Photochemical Modeling for Austin's Early Action Compact

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Early Action Compact Program

- Austin and San Antonio are among the first areas in the U.S. that have entered into 8-hour voluntary SIPS or Early Action Compacts (EACs) with the EPA. Technical work in support of EAC is funded through the Texas Near Non-attainment Area Program
- 33 areas throughout the country have signed EACs
- Many new technical issues not encountered with SIPS based on the 1-hour NAAQS

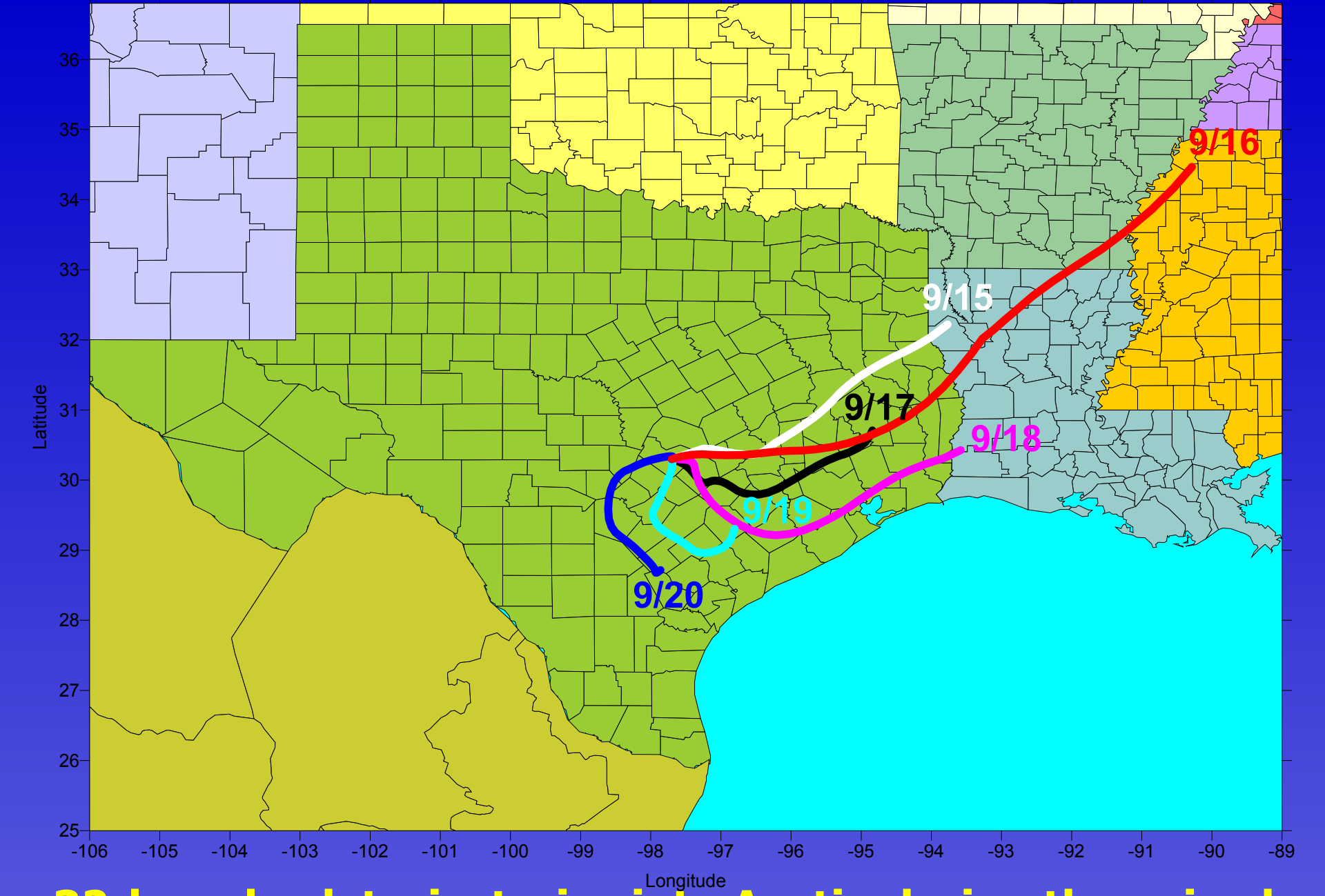
Evolution of the Sept. 13-20, 1999 CAMx Model

- TCEQ encouraged development of single, consistent episode for near non-attainment areas (NNAs)
- Costs of resource-intensive modeling could be shared
- Previous models developed for HGA or DFW areas not optimized for NNAs. New episode selected using conceptual models for NNAs.
- Development of this episode has required over two years of work (2001-2004) by NNAs, UT, ENVIRON in collaboration with the TCEQ

