Data-Driven Ozone Control Strategies for the DM/NFR Nonattainment Area

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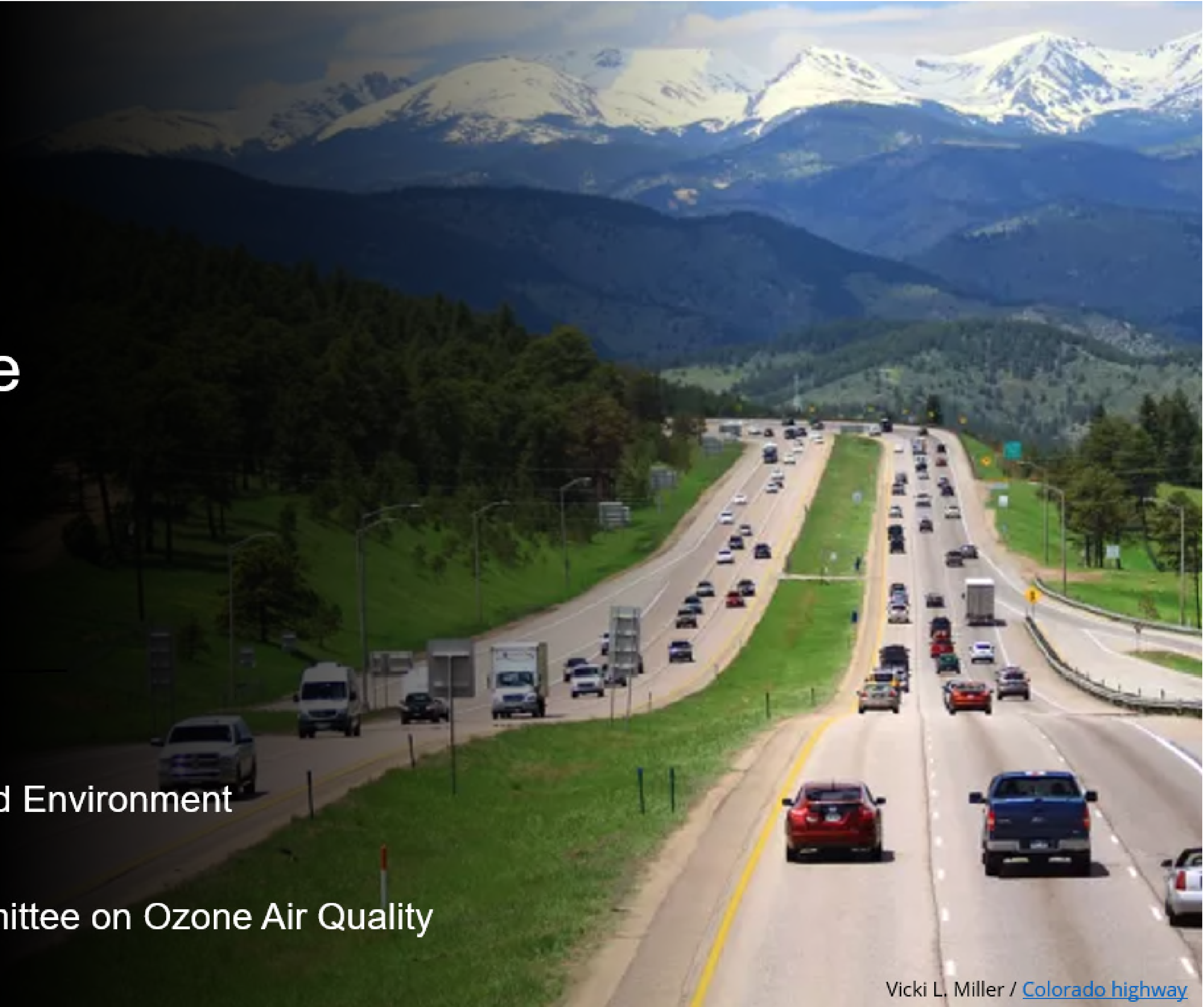
2023 Legislative Interim Committee on Ozone Air Quality



Vicki L. Miller / Colorado highway

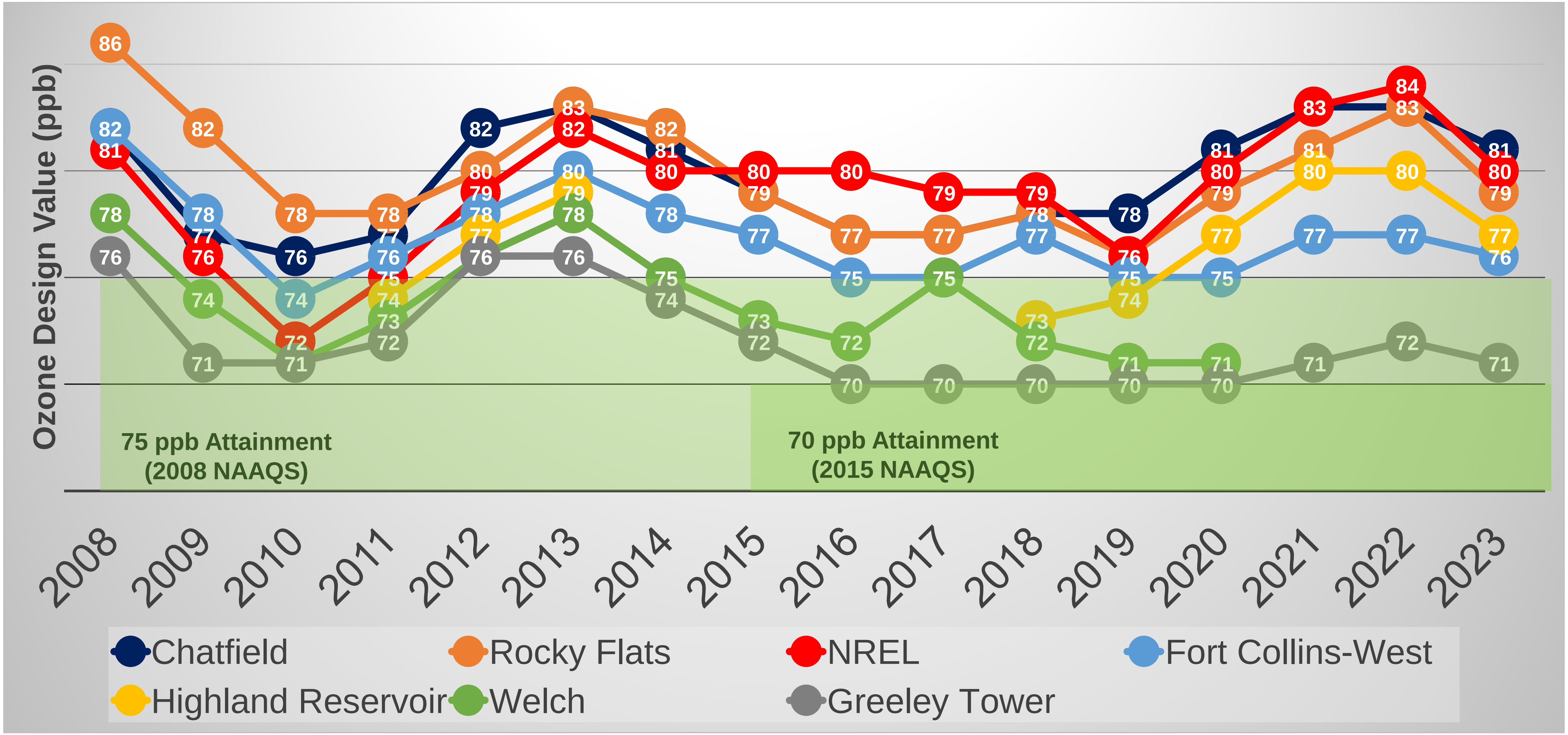
The purpose of this conversation is to **provide solutions that will actually reduce ozone pollution** and improve the health of our neighbors.

