



# What's New Since October

- Quantified emissions reductions
- Added Zero Emission Truck Measure and Enhanced Regional Emission Analysis in SIPs Measure
- Removed Phase 3 Greenhouse Gas Standards for Medium- and Heavy-Duty Vehicles Measure
- Moved CORE-CON Measure from the proposed measure list to the incentives' discussion

# Proposed New 2022 SSS Measures

## On-Road

- Advanced Clean Fleets Regulation
- Zero-Emission Trucks
- On-Road Motorcycle New Emissions Standards
- Clean Miles Standard\*
- Enhanced Regional Emission Analysis in State Implementation Plans

## Off-Road

- Tier 5 Off-Road Engine Standard
- Amendments to In-Use Diesel-Fueled Fleets Regulation
- Zero-Emission TRU Part II
- Commercial Harbor Craft
- Cargo Handling Equipment
- Off-Road Zero-Emission Targeted Manufacturer Rule
- Clean Off-Road Fleet Recognition Program
- Spark-Ignition Marine Engine Standards

## Primarily Federally-Regulated

- In-Use Loco Regulation
- Future Measures for Aviation Emissions Reductions

## Other

- Consumer Products Regulation Amendments
- Zero-Emission Standard for Space and Water Heaters

# On-Road Mobile Sources

- Advanced Clean Fleets Regulation
- Zero-Emission Trucks
- On-Road Motorcycles New Emissions Standards
- Clean Miles Standard Regulation
- Enhanced Regional Emission Analysis in SIPs





# Off-Road Vehicles and Equipment

- Tier 5 Off-Road New Compression-Ignition Engine Standards
- Amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation
- Transport Refrigeration Unit Regulation – Part II
- Commercial Harbor Craft Amendments
- Cargo Handling Equipment Amendments
- Off-Road Zero-Emission Targeted Manufacturer Rule
- Clean Off-Road Fleet Recognition Program
- Spark-Ignition Marine Engine Standards



# Control Measures for Other Sources

- Amendments to the Consumer Products Regulation
- Zero-Emission Standard for Space and Water Heaters



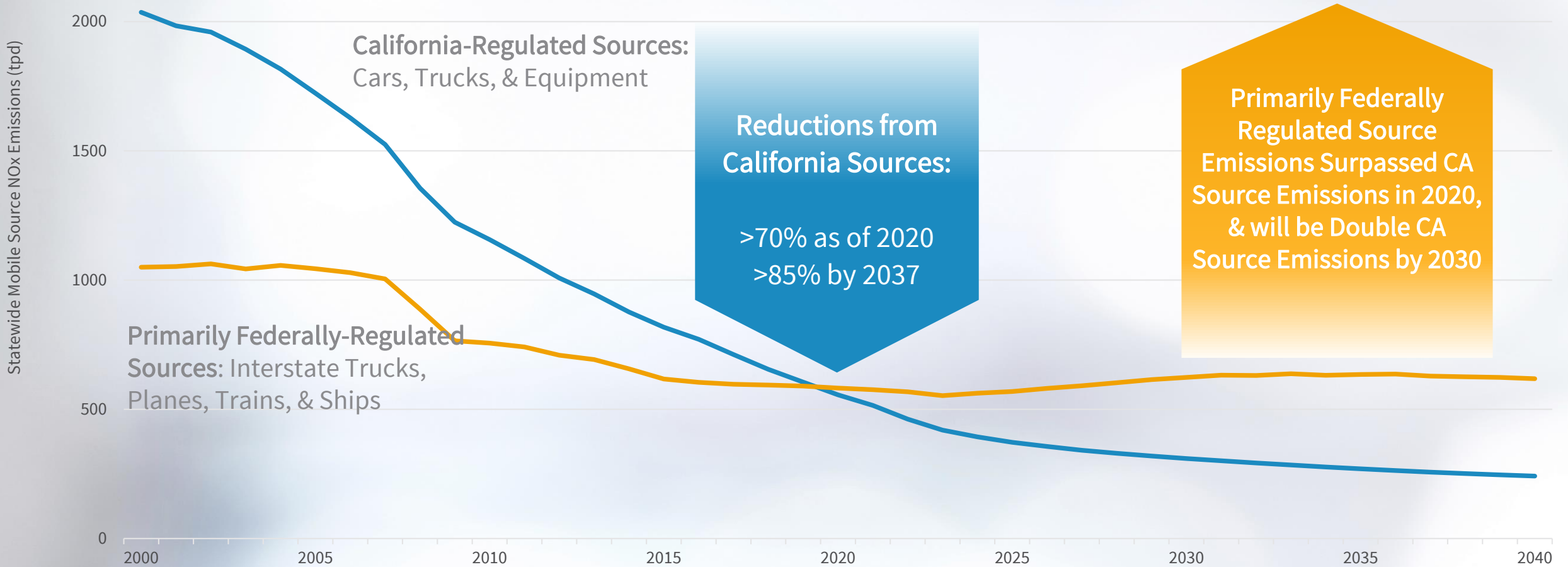
# Sources Primarily Regulated at the Federal and International Level – CARB Measures

- In-Use Locomotive Regulation
- Future Measures for Aviation Emissions Reductions