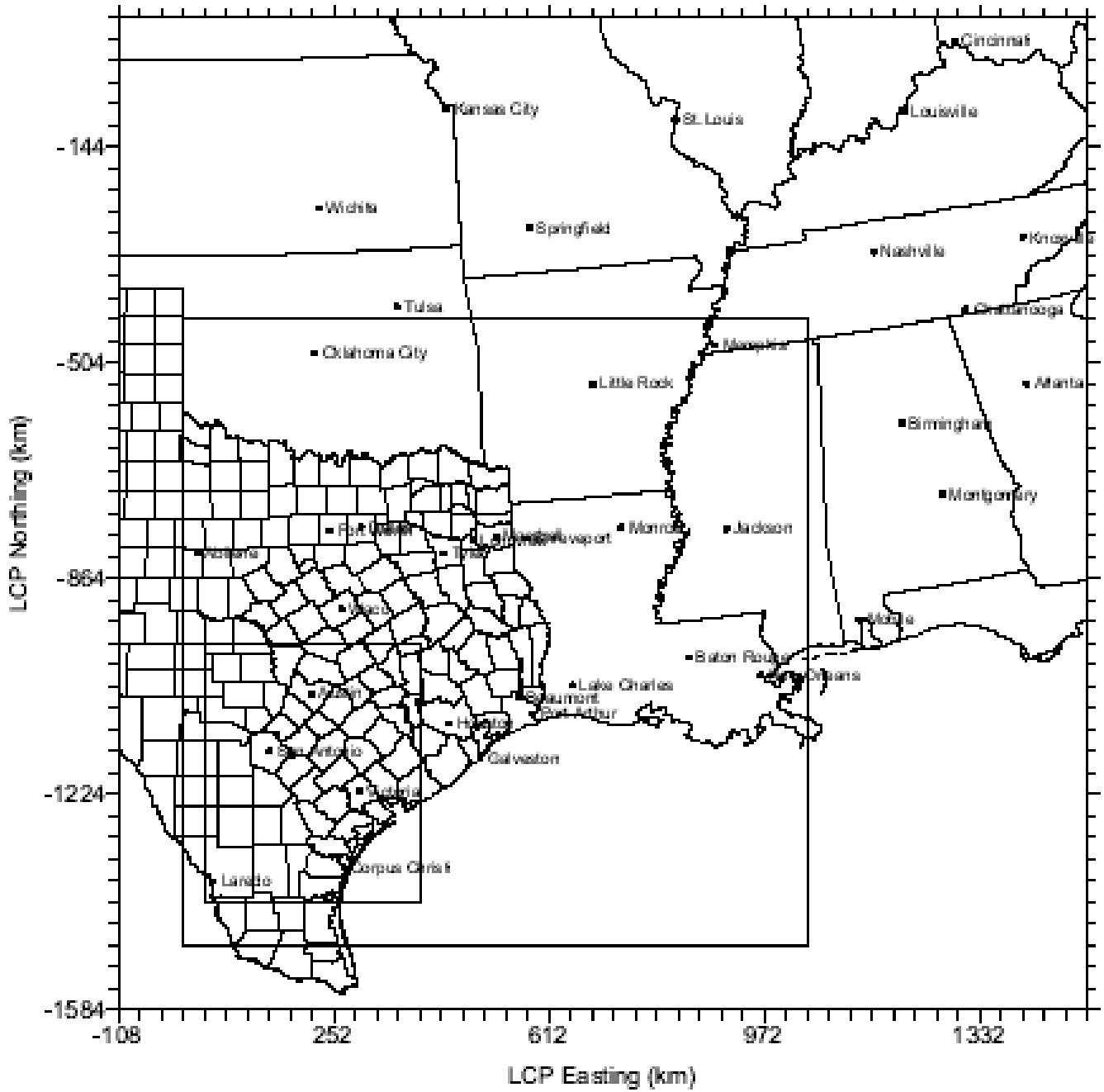
Peak 8-Hour Observed Ozone Concentrations

Date	Victoria	Austin	Corpus Christi	Dallas/ Ft. Worth	Houston/ Galveston/ Brazoria	San Antonio	Tyler/ Longview / Marshall
9/15/99	78	78	80	80	97	82	85
9/16/99	79	85	81	78	104	85	82
9/17/99	86	99	81	99	111	76	86
9/18/99	87	99	89	99	98	96	91
9/19/99	84	101	88	96	120	91	97
9/20/99	99	87	75	92	124	86	110

Urban areas throughout Texas experienced ozone concentrations above 85 ppb (orange) and above 95 ppb (red) during the episode



32-hour back trajectories into Austin during the episode demonstrate the significance of regional transport