My goal today is to share recommendations for immediate ozone action that are cost-effective, incentivize behavior change, and benefit our disproportionately impacted communities.

Outline for conversation

- History of ozone in DM/NFR nonattainment area
- SIP model projections of ozone in 2026
- Insights from source apportionment modeling results on what sources we should target to reduce ozone
- Recommendations to improve SIP planning and control strategy evaluation
- Recommendations for reducing NOx emissions from light duty vehicles and lawn and garden equipment

Colorado ozone history shows that good progress was being made in reducing ozone from 2013 to 2016, however that progress seems to have stalled.



Data source: https://www.epa.gov/air-trends/design-value-interactive-tool

Looking towards the future, SIP modeling projections show monitors will be in attainment of 2008 NAAQS in 2026. However, four monitors remain in non-attainment of the 2015 NAAQS.

Site	County	Base Year Monitored Design Values	Modeled RRFs	2026 Projected Monitored Design Values
NREL	Jefferson	79.3	0.9415	74.6
CHAT	Douglas	77.3	0.9256	71.5
FTCW	Larimer	75.7	0.9451	71.5
RFNO	Jefferson	77.3	0.9206	71.1
HIGH	Arapahoe	73.0	0.9268	67.6
WELC	Jefferson	73.0	0.9249	67.5
WELD	Weld	70.0	0.9534	66.7
FTCO	Larimer	69.0	0.9506	65.5
CASA	Denver	68.7	0.9516	65.3
RMNP	Larimer	69.3	0.9404	65.1
CAMP	Denver	67.7	0.9528	64.5
ASNP	Jefferson	70.0	0.9207	64.4
AURE	Arapahoe	67.7	0.9476	64.1
WELB	Adams	67.0	0.9457	63.3

Ozone design values exceed 2008 standard (75 ppb)

Ozone design values exceed **2015 standard** (70 ppb)

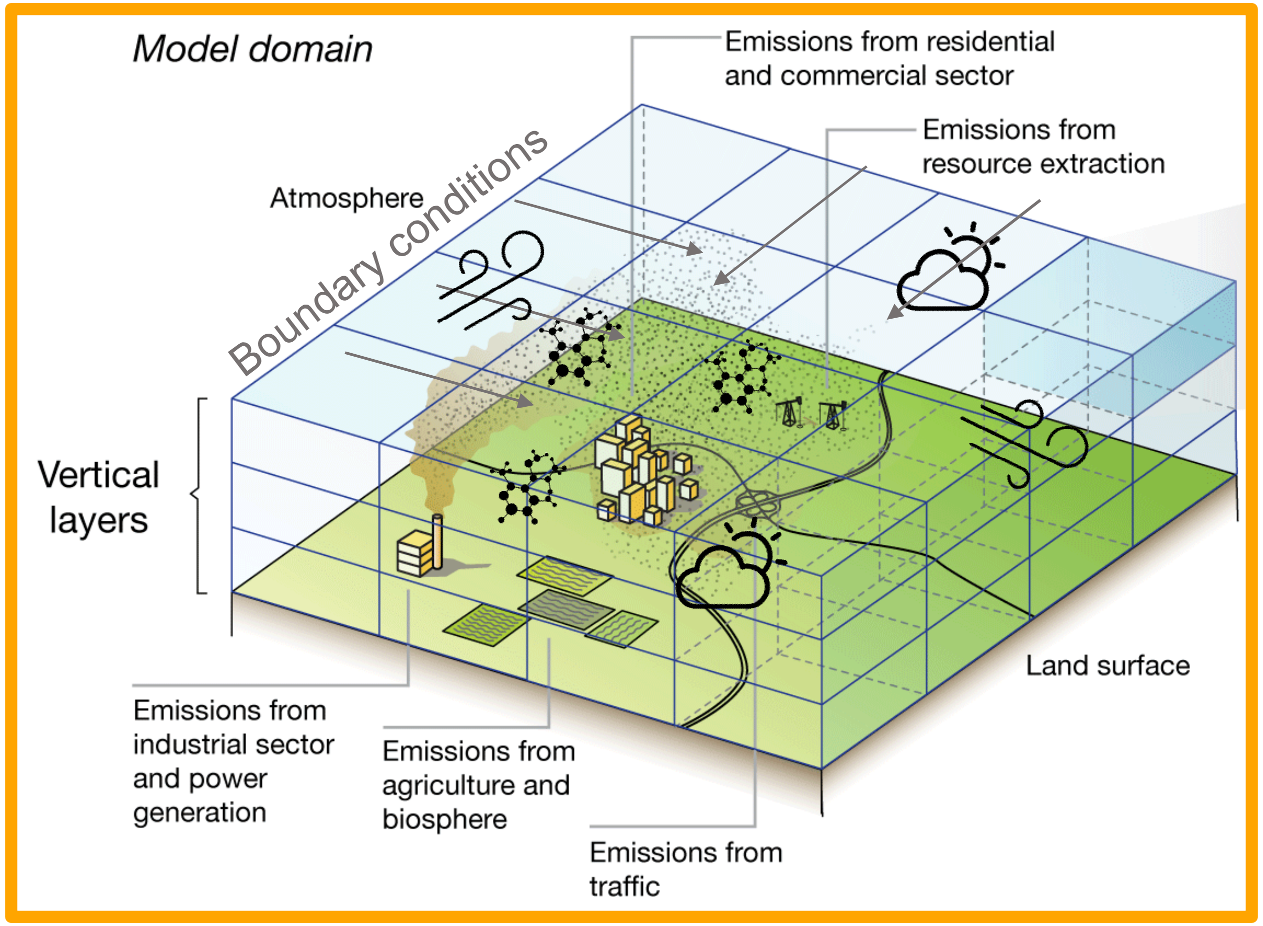
Source: SIP Chapter 5 draft, July 21, 2023. https://raqc.egnyte.com/dl/DdTYnOdvvd