# Federal Action is Critical



# Federal Actions Needed



## On-Road Heavy-Duty Vehicles

- Low-NOx Engine Standards
  - Zero-Emission Engine Standards



## Off-Road Equipment

- Tier V Standards
- Zero-Emission Standards Where Feasible



## Locomotives

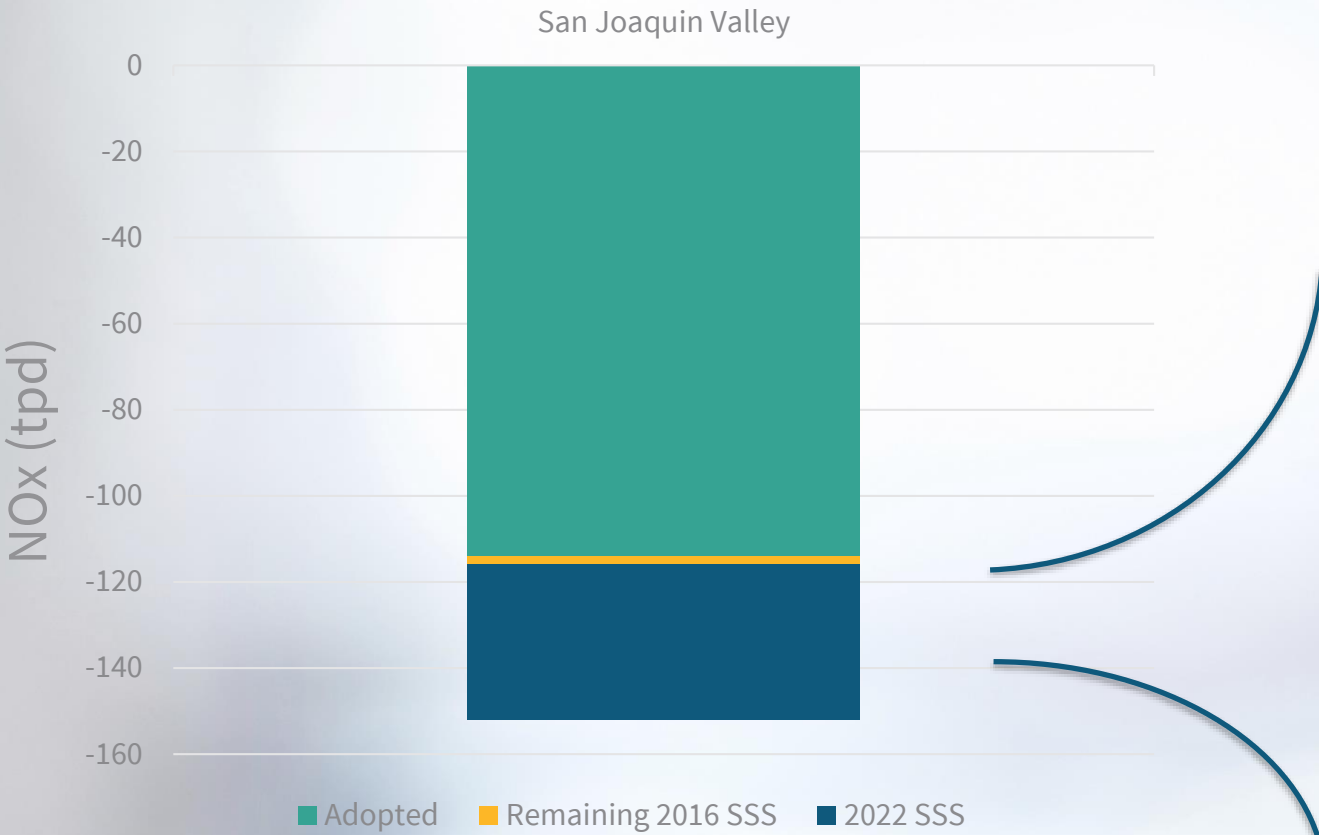
- More Stringent National Emission Standards
- Zero-Emissions Standards for Switcher
- Address Remanufacturing Loophole Ocean-Going Vessels



