

Assessing the Impact on Future Ozone Concentrations for a Proposed Additional Unit at the Coletto Creek Power Station

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Introduction

Victoria is currently in attainment of the NAAQS for ozone concentrations averaged over 8 hours.

- 2008 CAMS 87 design value is 66 ppb
- current 8-hour ozone NAAQS is 75 ppb

TCEQ permit review does not require photochemical grid modeling to determine the impact of new permits on ozone concentrations.

Photochemical modeling was performed to determine the impact of a proposed additional unit at Coleto Creek Power Station on 8-hour ozone concentrations in the Victoria, Austin, and San Antonio areas.

Photochemical Model

- This study used the 2007 Future Case for the September 13-20, 1999 CAMx modeling episode.
- This episode has been used to prepare the Early Action Compact plans (volunteer SIP) for Austin and San Antonio.
- This process has been used to estimate ozone impacts for multiple proposed new emissions sources in the San Antonio, Austin and Victoria areas over the past several years.

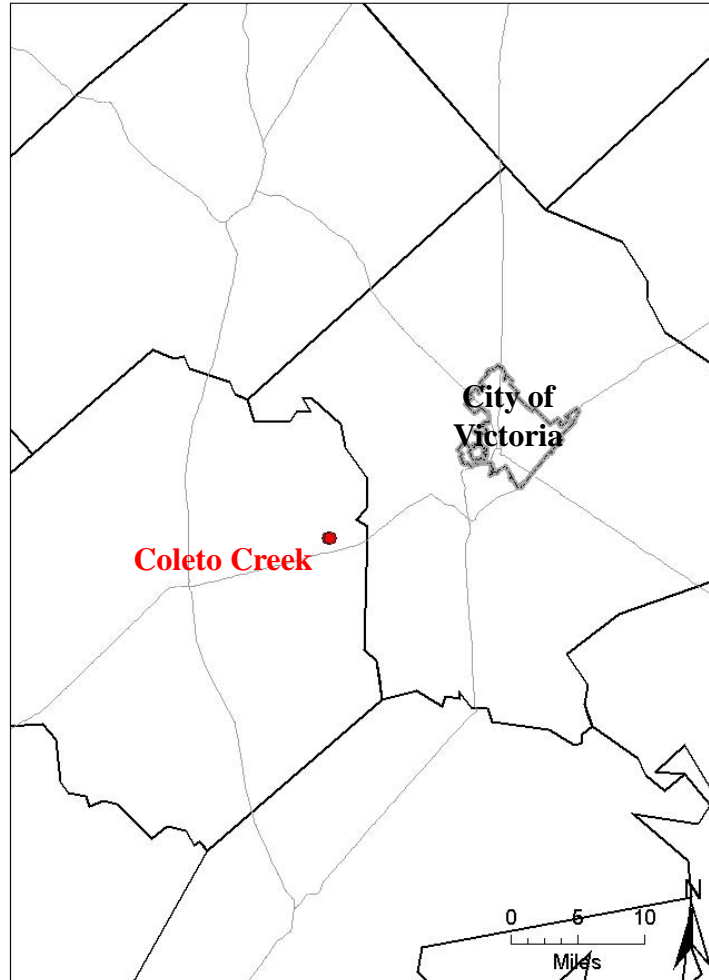
Coletto Creek Power Station Model Setup

- The Coletto Creek facility is located ~15 miles southwest of downtown Victoria in eastern Goliad County
- Coletto Creek currently consists of a single Unit (Unit 1) venting to a stack ~125 meters in height
- The first model run included a revision to the existing 2007 Future Case to update the Unit 1 release parameters and emissions for NO_x, VOC, and CO to values provided by Michael Fields and James Crysop (International Power)
- The modeled Unit 1 emission rates were based on permit allowables

Coletto Creek Power Station Model Setup

- A second model run was developed that was the same as the 2007 Future Case but included the proposed Unit 2 at Coletto Creek
- The Unit 2 stack was located ~266 meters east of the Unit 1 stack
- The Unit 2 stack height was 122 meters
- Unit 2 release parameters and emission rates for NO_x, VOC, and CO were supplied by Michael Fields of International Power
- For both the modified 2007 Future Case and 2007 Future Case with Unit 2 model runs, the ton per day emissions at Coletto Creek were distributed evenly throughout the day simulating a facility that operates at the same load over 24 hours a day and 7 days per week (i.e., a “flat” diurnal hourly profile was applied to the ton per day emissions).