To identify which emissions sources are contributing the most to ozone production at any monitor, we rely on **photochemical modeling studies**

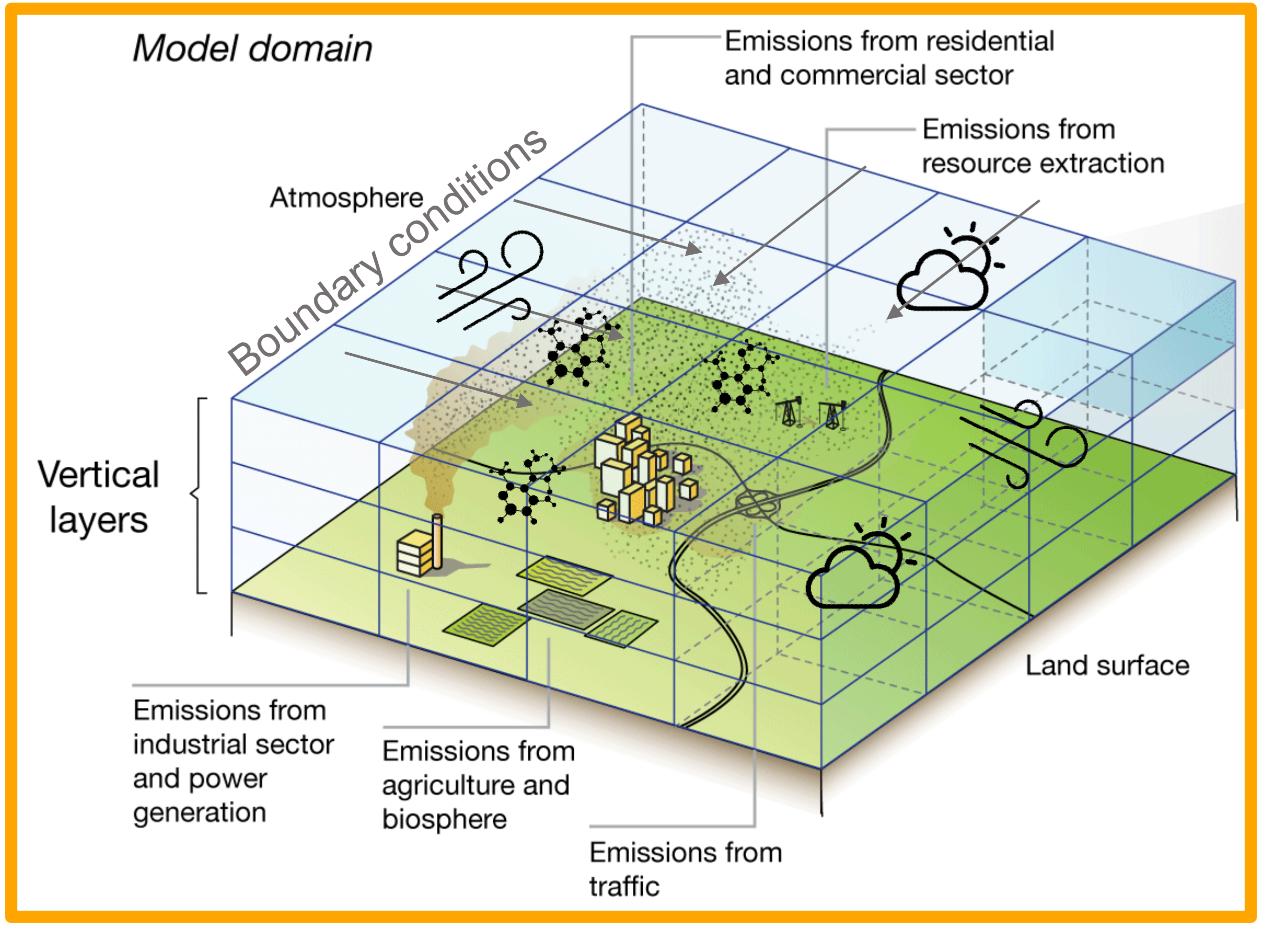
Ozone is created in the atmosphere via **chemical reactions.**

Photochemical models incorporate emissions, weather, and chemistry to simulate changes in ozone concentrations over time.

We use photochemical models to demonstrate attainment in the SIP!