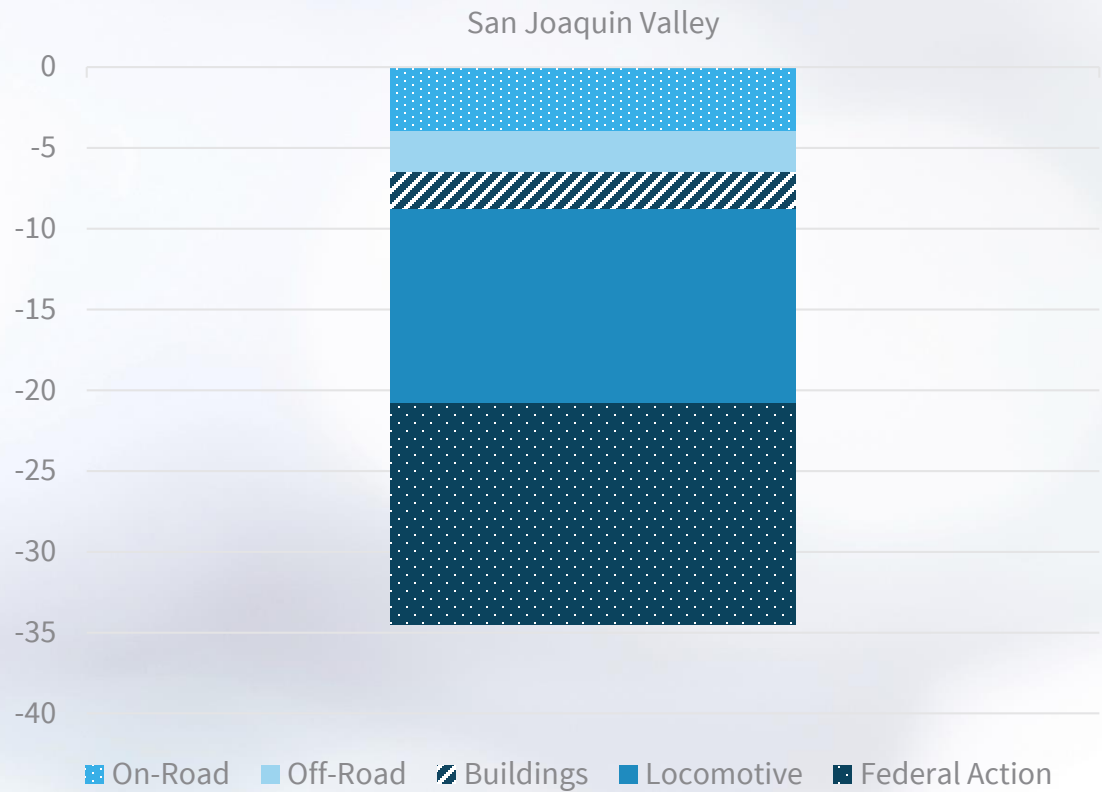
# 2022 SSS Emissions Reductions

Draft 2022 State SIP Strategy Measures for San Joaquin Valley in 2037	NOx	ROG
Advanced Clean Fleets	3.7	0.4
Zero-Emissions Trucks Measure	NYQ	NYQ
On-Road Motorcycle New Emissions Standards	0.3	0.6
Clean Miles Standard	<0.1	<0.1
Tier 5 Off-Road Vehicles and Equipment	1.2	NYQ
Amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation	1.0	<0.1
Transport Refrigeration Unit Regulation	NYQ	NYQ
Commercial Harbor Craft Amendments	<0.1	<0.1
Cargo Handling Equipment Amendments	<0.1	<0.1
Off-Road Zero-Emission Targeted Manufacturer Rule	NYQ	NYQ
Clean Off-Road Fleet Recognition Program	NYQ	NYQ
Spark-Ignition Marine Engine Standards	0.3	0.7
Consumer Products Standards	NYQ	NYQ
Zero-Emission Standard for Space and Water Heaters	2.3	0.2
Enhanced Regional Emission Analysis in SIPs	NYQ	NYQ
In-Use Locomotive Regulation	12.0	0.4
Federal On-Road Heavy-Duty Vehicle Low-NOx Engine Standard	11.7	<0.1
Federal Off-Road Equipment Tier 5 Standard for Preempted Engines	2.0	NYQ
<b>Aggregate Emissions Reductions</b>	<b>34.5</b>	<b>2.3</b>

# CARB NOx Strategy Benefits



**Total NOx Reductions in 2037**



**2022 SSS Reductions in 2037**

# Status of Public Measure Suggestions

On-Road Heavy-Duty Vehicle Useful Life Strategy\*



Additional Incentive Programs Zero-Emission Trucks



Enhanced Transportation Choices

Indirect Source Rule - Suggested Control Measure or Regulation

BACT/BARCT Determination

Additional Building and Appliance Emission Standards\*



Pesticides Regulation

Enhanced Bureau of Automotive Repair Consumer Assistance Program

# Next Steps



# Contact Us!

- Austin Hicks, Air Pollution Specialist  
[Austin.Hicks@arb.ca.gov](mailto:Austin.Hicks@arb.ca.gov)
- Ariel Fideldy, Manager  
[Ariel.Fideldy@arb.ca.gov](mailto:Ariel.Fideldy@arb.ca.gov)
- General SIP Questions: [SIPplanning@arb.ca.gov](mailto:SIPplanning@arb.ca.gov)

<https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy>



Thank you!

**Questions\Comments?**

# Ozone SIP Modeling In The San Joaquin Valley: 70 ppb 8-hr Ozone Standard

Chenxia Cai

Air Quality Planning & Science Division

California Air Resources Board

San Joaquin Valley Ozone SIP workshop 03/07/2022

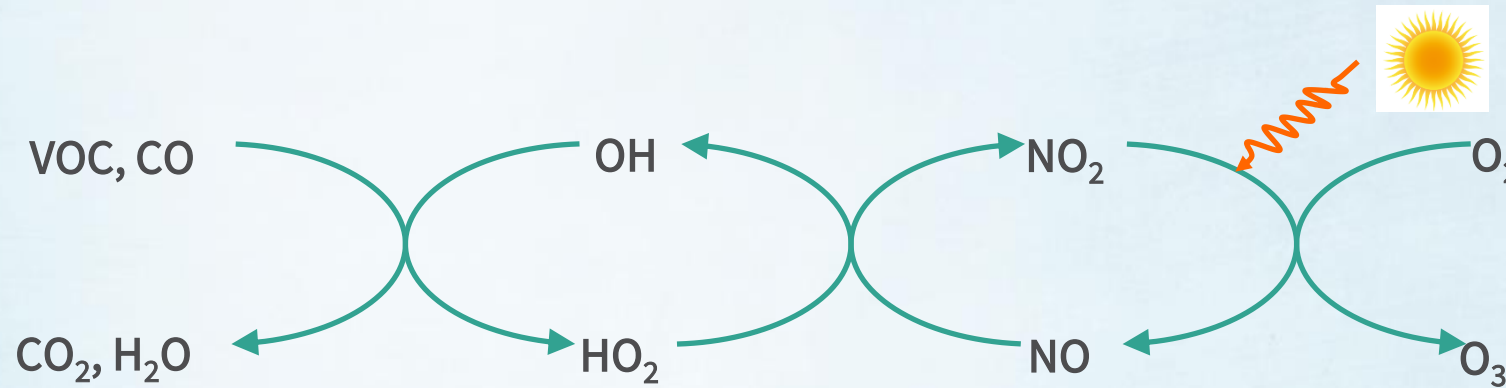
# Outline

- Ozone chemistry
- Weekend/weekday effect
- Emission and ozone trends in SJV
- Use of model for attainment demonstration
- SJV ozone SIP modeling configuration
- Next steps