Coletto Creek Location



Coletto Creek Power Station Emission Release Parameters

| Emissions Point Name | Stack Height (meters) | Stack Diameter (meters) | Exit Temperature (K) | Exit Velocity (meters/second) |
|-----------------------------|------------------------------|--------------------------------|-----------------------------|--------------------------------------|
| Unit 1 (existing) | 124.7 | 6.10 | 448 | 35.51 |
| Unit 2 (proposed) | 121.9 | 7.20 | 355 | 6.88 |

Coletto Creek Power Station Modeled Emission Rates

| Emissions Point Name | NO_x (tons per day) | VOC (tons per day) | CO (tons per day) |
|---------------------------------|--|-------------------------------|------------------------------|
| Unit 1 (existing) | 13.80 | 0.29 | 60.64 |
| Unit 2 (proposed) | 4.80 | 0.24 | 12.00 |

Photochemical Modeling Episode

For the Unit 2 model run, the model configuration, meteorological fields, boundary and initial conditions, dry deposition algorithms, chemical mechanisms, and biogenic emissions inventories were the same as those for the 2007 Future Case.

The only differences between the 2007 Future Case and the 2007 Future Case with Unit 2 runs were differences in the 2007 projected anthropogenic emissions inventory due to modeled emissions from Unit 2 at the Coletto Creek Power Station.

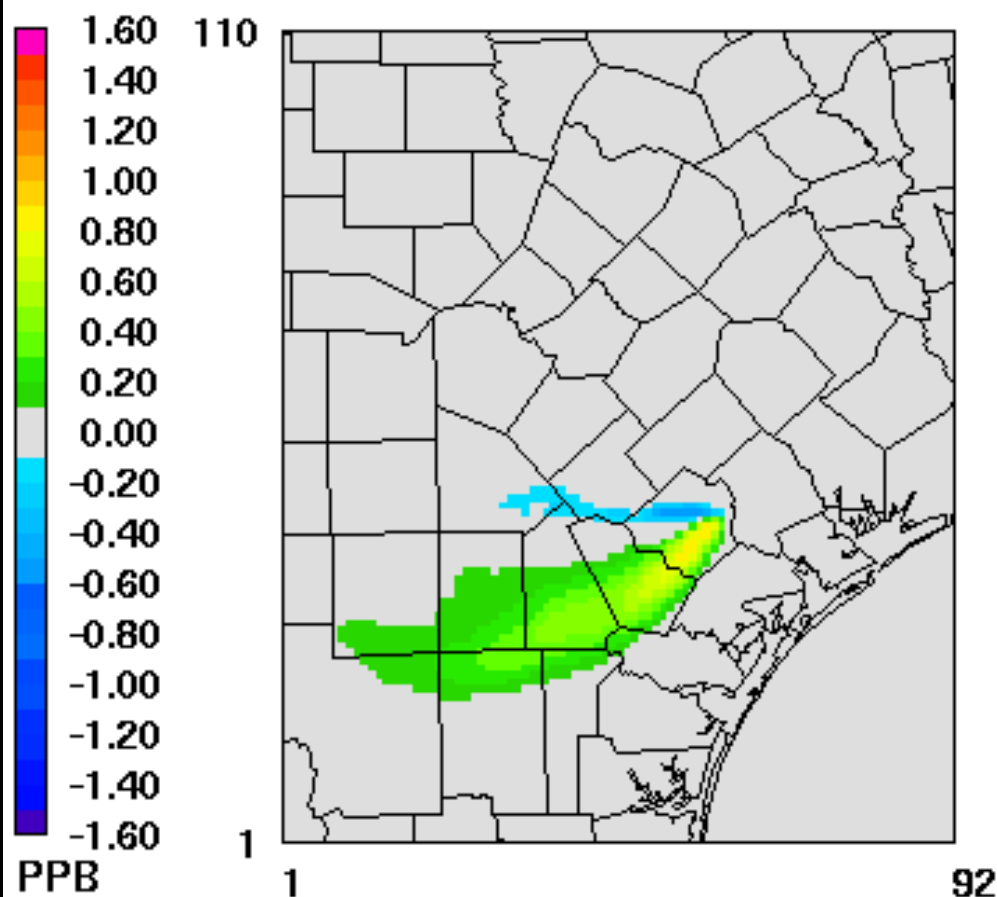
Modeling Results

- For each grid cell, calculate the difference in the daily maximum 8-hour ozone concentrations between the 2007 Future Case and the 2007 Future Case with Unit 2 scenario.
- Generate maps showing differences in maximum 8-hour ozone concentrations for each day September 15-20, 2007.
- Report the maximum daily differences for the seven-county Victoria area (Calhoun, De Witt, Goliad, Jackson, Lavaca, Refugio, and Victoria) and for Victoria County only.
- Report the maximum daily difference at the CAMS 87 and Rabbit Run monitoring stations.
- Report the maximum daily differences for the five-county Austin (Bastrop, Caldwell, Hays, Travis, and Williamson) and three-county San Antonio (Bexar, Comal, Guadalupe, and Wilson) areas.