1 Allocate consistent and sufficient funds for regular photochemical modeling studies and data analysis and use the results for air quality and SIP planning

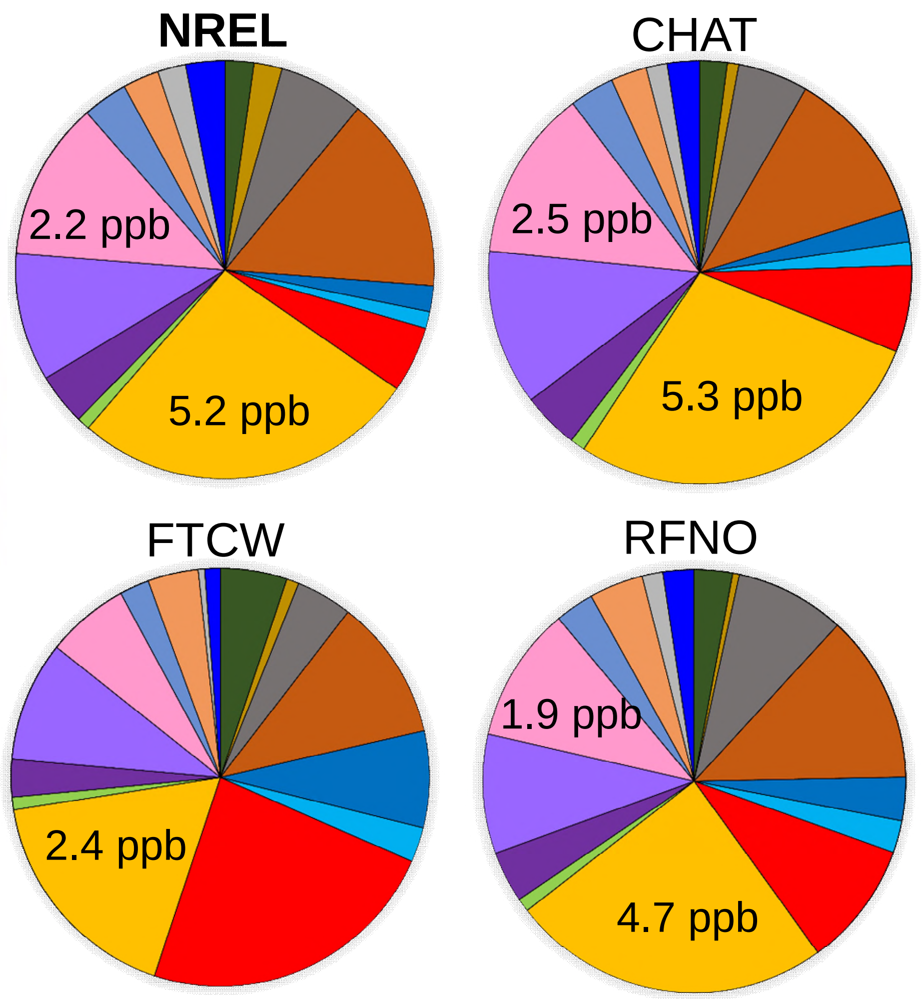


Photochemical modeling studies allow for source apportionment investigation. Last source apportionment was done in 2021.

Colorado *needs* up-to-date source apportionment modeling to prepare future SIPs and develop effective control strategies

Source apportionment modeling conducted in 2021* shows that **all monitors have light-duty vehicles as a major source for ozone**. Within Denver Metro, lawn and garden equipment are major sources.

Site	County	2026 Projected Monitored Design Values
NREL	Jefferson	74.6
CHAT	Douglas	71.5
FTCW	Larimer	71.5
RFNO	Jefferson	71.1



Main emissions sources

- Non-EGU
- Point Source Oil and Gas
- Oil and Gas Area Sources
- Light Duty Motor Vehicles
- Construction
- Lawn and Garden Equipment

*Modeling was conducted in 2021 by Ramboll funded by RAQC projecting results into 2023

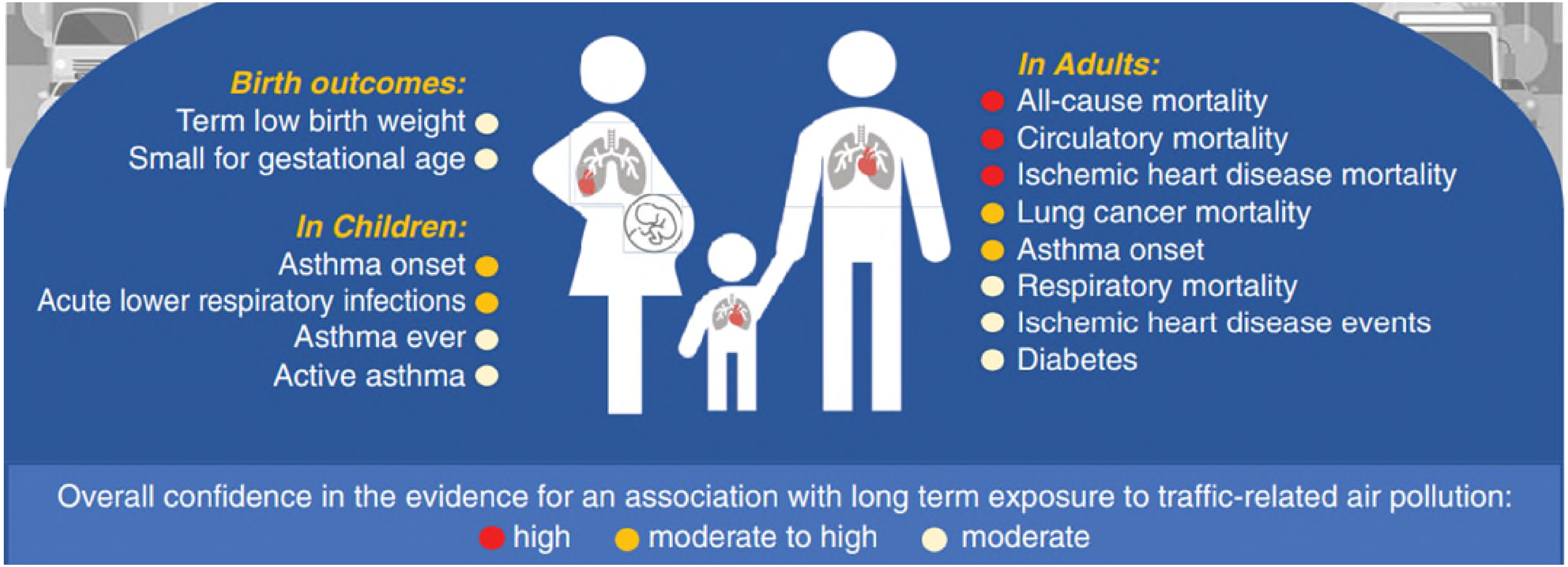
Data source: https://raqc.org/document/2021-modeling-forum-local-source-apportionment/

2 Allocate State funding for a program to find and fix high-emitting vehicles, reducing traffic pollution

High emitting vehicles make up a small percentage of our light-duty fleet, but these malfunctioning or poorly maintained vehicles can emit up to 100 times more than a well-maintained vehicle.

