Photochemical Modeling Report

Presented to

AACOG Board of Directors Air Quality Committee

Presented by

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Project Purpose

- This project satisfies TCEQ Deliverable: Photochemical Modeling.
- Photochemical models are used to determine if a region meets federal air quality standards and the impact of control measures.
- The current model is the latest available for the San Antonio, Houston, Dallas, and Austin regions. The model is approved by TCEQ and is used in the current Houston and Dallas SIPs.
- The Photochemical Model is the only model used by EPA to predict future ozone levels and the effectiveness of control measures.
- EPA requires the photochemical models in State Implementation Plans (SIPs) for any region that has a moderate or higher non-attainment status.
- Results are based on the 2012 ozone season episode projected to 2017, 2023, 2026, and 2030.

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Photochemical Model Inputs

Emissions inventory

- Cars, trucks, nonroad equipment, point sources, offroad equipment, oil and gas development, airplanes and locomotives, biogenic sources, etc.
- Emissions data is provided by traffic counts, travel data, survey results, air monitors on stacks, production values, satellite data, observed emission rates, EPA and TCEQ, etc.

Meteorology

- Winds, temperature, humidity, clouds, precipitation, vertical mixing, water conditions, optical depth, cloud cover, pressure, etc.
- Meteorological data is provided by weather stations, wind profilers, satellites, etc.

Boundary and Land Use Conditions

- Land features and pollutant concentrations at the domain boundaries which reflect transport from outside the region modeled.
- Boundary and land use conditions are provided by satellites and aerial imagery.

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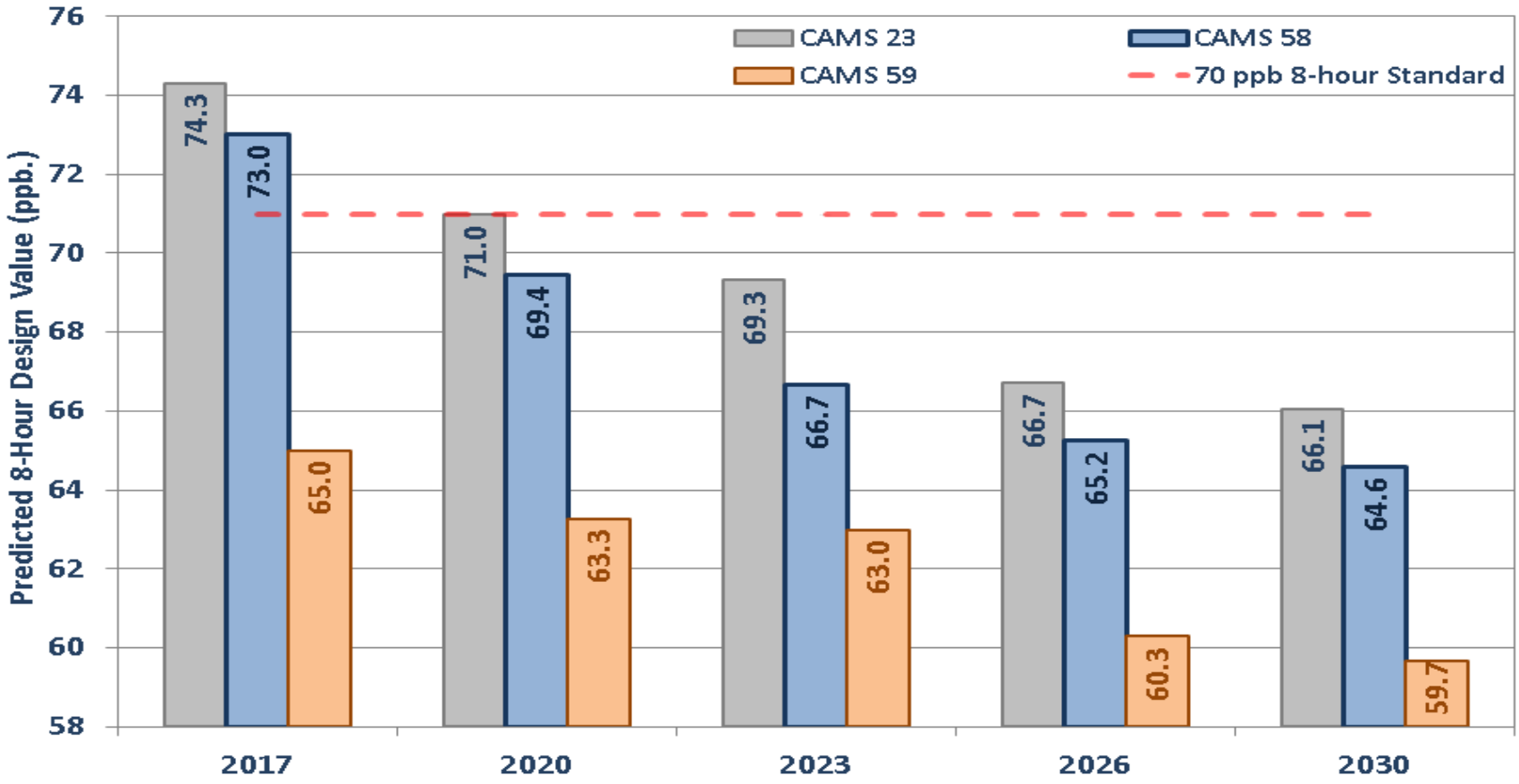
Future Design Value, 2017, 2020, 2023, 2026, and 2030



1. Improved NOx emission standards on cars and diesel trucks;
2. Improved NOx emission standards on non-road equipment; and
3. Reduction in Power Generation Emissions (NOx Control/Reduction).