Difference in Daily Maximum 8-hr Average Ozone

Coletto Creek with Unit 2 - 2007 Future Case

a=fine2.070915.03.eight, b=fine2.070915.03.eight



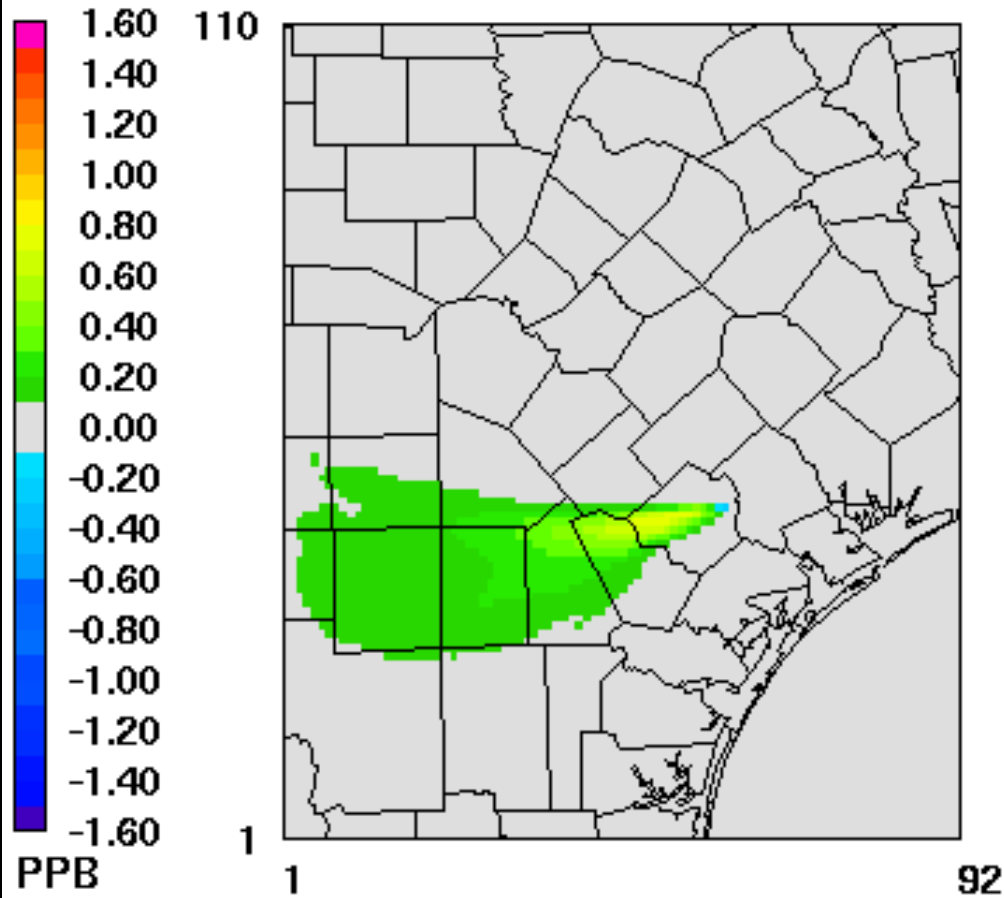
September 15, 1999 0:00:00

Min= -0.60 at (57,45), Max= 0.89 at (58,42)

Difference in Daily Maximum 8-hr Average Ozone

Coletto Creek with Unit 2 - 2007 Future Case

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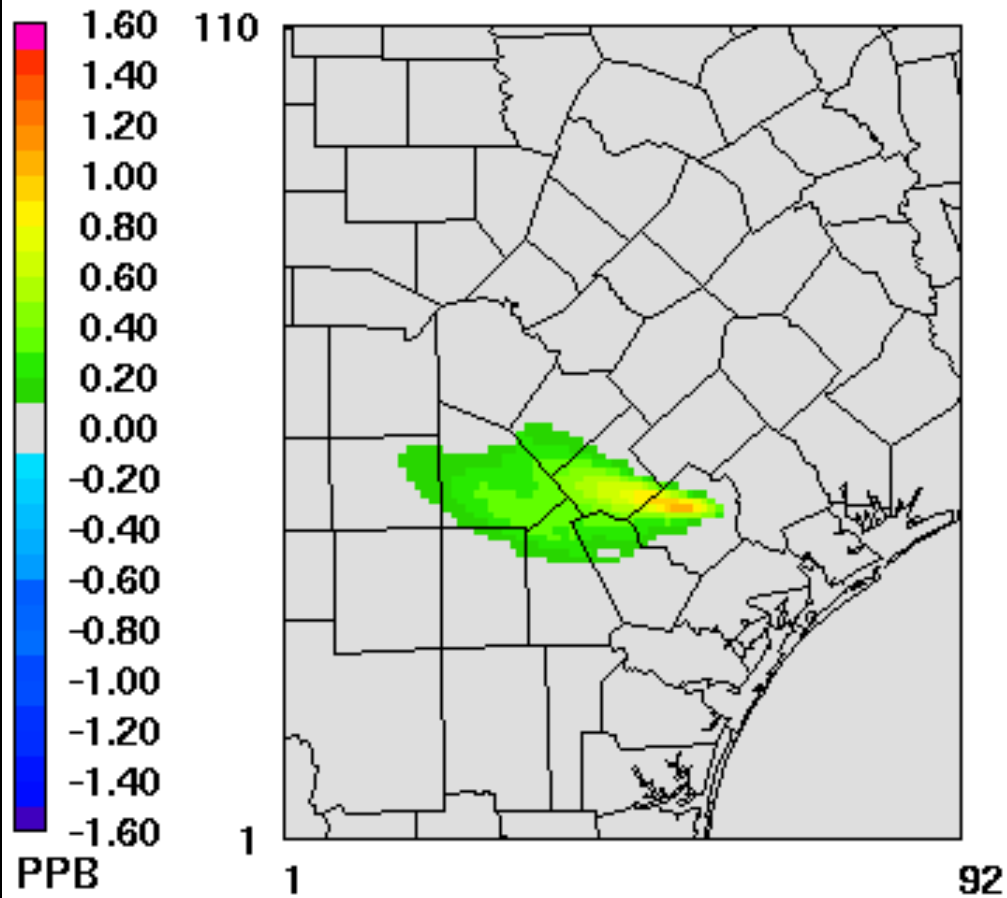
September 16, 1999 0:00:00