# Ozone Chemistry:

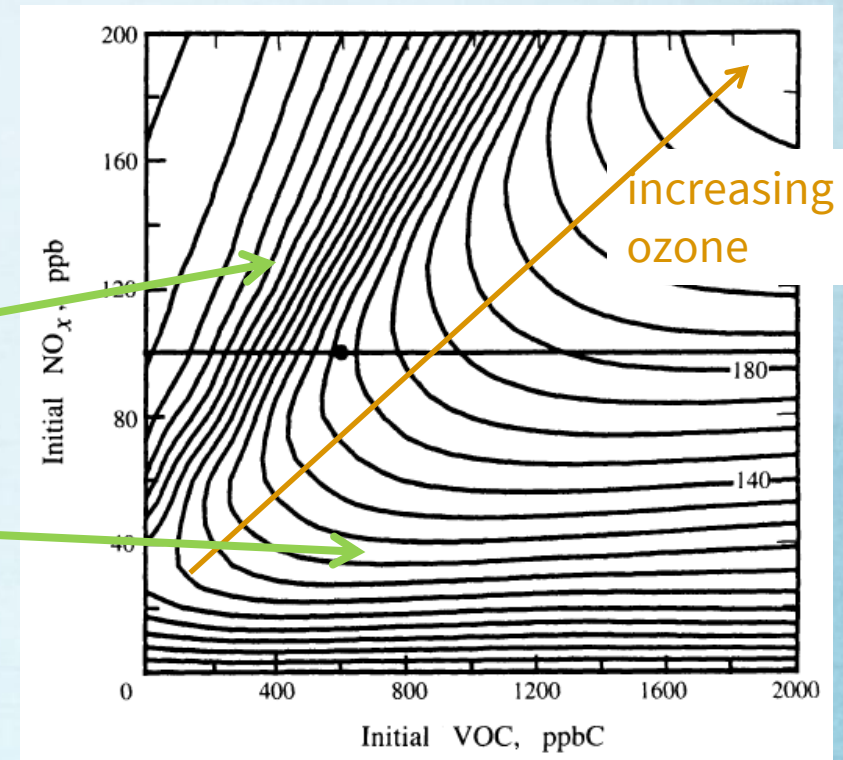
**NO<sub>x</sub> + VOC + sunlight**

**→ O<sub>3</sub>**



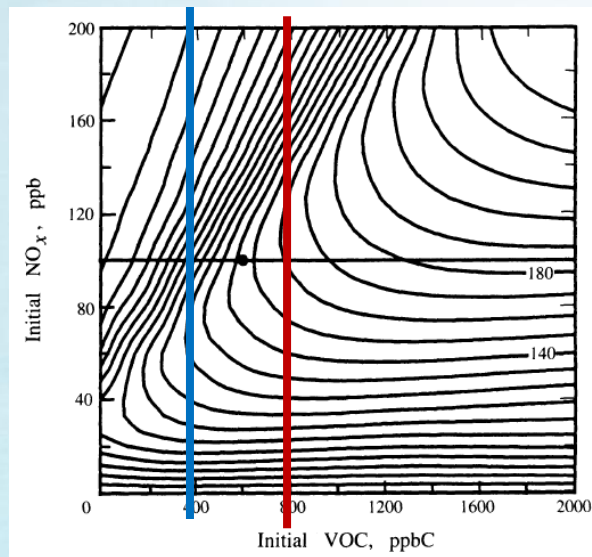
- Complex chemical interactions make ozone chemistry highly non-linear
  - VOC (radical)-limited
  - NO<sub>x</sub>-limited
- Can't use past changes in ozone to predict future changes