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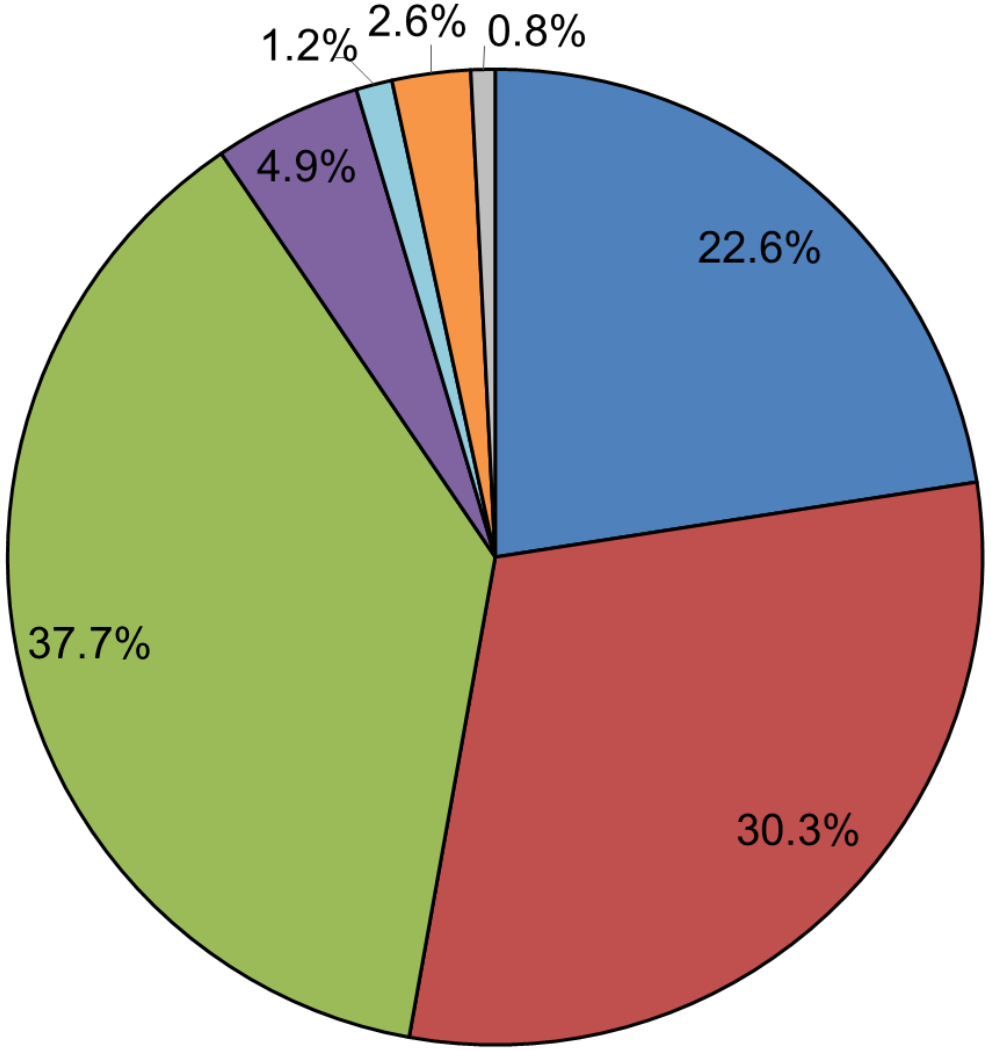
Source Region Contribution to Local Ozone (C58), Maximum 8-hour Ozone on Days > 60 ppb of Ozone, 2017



- San Antonio-New Braunfels MSA
- Other International
- Other States/ Mexico/Canada/ Offshore
- Other Texas Counties
- Austin
- Houston
- Dallas

- The results are similar to what is calculated in the local Conceptual Model using monitor data