Average age of a car is ~12 years – as cars age, emissions control systems and on-board devices deteriorate, and their emissions can increase significantly!

Studies have shown the negative health impacts of long-term exposure to traffic-related air pollution. **Lower-income neighborhoods are often closer to congested roads** due to persistent inequities and unfair housing/infrastructure decisions.



https://www.healtheffects.org/system/files/hei-special-report-23-executive-summary_1.pdf

The San Joaquin Valley of central California is a fertile agricultural region surrounded by mountains. Like the DM/NFR, their geography can worsen air quality.

Their "Tune In & Tune Up" program **efficiently converts program funds unto quantifiable emissions reductions** – for ~$8,000 in cost, they see 1 ton in emission reductions

Since 2005, **70,000 low-income disadvantaged community residents** have participated, resulting in **repairs to 30,000 high-emitting vehicles**

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

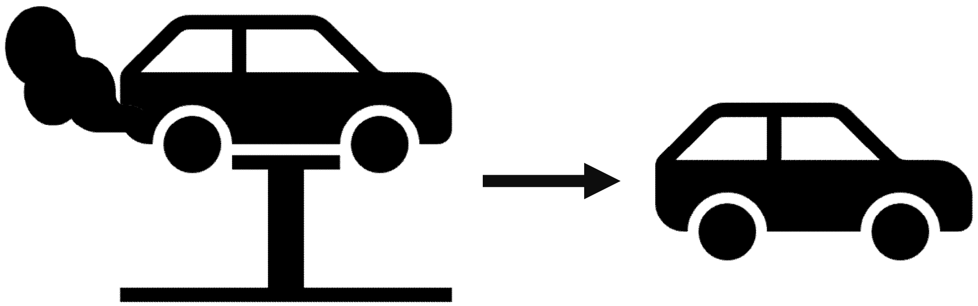
https://valleycan.org/home/titu-about/

We currently have the Vehicle Exchange Colorado program to recycle and replace high-emitting vehicles with EVs. However, the allocated funds will **result in ~300 rebates available at the max of $6,000**

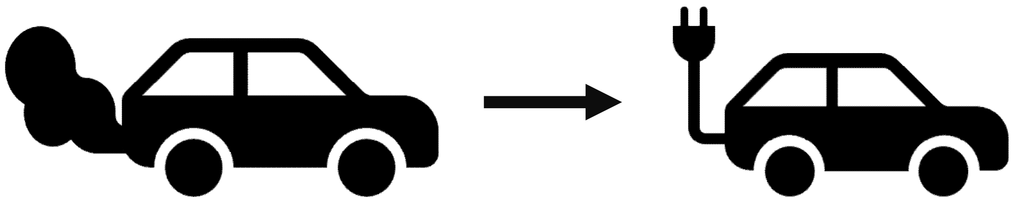
A program in Colorado to fix high-emitting gas-powered vehicles at low or no cost would supercharge the emissions reduction benefits. Based on the San Joaquin Valley program, **$1 million in spending produces 1,150 repairs**!

The VXC program in conjunction with a Find & Fix Colorado program could lead to **REAL benefits by next ozone season and improve air quality in DI communities**

“Find & Fix” Program



VXC Program



The next three years are key for our attainment status.
Our current 2008 NAAQS Severe Non-Attainment could be downgraded to Extreme if we don’t act now.

3 Incentivize municipalities and local governments to convert their fleets to cleaner vehicles

Grant applications take a significant amount of effort, time, and paperwork – *is it worth applying if grants only provide for 10% of incremental cost?*

Funds from State enterprise and/or Dept. of Local Affairs should be invested to **subsidize 50-80% of vehicle costs** for public fleets to pursue low-NOx options

4 Create convenient incentives to transition away from gas-powered lawn and garden equipment, focus on commercial entities

1 hour of gas-powered leaf blower use

<u>Driving 1100 miles</u> from LA to Denver

https://www.mowdownpollution.org/

Transitioning away from gas-powered L&G equipment will **reduce NOx and ozone and co-pollutants like PM2.5, CO, and benzene.**

https://pirg.org/colorado/foundation/resources/small-machines-big-pollution/

Direct benefit to equipment users/operators and communities where electric equipment is used.

Executive order: Electrification of equipment used by the State

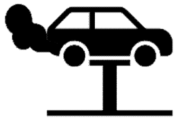
SB23-016: 30% discount at point of purchase via retailer tax credit

RAQC: Public program, needs funding to keep up with demand

AQCC Regulation 29: use restrictions and potential sales ban

Summary of key points

- Sufficient and consistent funding for **regular photochemical modeling** is needed for effective air quality planning
- In DM/NFR NAA, **reductions in NOx emissions** from major contributors to ozone will be **most effective to reduce ozone**
- Control measures need to be **strategic, cost-effective, and realize benefits quickly** to reduce ozone and improve air quality


A program to repair and replace high-emitting vehicles can be cost-effective and benefit disproportionately impacted communities


Local governments must be incentivized to convert their fleets to cleaner vehicles sooner


Coordinated efforts are needed to effectively transition away from gas-powered lawn and garden equipment