NO<sub>x</sub>-disbenefit

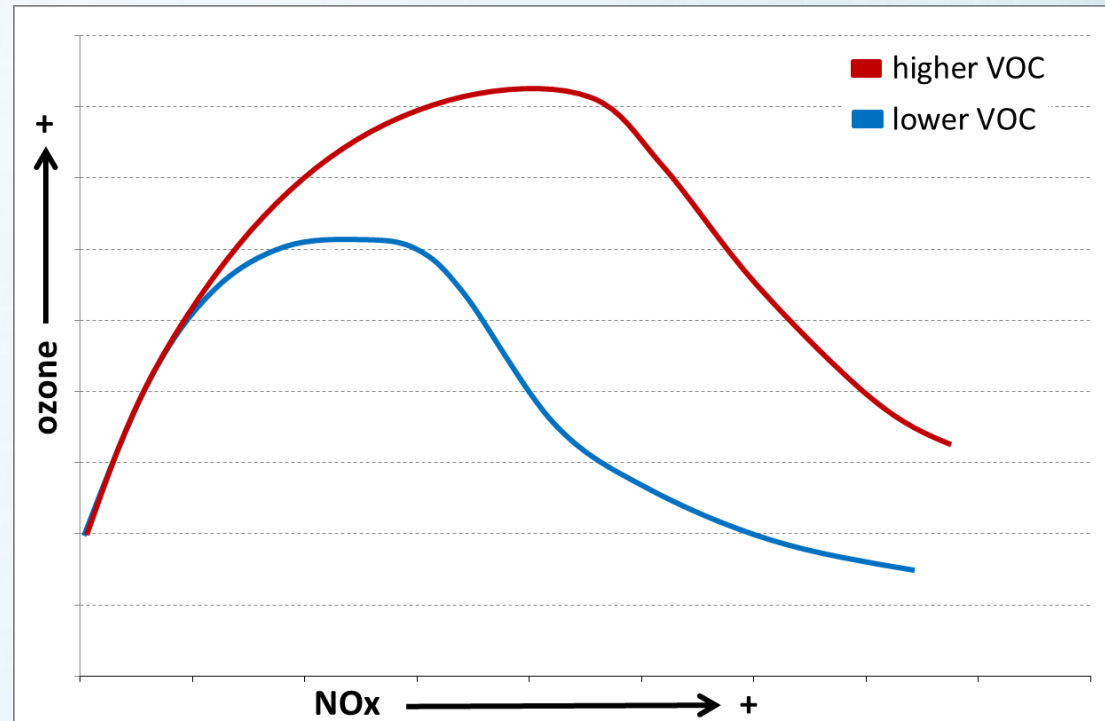


# Weekend/Weekday Effect

- Every weekend we see a large reduction in  $\text{NO}_x$  emissions (fewer diesel trucks on the road) with little change in VOC emissions
- Change in ozone from weekday to weekend indicates the general responsiveness of ozone to  $\text{NO}_x$  emission controls