Min= -0.23 at (61,45), Max= 0.77 at (51,43)

Difference in Daily Maximum 8-hr Average Ozone

Coletto Creek with Unit 2 - 2007 Future Case

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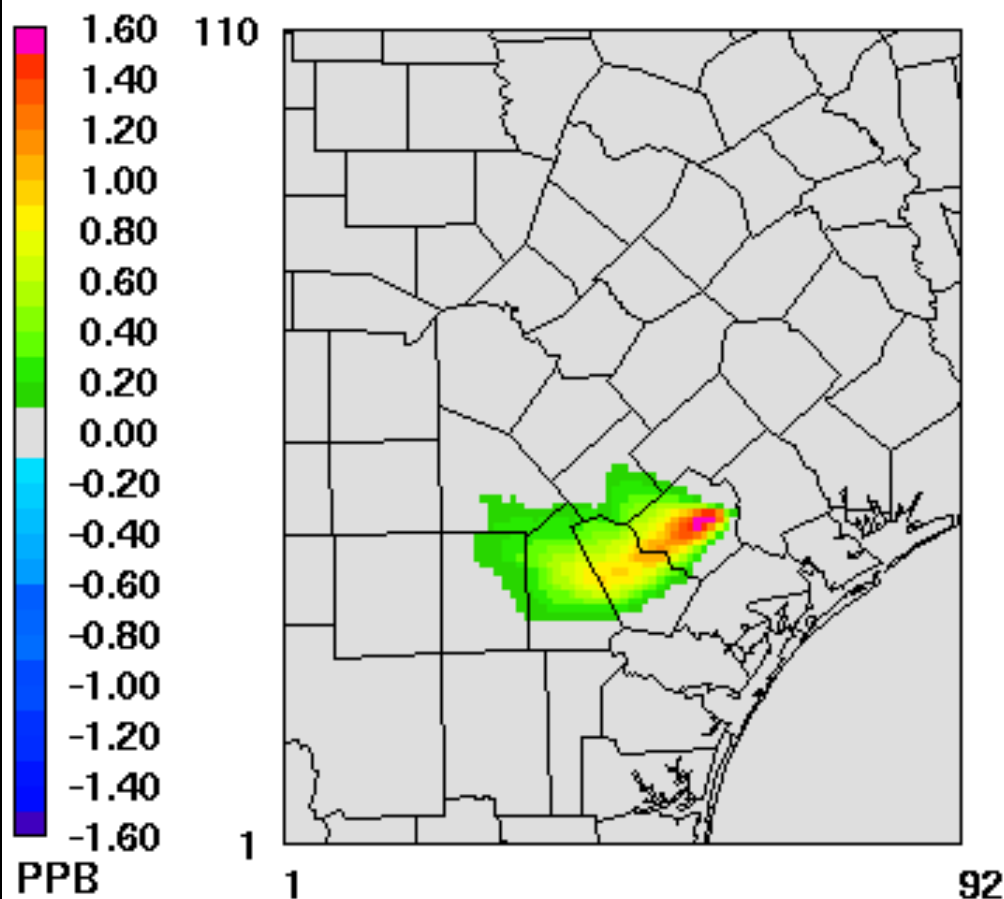


September 17, 1999 0:00:00
Min= -0.06 at (61,46), Max= 1.07 at (55,45)