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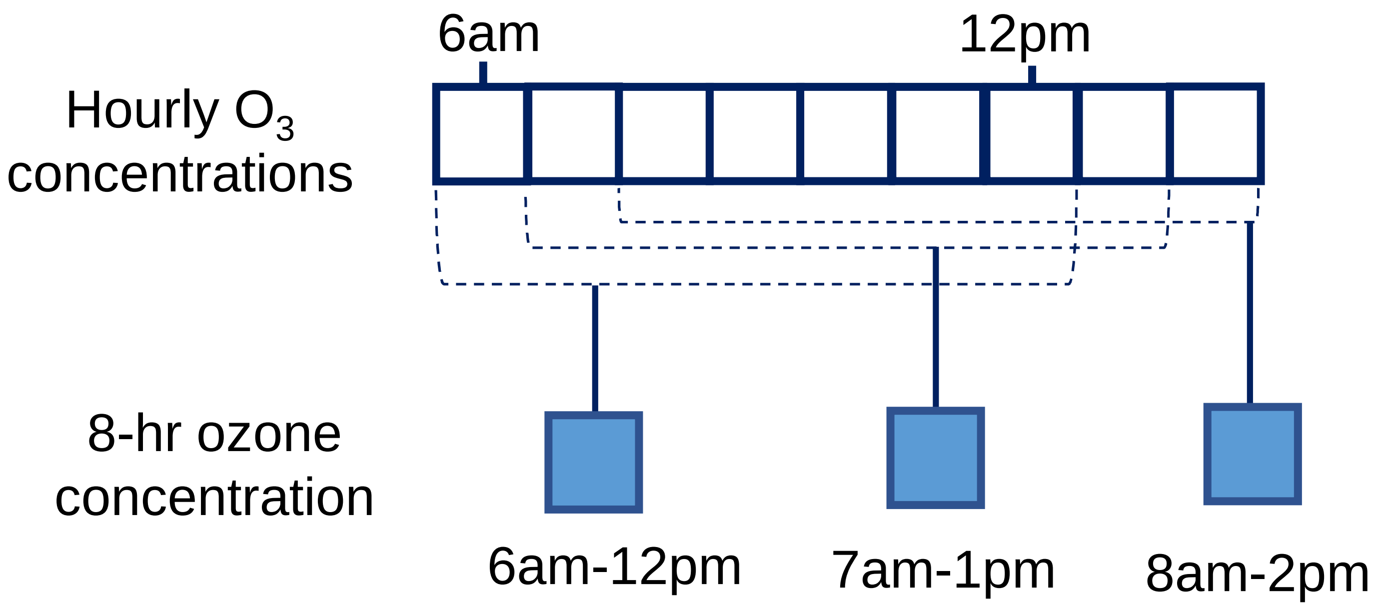
Supplemental slides

Steps for calculating an ozone design value (1/4)

Standard is based on the *annual fourth-highest daily maximum* ***8-hour concentration****,* *averaged over 3 years*

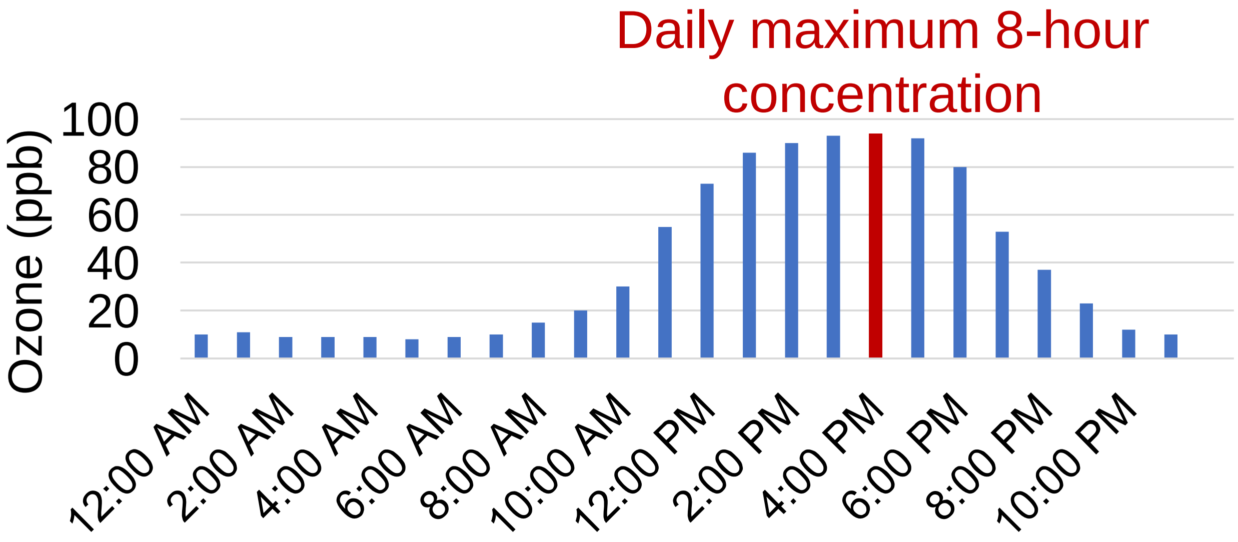
Step 1: Calculate 8-hr running averages of hourly O_3 at a monitor



Steps for calculating an ozone design value (2/4)

Standard is based on the *annual fourth-highest **daily maximum** 8-hour concentration, averaged over 3 years*

Step 2: For each day of the year, find the highest value of the 8-hour averages (24 total) at a monitor



Steps for calculating an ozone design value (3/4)

Standard is based on the ***annual fourth-highest*** *daily maximum 8-hour concentration, averaged over* ***3 years***

Step 3: Find the 4th highest daily maximum 8-hour concentration for each year at a monitor

	2 years ago	Last Year	Current Year
1st place	94	88	85
2nd place	92	87	78
3rd place	89	80	75
4th place	86	79	71

Steps for calculating an ozone design value (4/4)

Standard is based on the *annual fourth-highest daily maximum 8-hour concentration*, ***averaged over 3 years***