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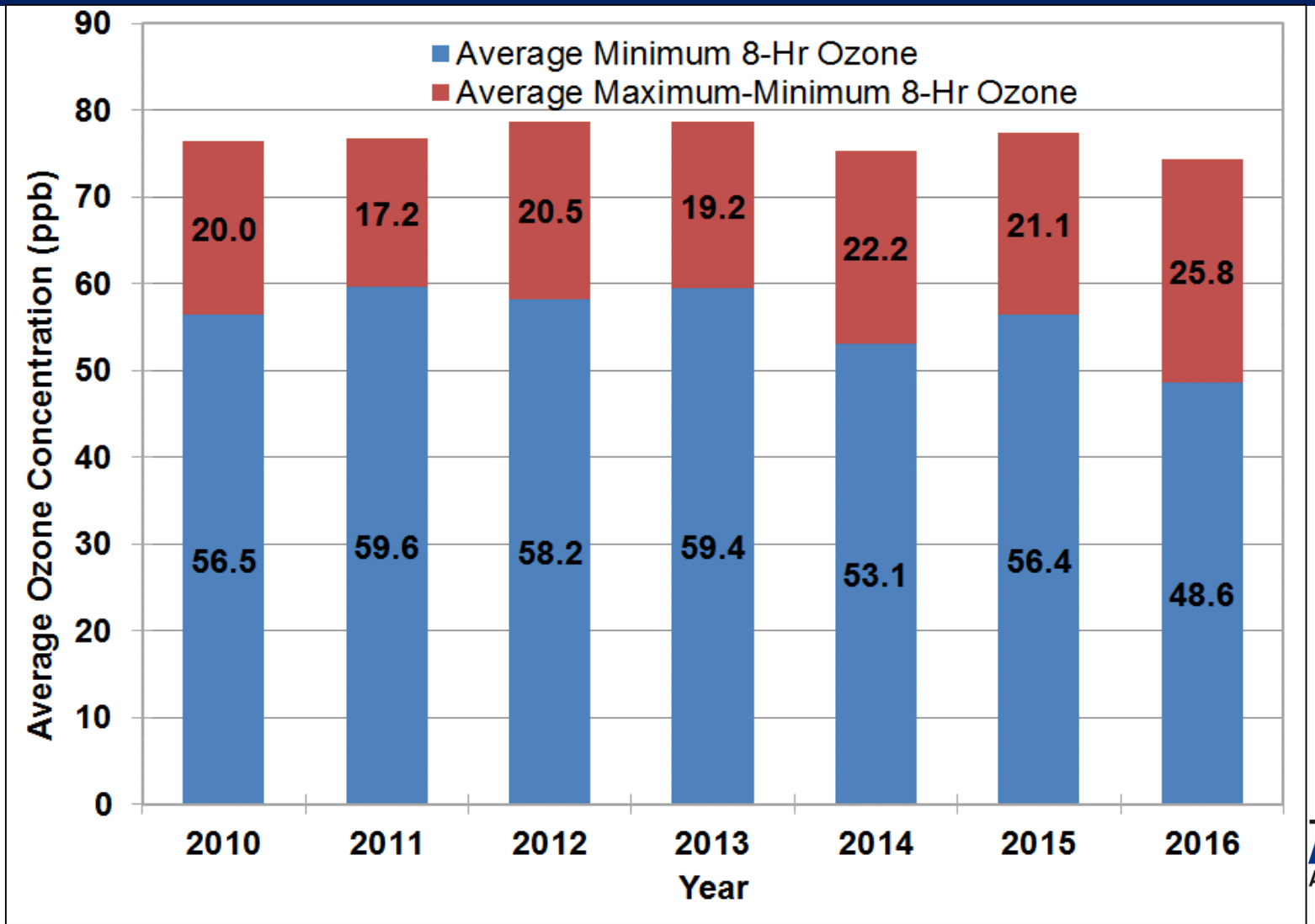
Yearly Averages of Daily Minimum and Maximum-Minimum Peak 8-Hr Ozone on Days > 70 ppb