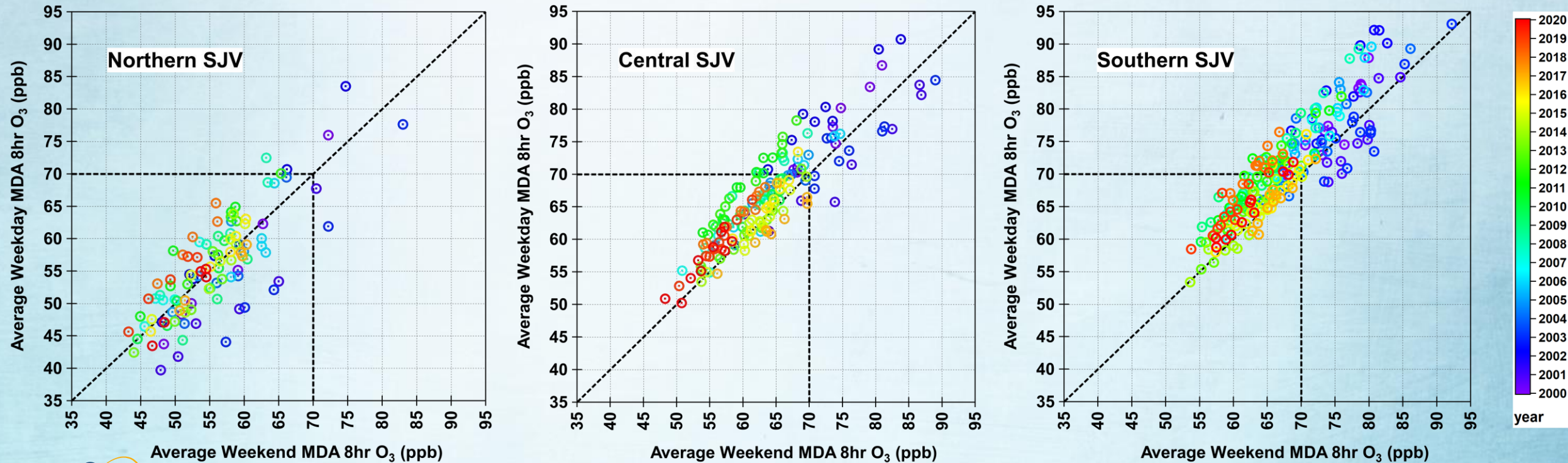
Seinfeld & Pandis



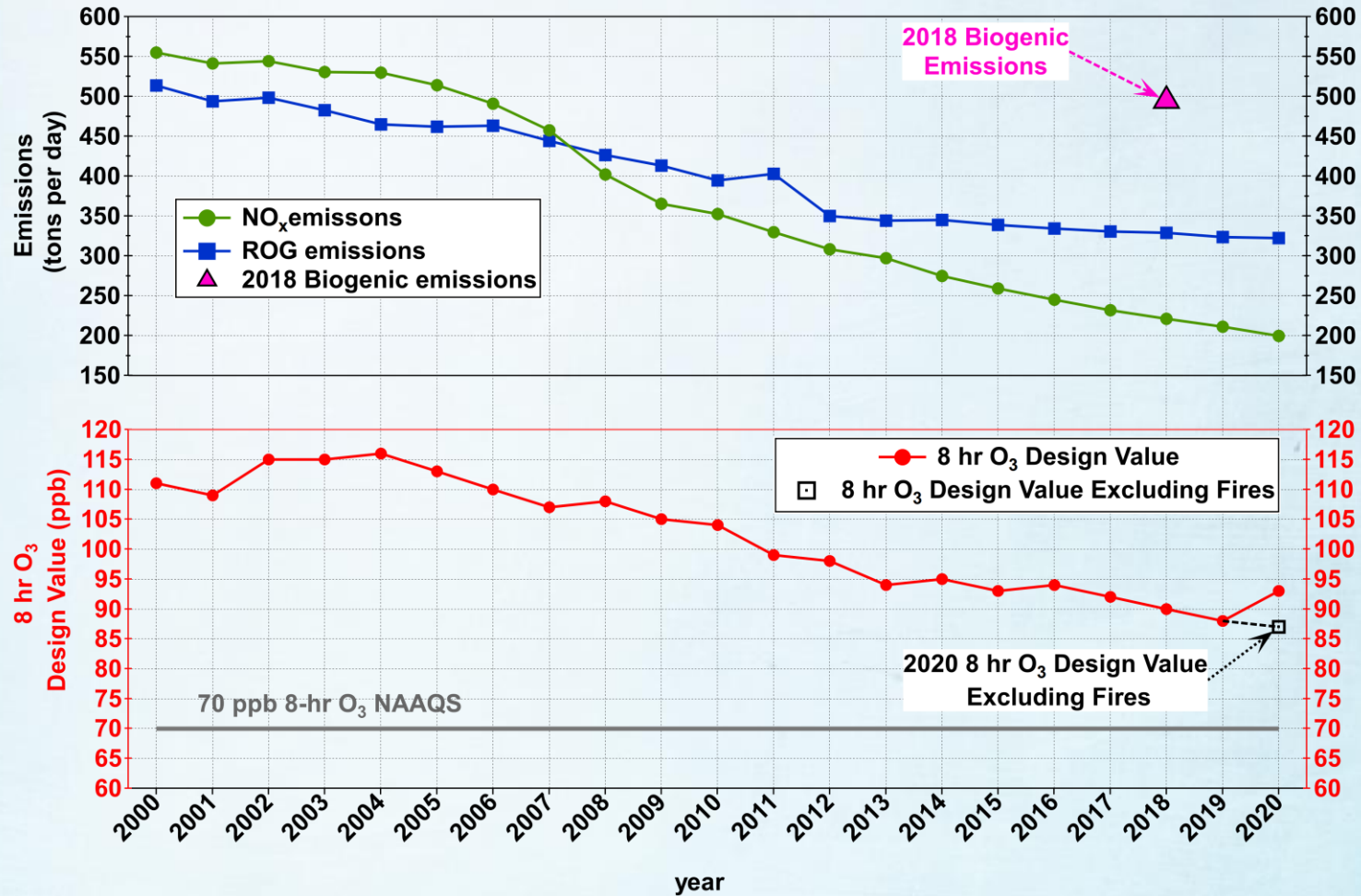


# Weekend/Weekend Effect Over Time

- Early 2000s: many sites in the valley exhibit a NO<sub>x</sub>-disbenefit
- Southern and Central regions transited to NO<sub>x</sub> limited first followed by the North.
- In recent years, all the regions are generally NO<sub>x</sub> limited with some variability from year to year due to meteorology and biogenic emissions



# Long Term Emission and Ozone Trends in SJV



# Model Attainment Demonstration

Observation and model based relative response approach:

DVB: Baseline O<sub>3</sub> design value (observation-based)

$$\text{RRF} = \frac{\text{Future average daily max. 8hr O}_3}{\text{Base average daily max. 8hr O}_3} \quad (\text{model-based})$$

RRF: Relative Response Factor (model based)

For a given monitoring site

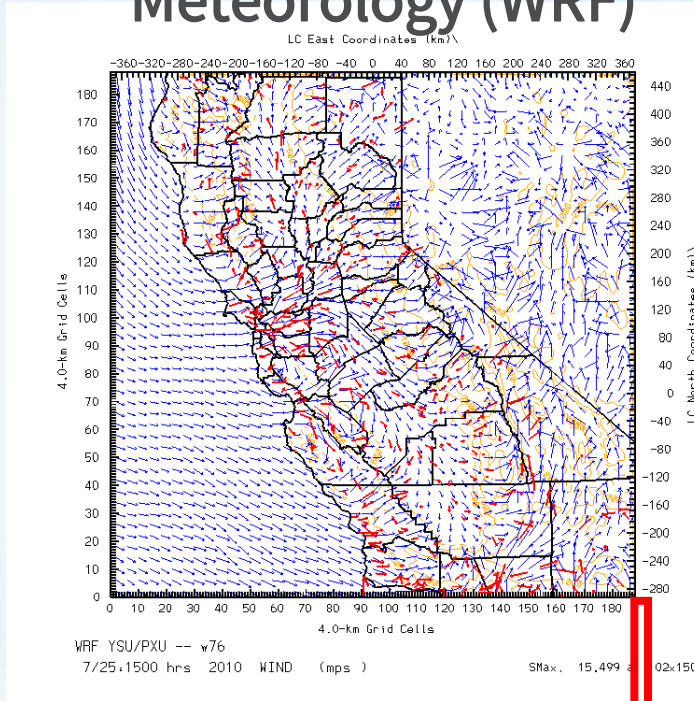
$$\text{DVF} = \text{RRF} * \text{DVB}$$