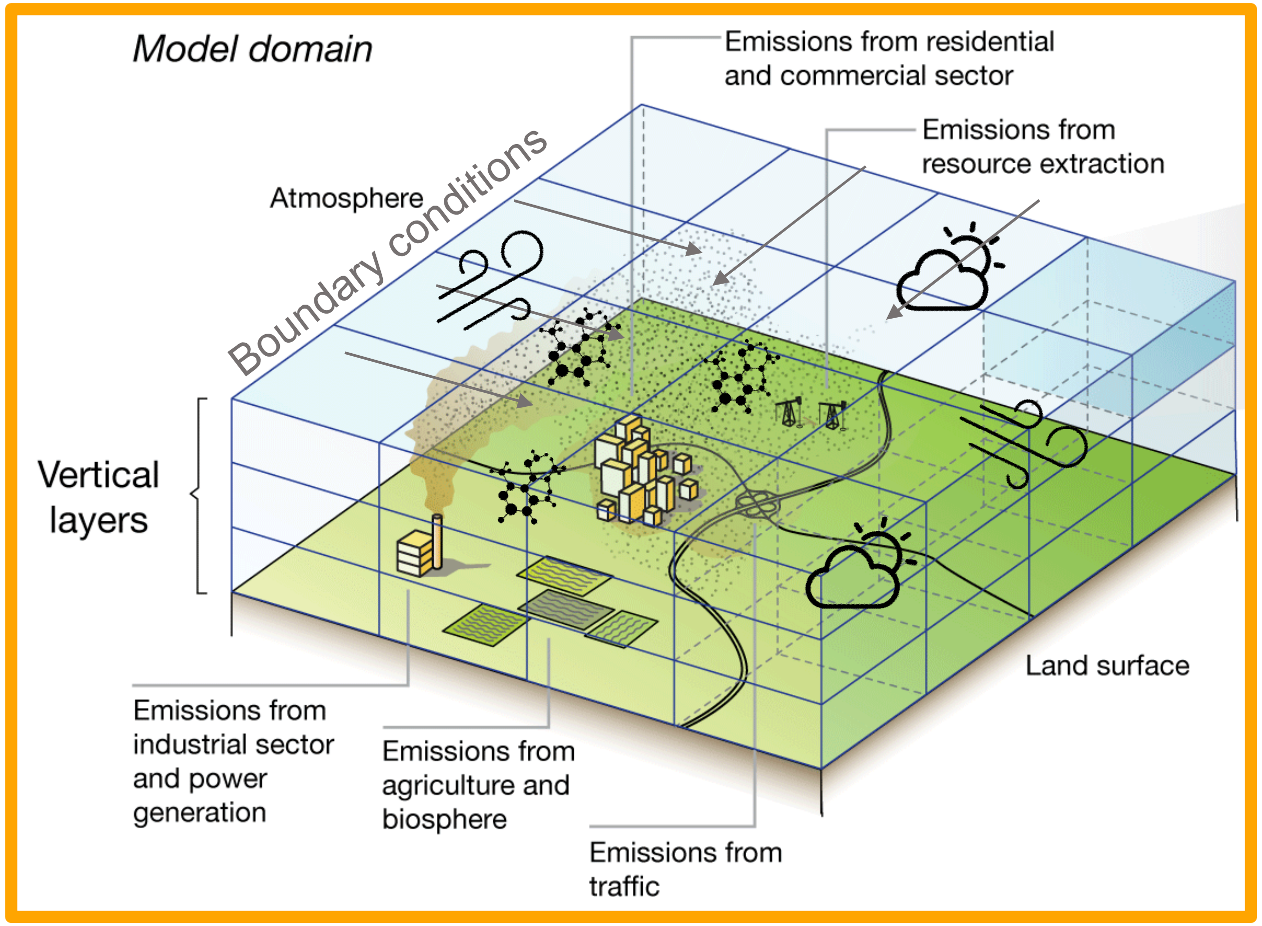
Step 4: Calculate the 3-year average of the 4th highest daily maximum 8-hour concentration at a monitor