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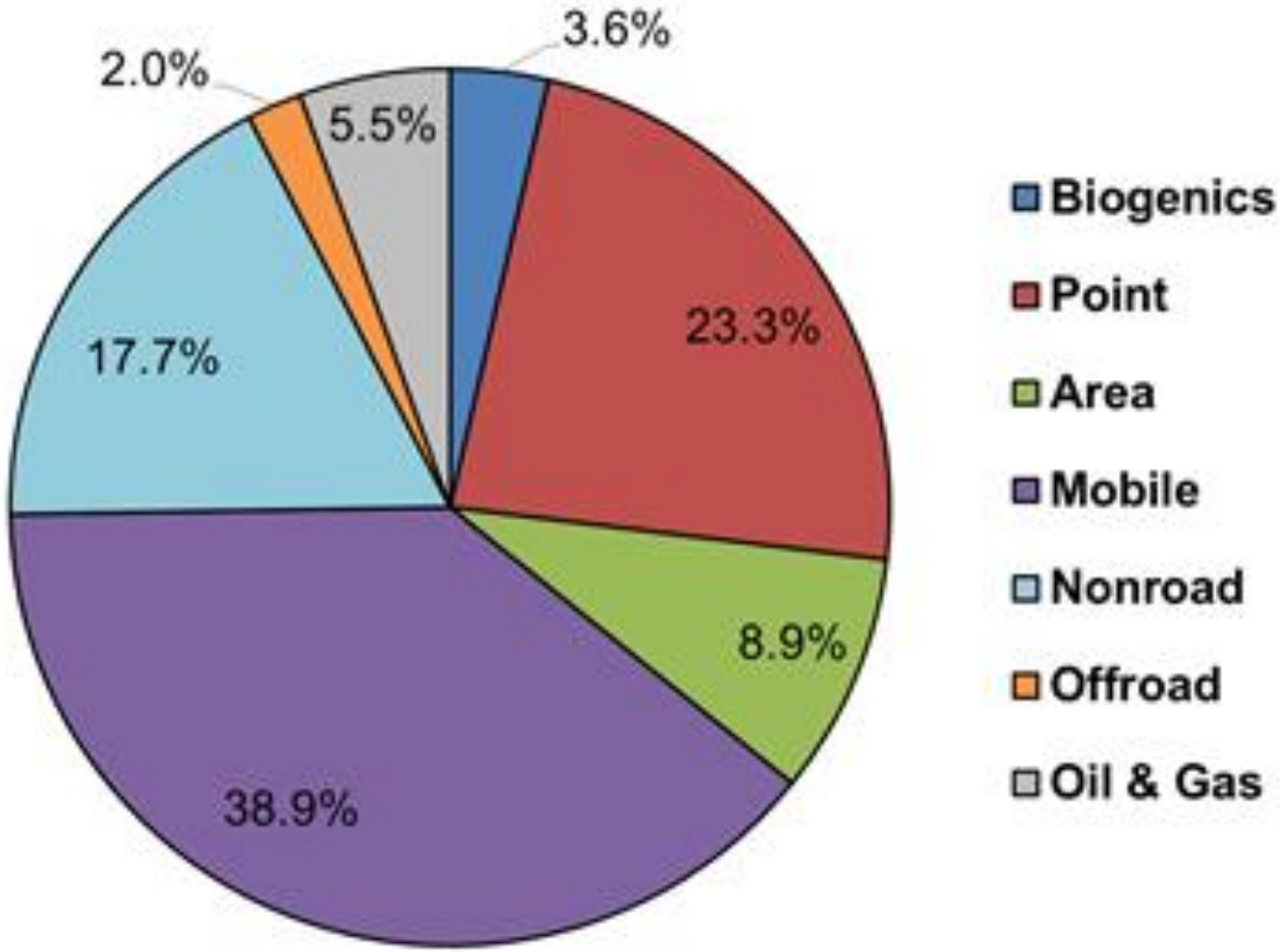
Local Emission Source Contribution to Ozone (C58), Maximum 8-hour Ozone on Days > 60 ppb of Ozone, 2017



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Control Strategy Runs

Run 1: Expending the current available TERP funding.

Run 2: Implementation of an additional 200 MW solar plant in Bexar County.

Run 3: Early retirement of a medium-sized coal power plant in the 8-county San Antonio-New Braunfels MSA.

Run 4: Additional control strategies, which include: expending the currently available TERP funding, implementation of an additional 200 MW solar plant in Bexar County, extending Save for Tomorrow Energy Plan (STEP 2) program from 2020 to 2023, converting all airport non-road equipment to tier 4 engines, and retirement of a coal power electric generation unit.