Difference in Daily Maximum 8-hr Average Ozone

Coletto Creek with Unit 2 - 2007 Future Case

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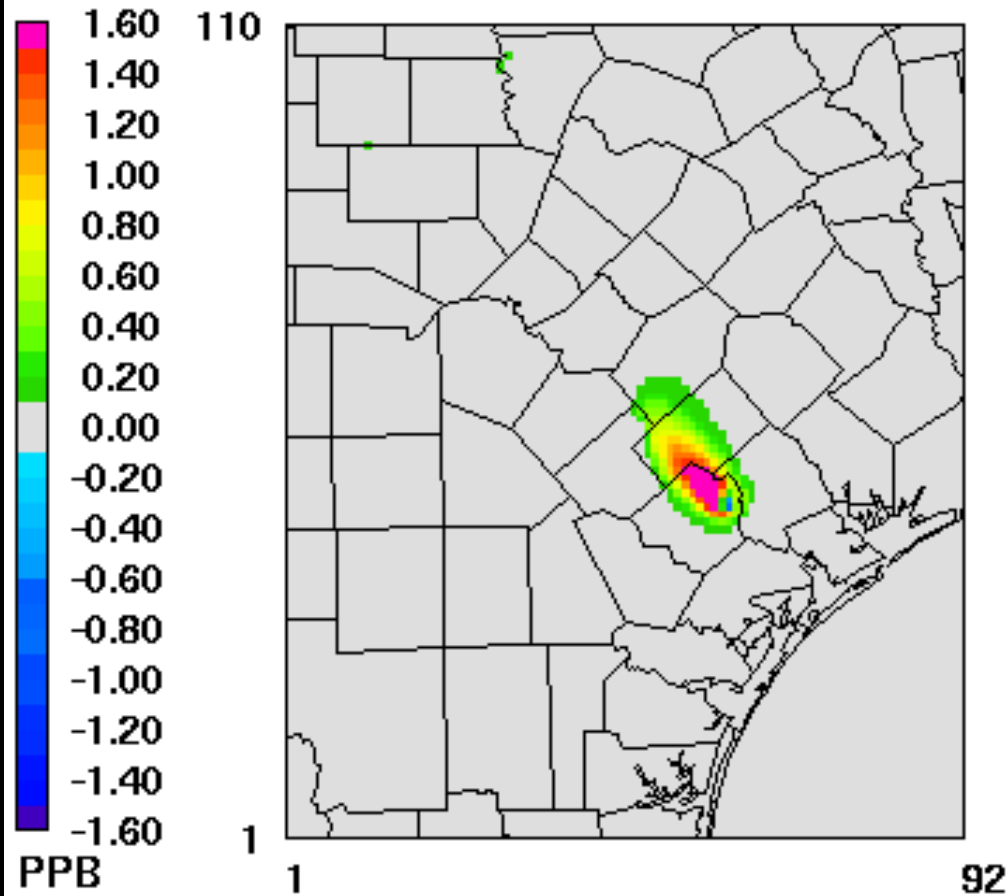
September 18, 1999 0:00:00

Min= -0.07 at (59,48), Max= 1.73 at (58,44)

Difference in Daily Maximum 8-hr Average Ozone

Coletto Creek with Unit 2 - 2007 Future Case

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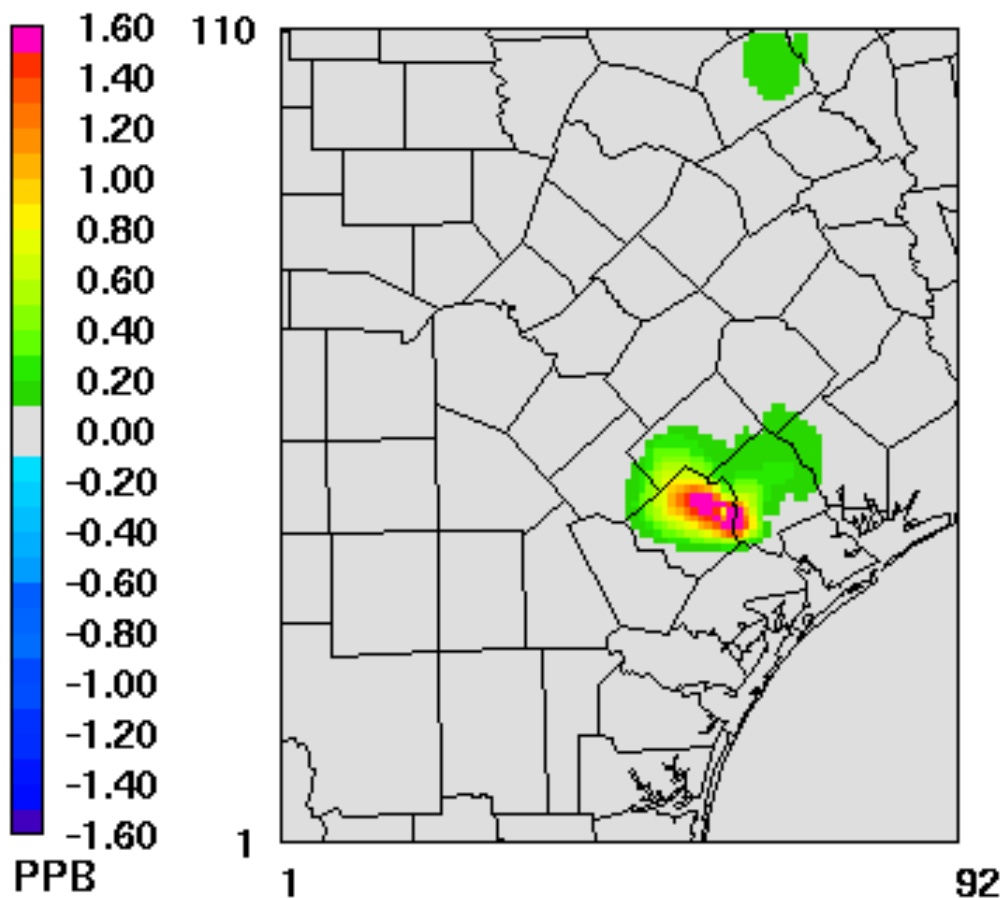
September 19, 1999 0:00:00