DVF=Future O<sub>3</sub> design value

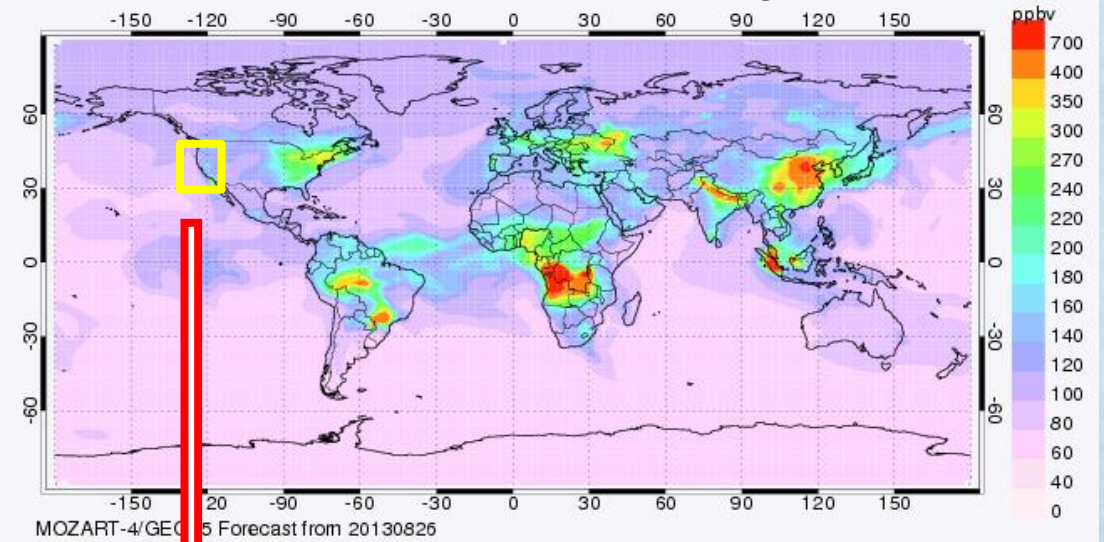


# SIP Modeling Platform:

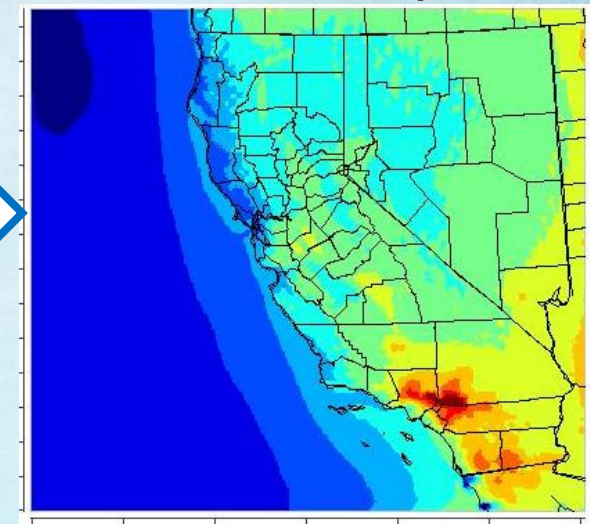
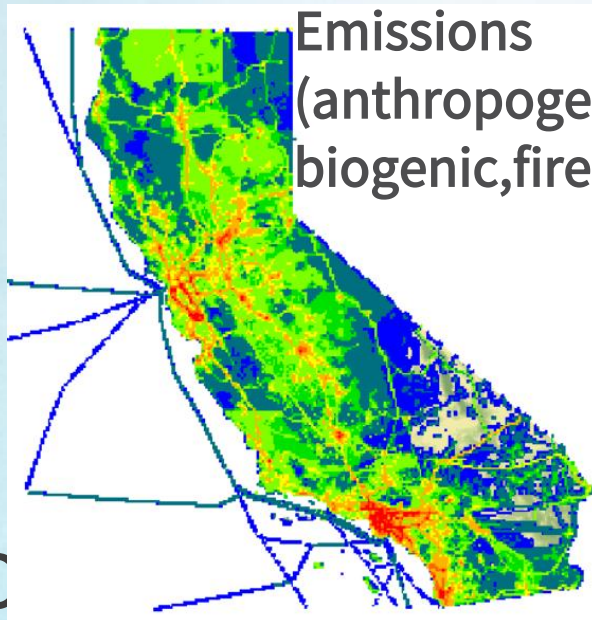
## Meteorology (WRF)



## CAM-Chem Global Chemistry Model



Chemical Boundary Conditions  
CMAQ Output: hourly concentrations of chemical species



# SJV O<sub>3</sub> SIP Modeling Configuration

Base Year (2018): used to assess model performance

Reference year (2018): used to project future DV, same as base year simulation except no wildfire emissions

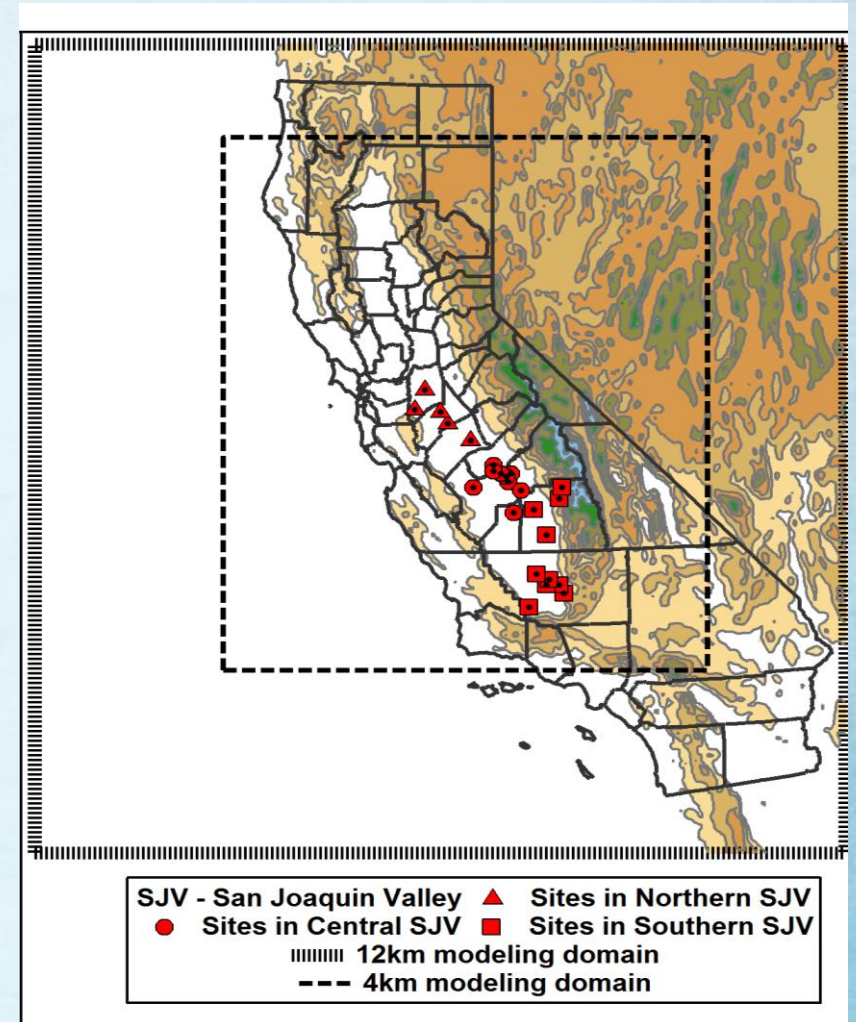
Future Year (2037): used to project future DV