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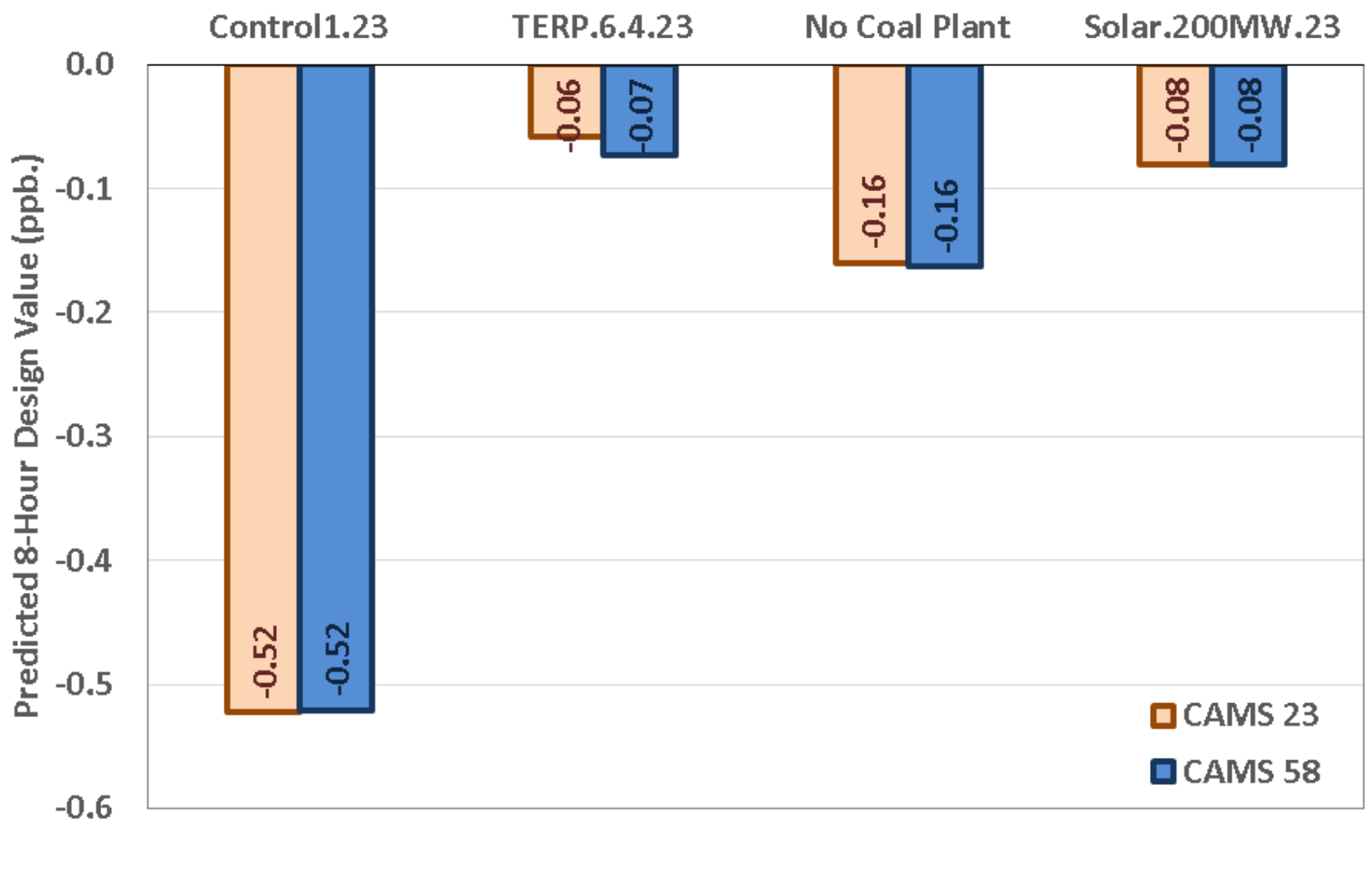
Future Design Value, 2017, 2020, 2023, 2026, and 2030



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Next Steps

- Working with CoSA, Bexar County, and the Alamo Area MPO to continue photochemical modeling runs and control strategy development.

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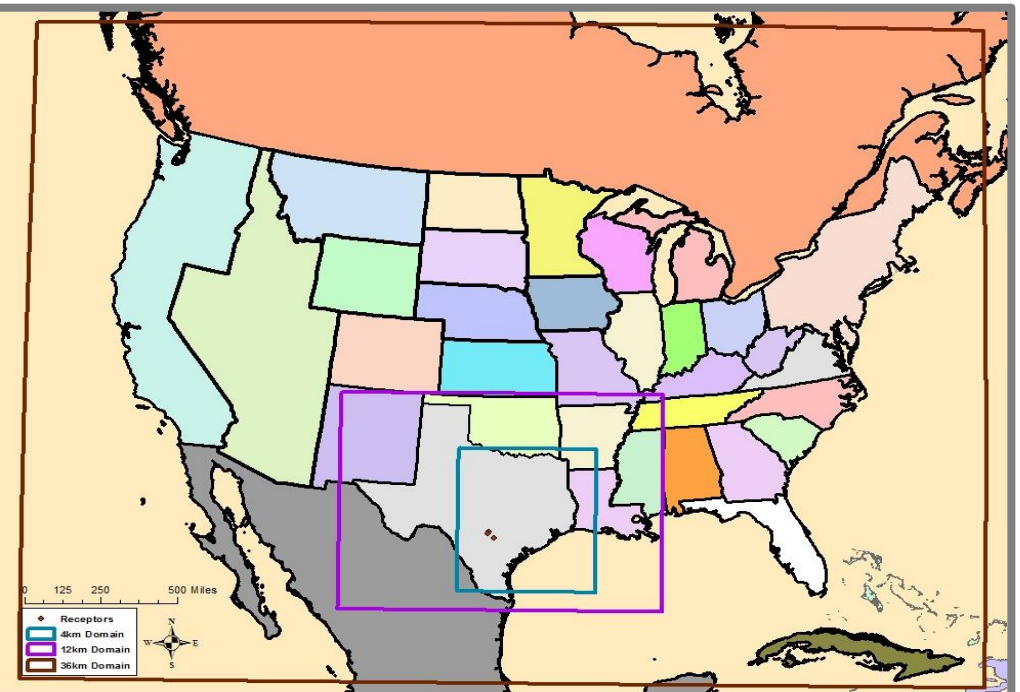
APCA Photochemical Model Run

- The EPA-approved Anthropogenic Precursor Culpability Assessment (APCA) was used to trace ozone back to the source.

- APCA estimates the contributions from multiple source areas, categories, and pollutants to local ozone monitoring stations.



- A regular APCA run can take 17 months for the 2012 ozone season episode.

- A complex APCA run can take 50 months.