Min= -0.81 at (61,45), Max= 2.23 at (58,47)

Difference in Daily Maximum 8-hr Average Ozone

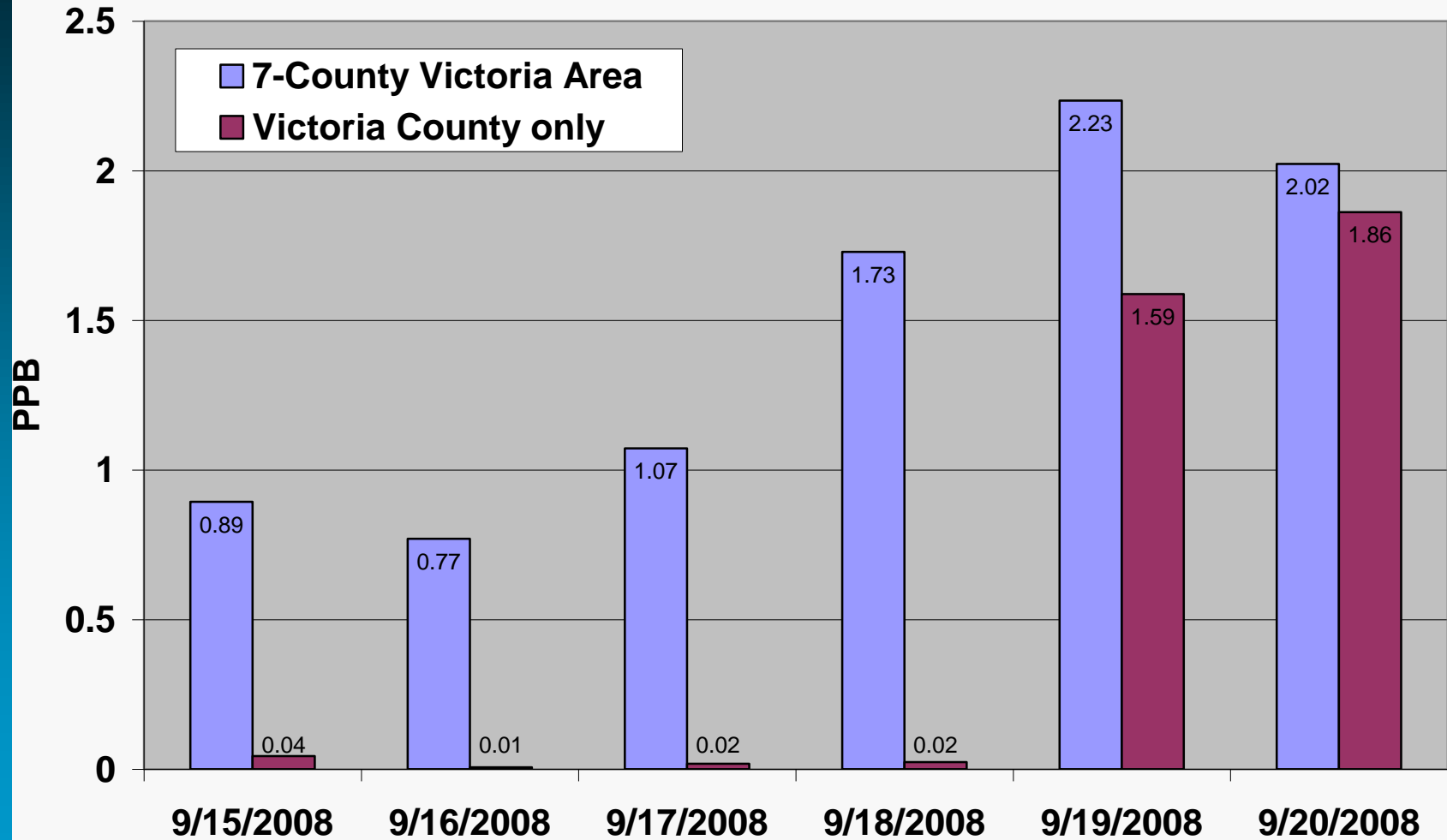
Coletto Creek with Unit 2 - 2007 Future Case