	2 years ago		Last Year		Current Year	
4th place	86	+	79	+	71	/ 3 = **79 ppb**

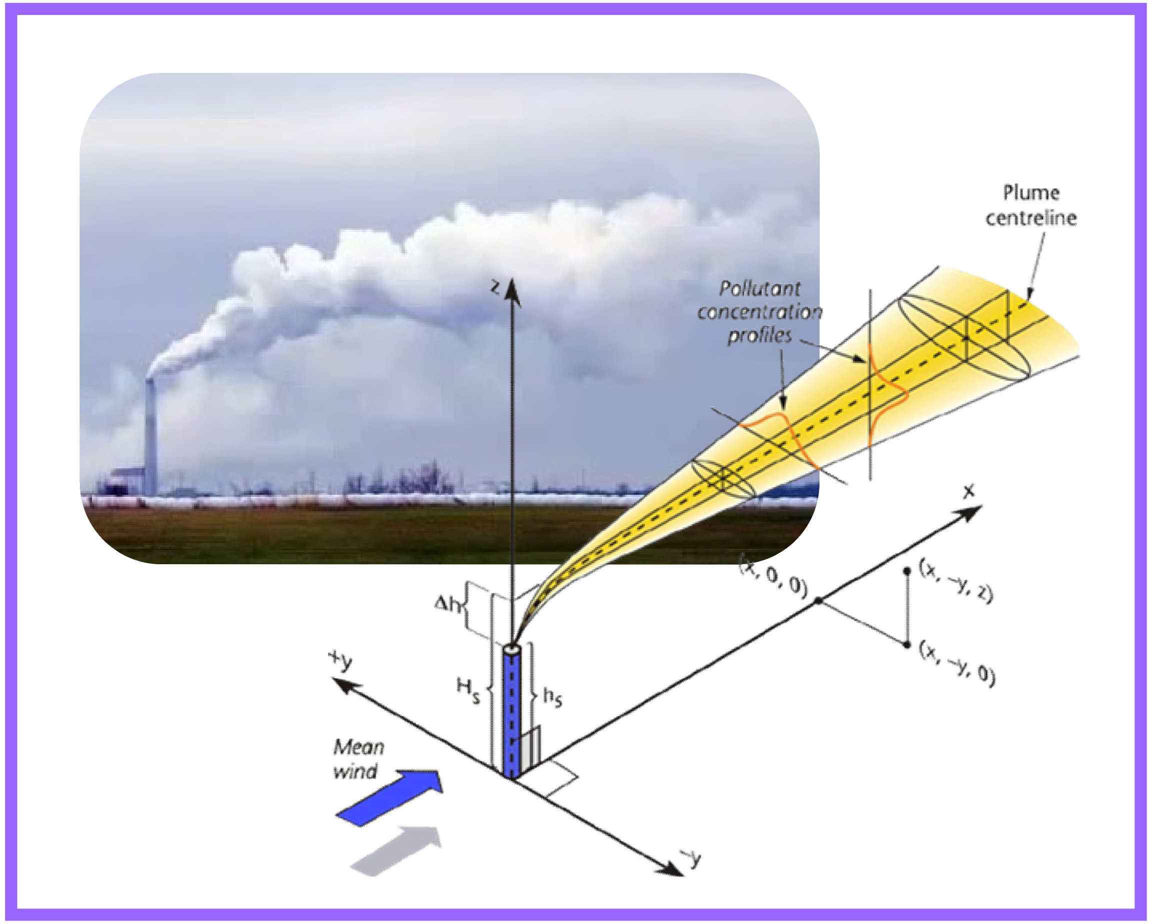
Design Value for Current Year

THIS is what EPA compares to the ozone NAAQS at each monitor to determine attainment

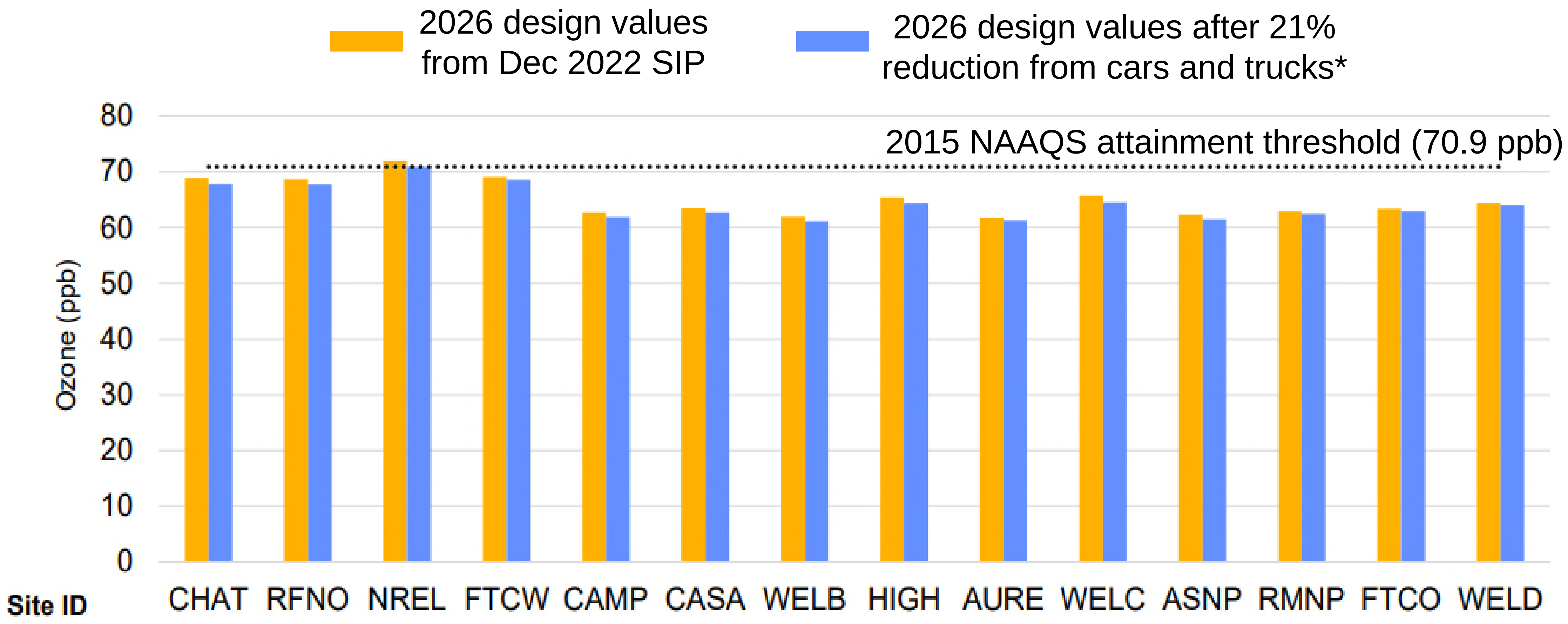
Photochemical modeling used in the SIP is **NOT** the same as dispersion modeling used in permits



Does not include chemical reactions!



A 21% reduction in the ozone contribution from cars and trucks is estimated to bring all monitors into 2015 NAAQS attainment



*21% reduction calculated based on 2021 source apportionment results
https://raqc.egnyte.com/dl/lJuxGvGWRQ/CAMx_APCA_Local-Source_Modeling-Forum_2021-04-14v3.pdf_

Steps for estimated ozone reductions from LDV contribution reductions

1. Look at DVF for NREL (72.0 ppb, the only monitor projected to exceed 70ppb in the model projections we used for this analysis)
2. Determine the ppb reduction needed to get into attainment (1.1 ppb to reach 70.9ppb) at NREL
3. Calculate what % that is of the LDV contribution at that monitor (5.2/1.1 = 21%). 5.2 is the LDV contribution at NREL from SA modeling
4. Apply that 21% reduction in LDV contribution to the LDV contribution at each monitor to determine the ppb reduction in ozone that 21% reduction would achieve
5. Calculate a new DVF by subtracting this ppb from the original DVF for the monitor
6. Plot the original DVF and the adjusted DVF (assuming LDV contributions are reduced 21% at each monitor)

The DVFs are from the Dec 2022 SIP model projections, and the LDV contributions are from the 2021 source apportionment modeling.

https://raqc.egnyte.com/dl/lJuxGvGWRQ/CAMx_APCA_Local-Source_Modeling-Forum_2021-04-14v3.pdf_