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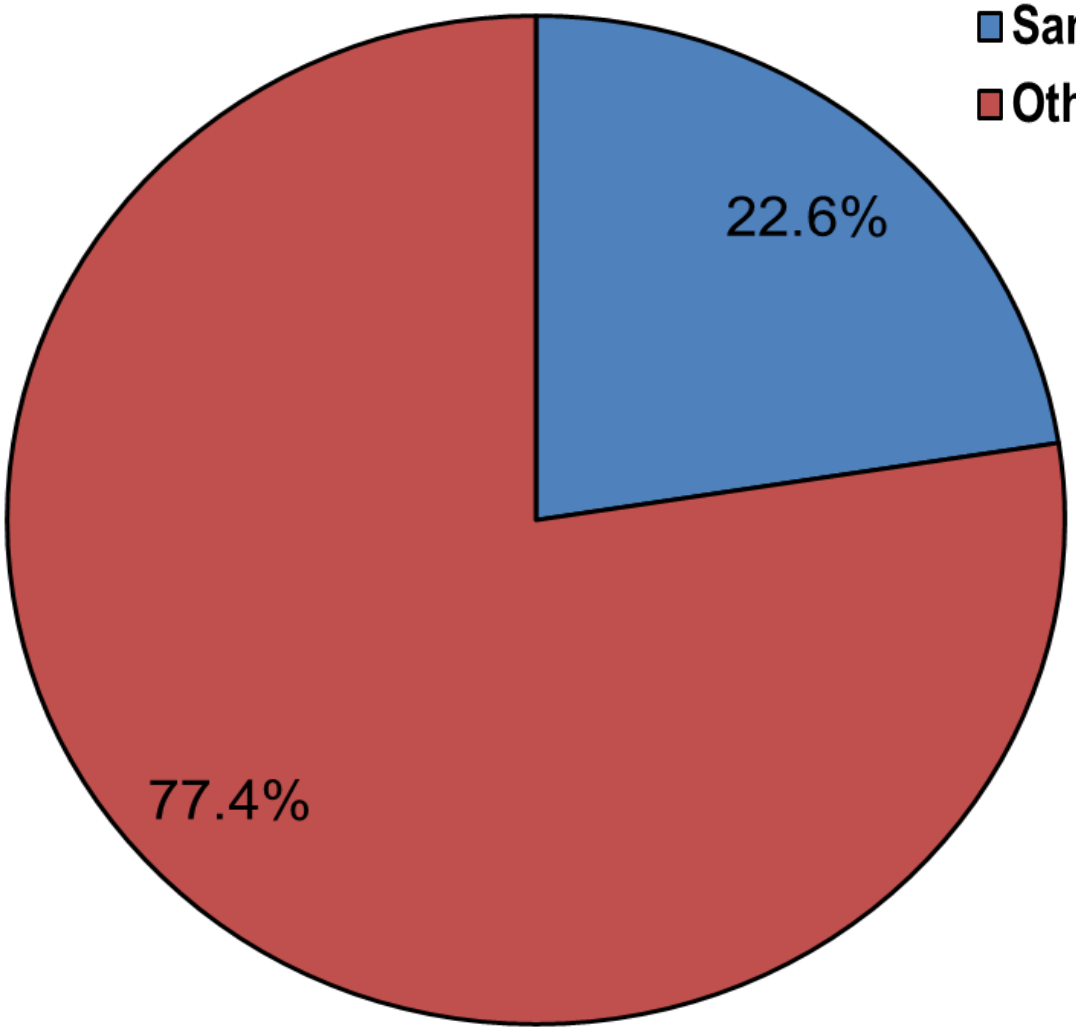
Source Region Contribution to Local Ozone (C58), Maximum 8-hour Ozone on Days > 60 ppb of Ozone, 2017