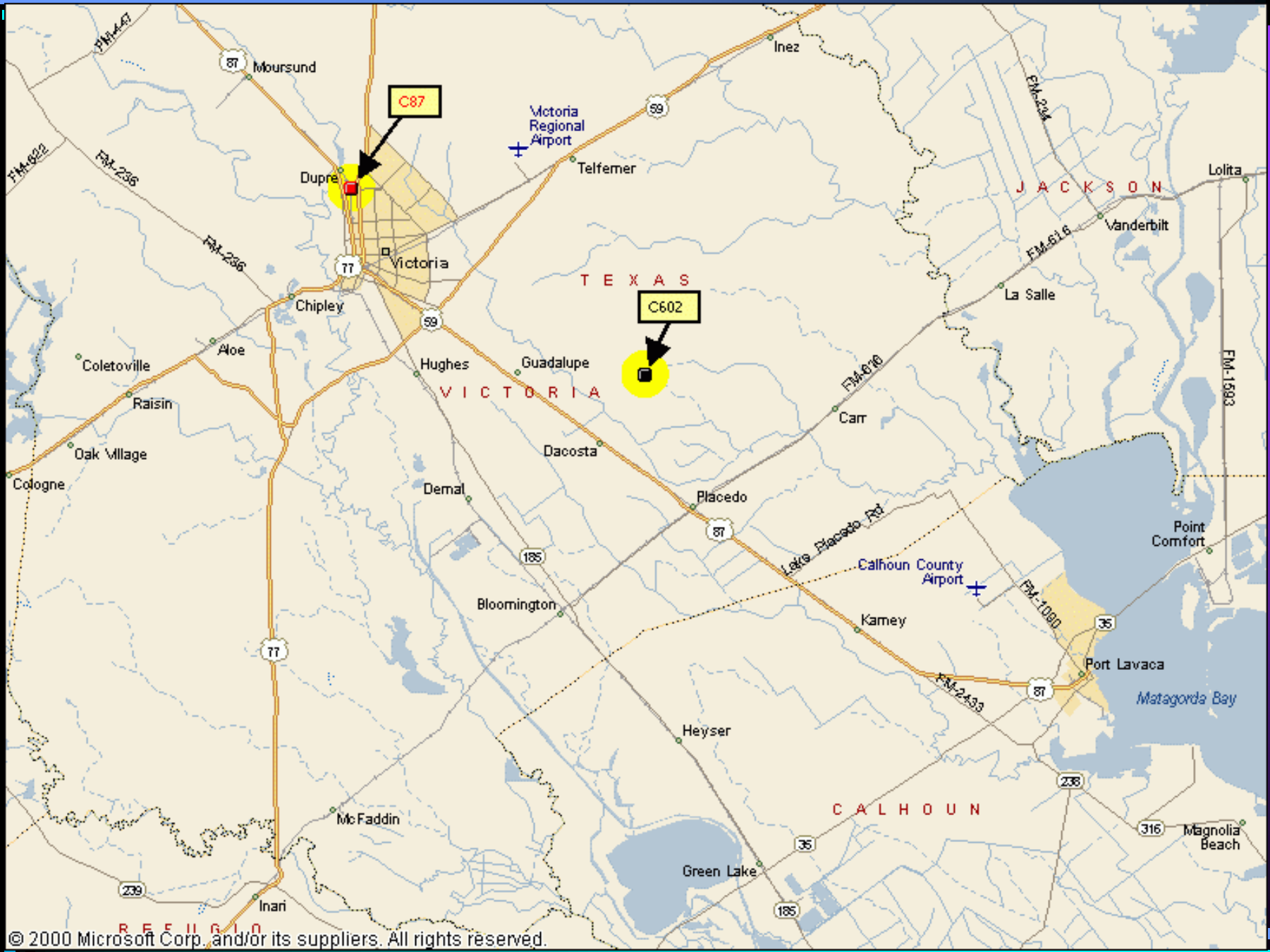
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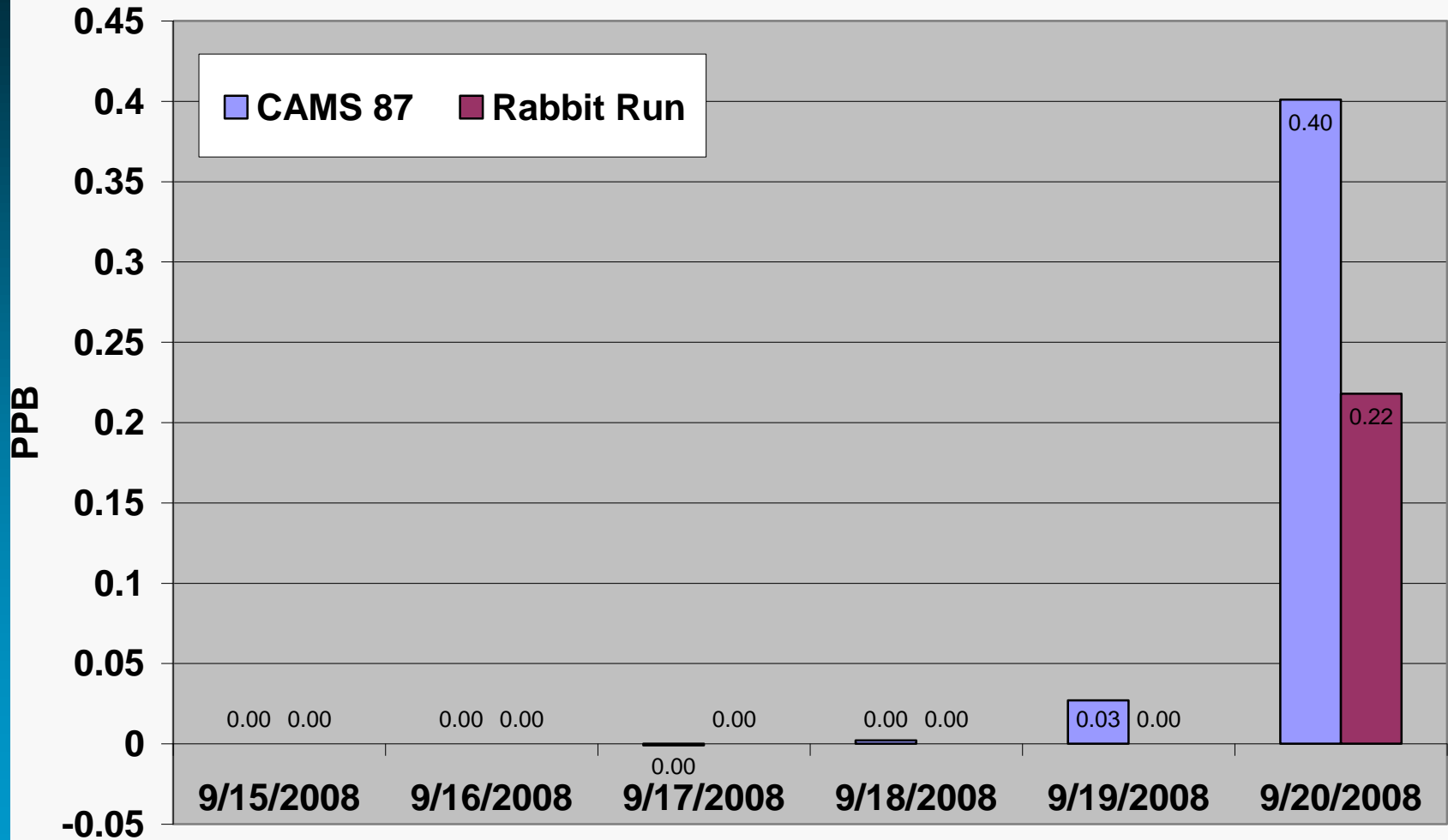
September 20, 1999 0:00:00
Min= -0.02 at (72,43), Max= 2.02 at (62,45)