Emission: 2019 CEPAM v1.03

2037 emission includes benefits from CARB and District rules and commitments:

**CARB: SORE rule, HD I/M, State SIP Strategy**

**District: recent rules (e.g. open burning, boilers, glass melting furnaces and internal combustion engines)**





# Next Steps

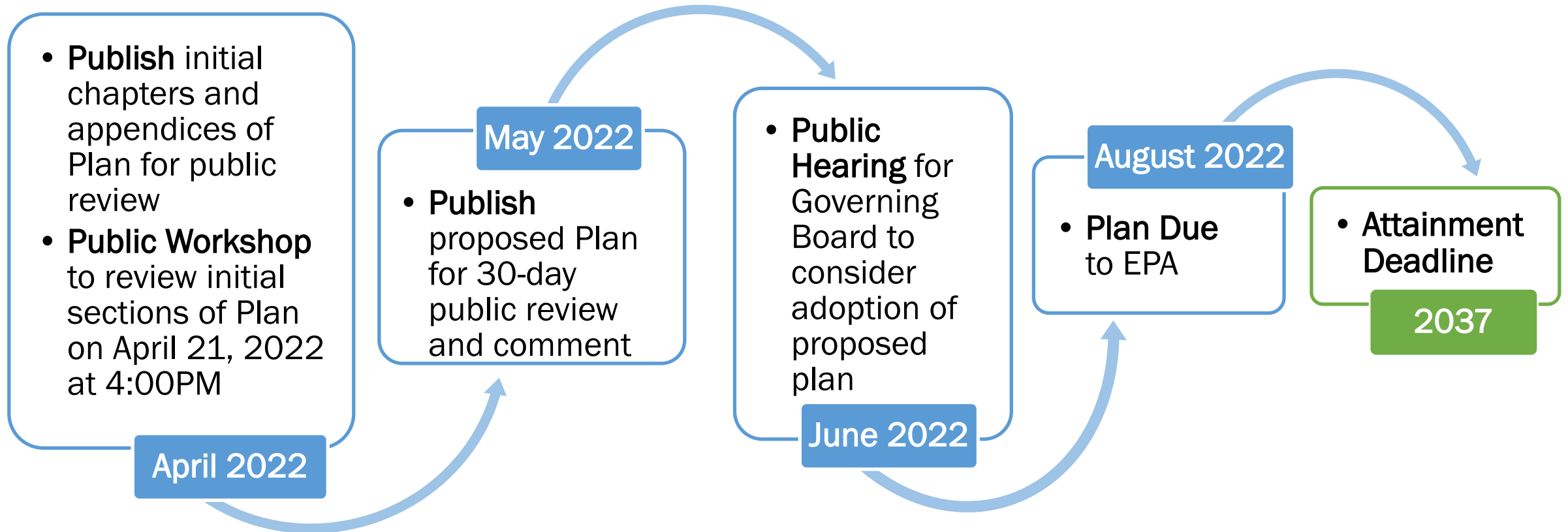
- Process emissions with updated SORE, HD I/M, District rules, and State commitments (March)
- Conduct modeling for 2018 and 2037 (April)

# Public Engagement Opportunities To-Date

Date	Meeting Topics
February 2020	Update to District Governing Board on upcoming planning efforts for attainment of the 2015 8-hour ozone NAAQS
February 2021	Update to District Governing Board to discuss next steps for attainment planning efforts for Federal PM2.5 and ozone standards
March 2021	Update to District's Citizens Advisory Committee to discuss next steps for attainment planning efforts for Federal PM2.5 and ozone standards
September 2021	Update to District Governing Board on attainment planning efforts for Federal PM2.5 and ozone standards
October 2021	Update to District's Citizens Advisory Committee on attainment planning efforts for Federal PM2.5 and ozone standards
April 2021	Public Workshop: General background of Plan requirements and development process
July 2021	Technical Working Group Public Meeting: Emissions inventory and modeling
October 2021	Technical Working Group Public Meeting: Stationary and Area source measures, RACM, State SIP Strategy
March 2022	Technical Working Group Public Meeting: Projected emissions inventory, modeling, and State SIP Strategy

*Public Participation and Comment Invited throughout Process*

# Next Steps for 2022 Ozone Plan



# Contact

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Visit <https://ww2.valleyair.org/about/sign-up/>  
to sign up for the District's Ozone Plans Listserv

# Comments/Questions

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