- The results are similar to what is calculated in the local Conceptual Model

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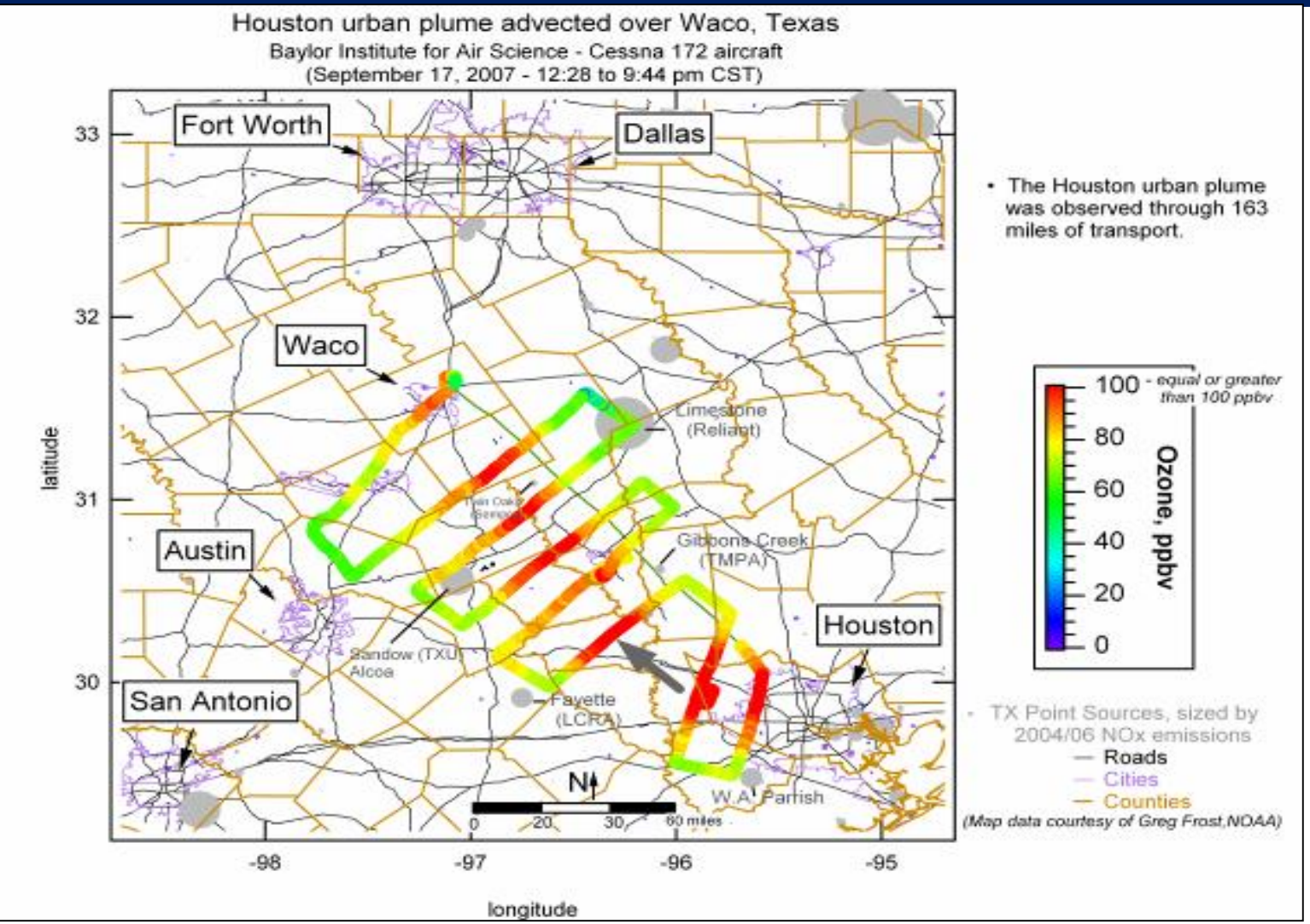
Baylor University Airborne Ozone (ppbv) Sampling: Houston Urban Ozone Plume – September 17, 2007