Predicted Maximum Increases in the Daily Maximum Ozone Concentrations





Predicted Changes in the Daily Maximum Ozone Concentrations at Rabbit Run and CAMS 87



Maximum Predicted Increases in the Daily Maximum 8-hour Ozone Concentrations in the Austin and San Antonio Areas

| Scenario | Maximum Ozone Concentration in ppb | | | | | |
|---------------------------|------------------------------------|-------|-------|-------|-------|-------|
| | 9/15 | 9/16 | 9/17 | 9/18 | 9/19 | 9/20 |
| 5-County Austin Area | 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.084 |
| 4-County San Antonio Area | 0.000 | 0.001 | 0.374 | 0.022 | 0.068 | 0.074 |

Summary

We have used the 2007 Future Case model as a tool to estimate the 8-hour ozone concentration increases in the Victoria, Austin, and San Antonio areas due to operation of a proposed additional unit at the Coletto Creek Power Station.

- Predicted increases in the daily maximum 8-hour ozone concentrations in the 7-county Victoria area ranged from 0.770 ppb on September 16th to 2.234 ppb on September 19th.
- At CAMS 87: Predicted changes in daily maximum 8-hour ozone concentrations ranged from -0.001 ppb on September 17th to 0.401 ppb on September 20th.
- At Rabbit Run: Predicted changes in daily maximum 8-hour ozone concentrations were 0.000 ppb on all days but September 20th, which had an increase of 0.218 ppb.

Summary (continued)

- Austin Area: Predicted increases in the maximum daily ozone 8-hour concentrations were 0.000 ppb except for 0.039 ppb and 0.084 ppb on September 19th and September 20th, respectively.
- San Antonio Area: Predicted increases in the maximum daily 8-hour ozone concentrations of 0.000/0.001 ppb on September 15th/16th; otherwise ranged from 0.022 ppb on September 18th to 0.374 ppb on September 17th.

Caveat

The September 15-20, 1999 period was originally selected for modeling, in part, because it is representative of the large-scale weather patterns and associated local meteorological conditions typically experienced during high ozone episodes in the Austin, San Antonio, and Victoria areas.

However, over a number of years the meteorological conditions and, particularly, the ozone transport patterns are characterized by variability between different high ozone episodes.

Questions?