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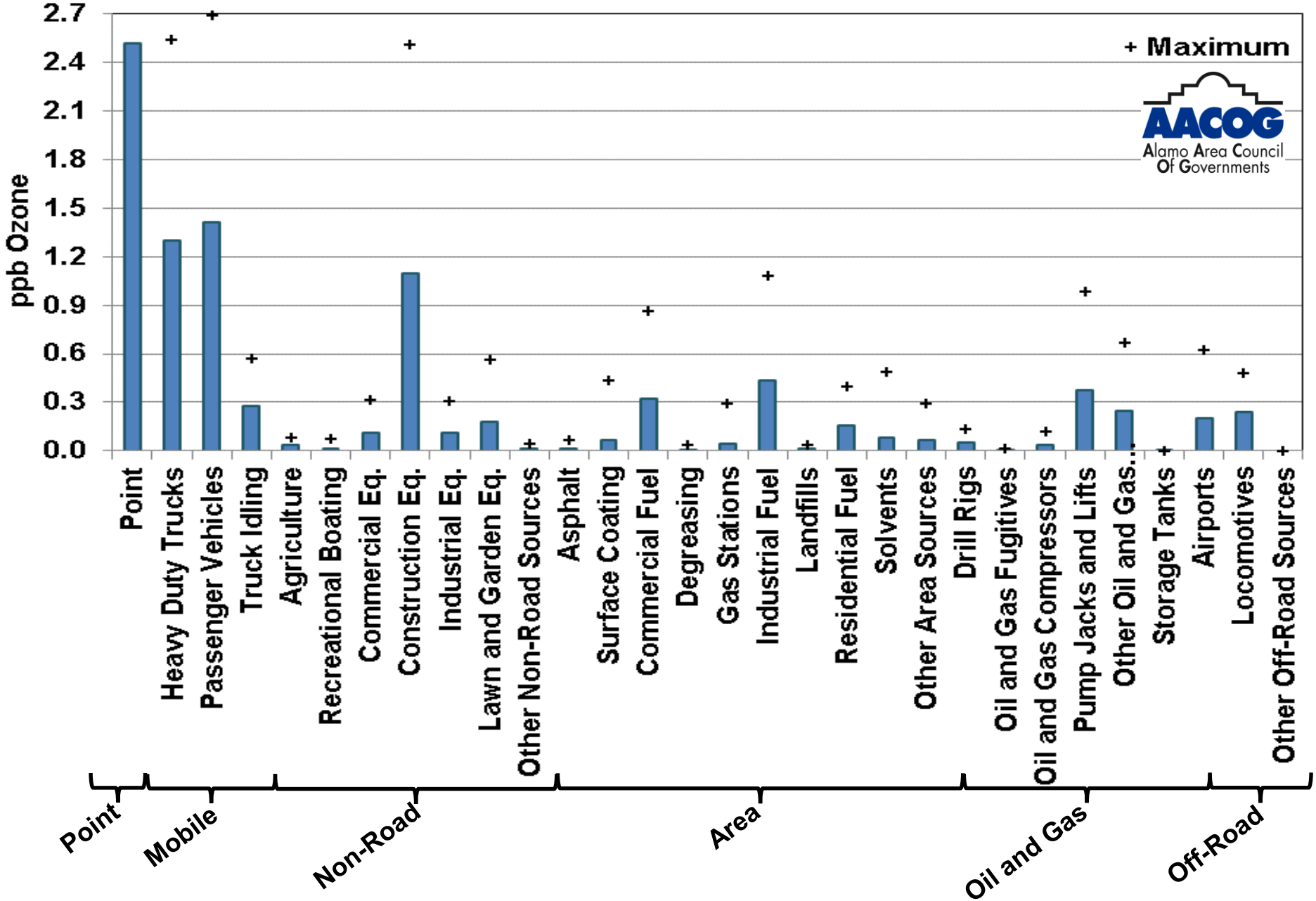
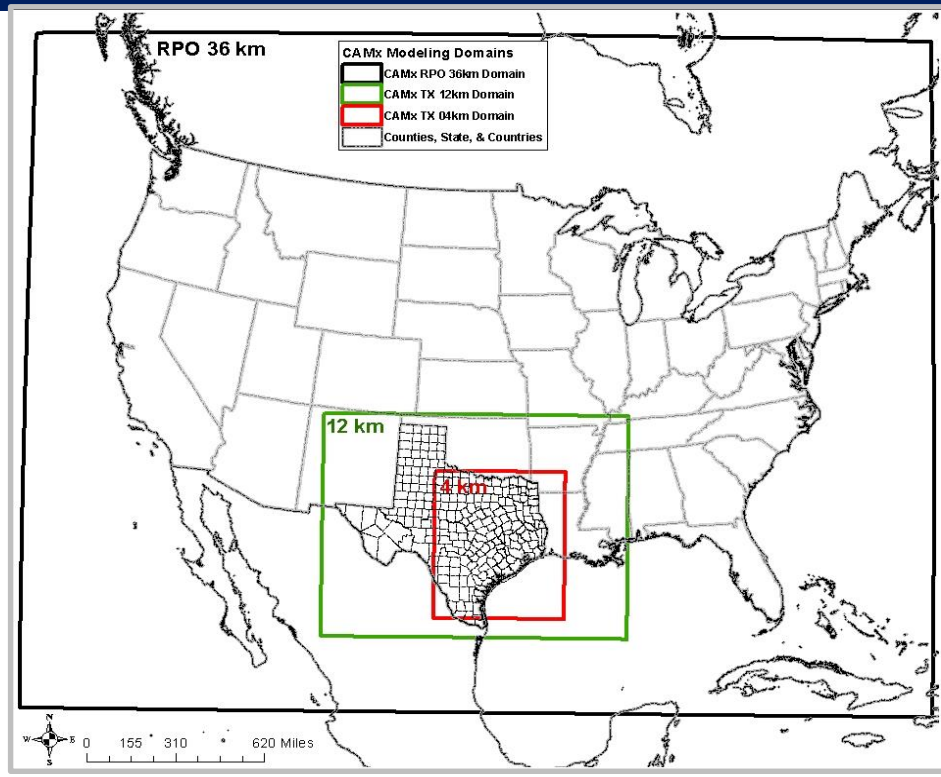
Detailed Local Emission Source Contribution to Ozone (C58), Maximum 8-hour Ozone on Days > 60 ppb of Ozone, 2023



Ozone Season 2012 Photochemical Modeling Episode Metadata

- WRF v3.71 Meteorological Model, CAMx 6.4
- Version 6 of the Carbon Bond photochemical mechanism (CB6)
- Modeling Days:
  - 13 ramp-up days, April 16 - 28, 2012
  - 156 primary episode days, April 29 – Sept. 30, 2012
- During the episode, 8-hour ozone exceeded 60 ppb for twenty days at C58 (for APCA runs)
- Base line 2012 emissions were projected to 2017, 2020, 2023, 2026, and 2030
- TCEQ approved Local EI
- Chemistry solver: EBI (Euler-Backward Iterative)
- Advection solver: PPM (Piecewise Parabolic Method)
- Dry deposition model: WESELY89



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