36-km/12-km/4-km nested grid domain

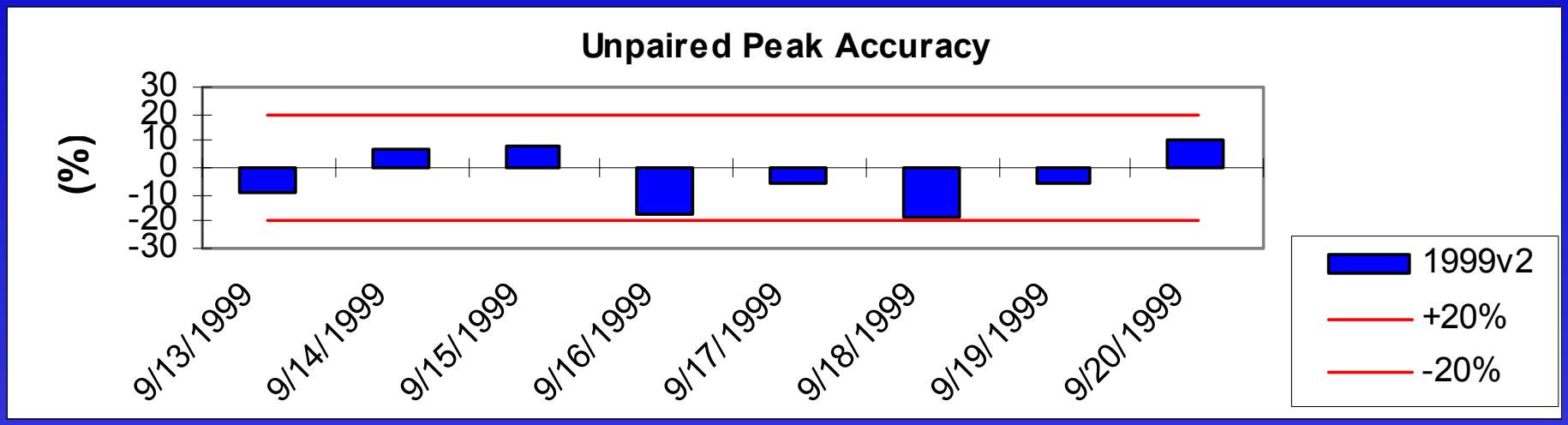
Initial CAMx Model Development

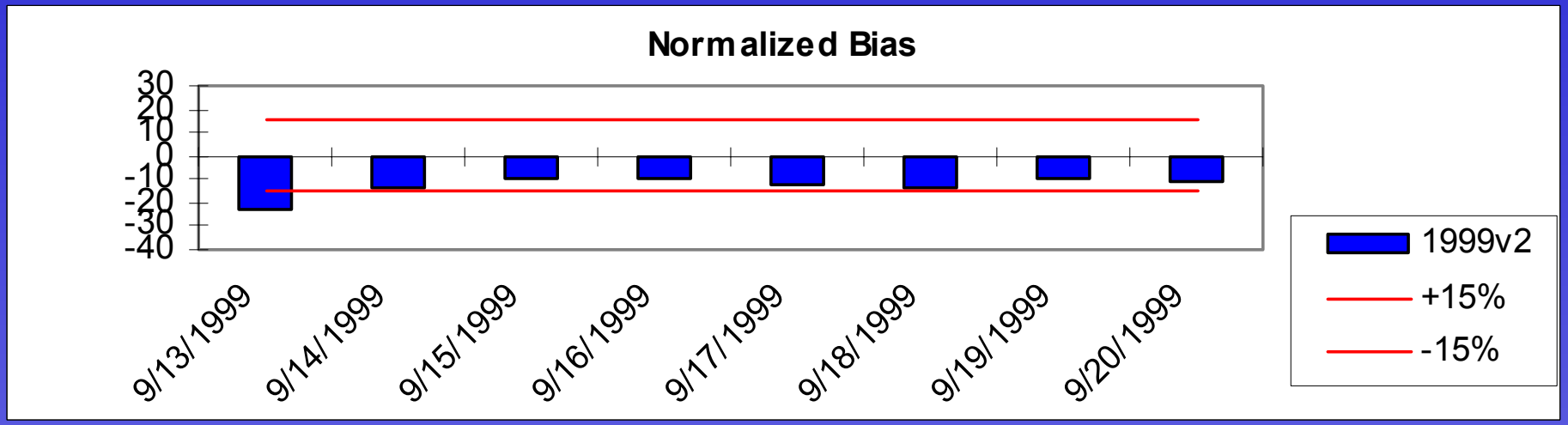
- Occurred during 2001-2002
- Excellent replication of diurnal trends
- EPA criteria for unpaired peak accuracy and gross error met. However, consistent under prediction bias.
- Daily peak ozone under predicted by 10-20% at each site. Daily mean ozone is under predicted by 10-30% at each site.

Refined CAMx Model Development

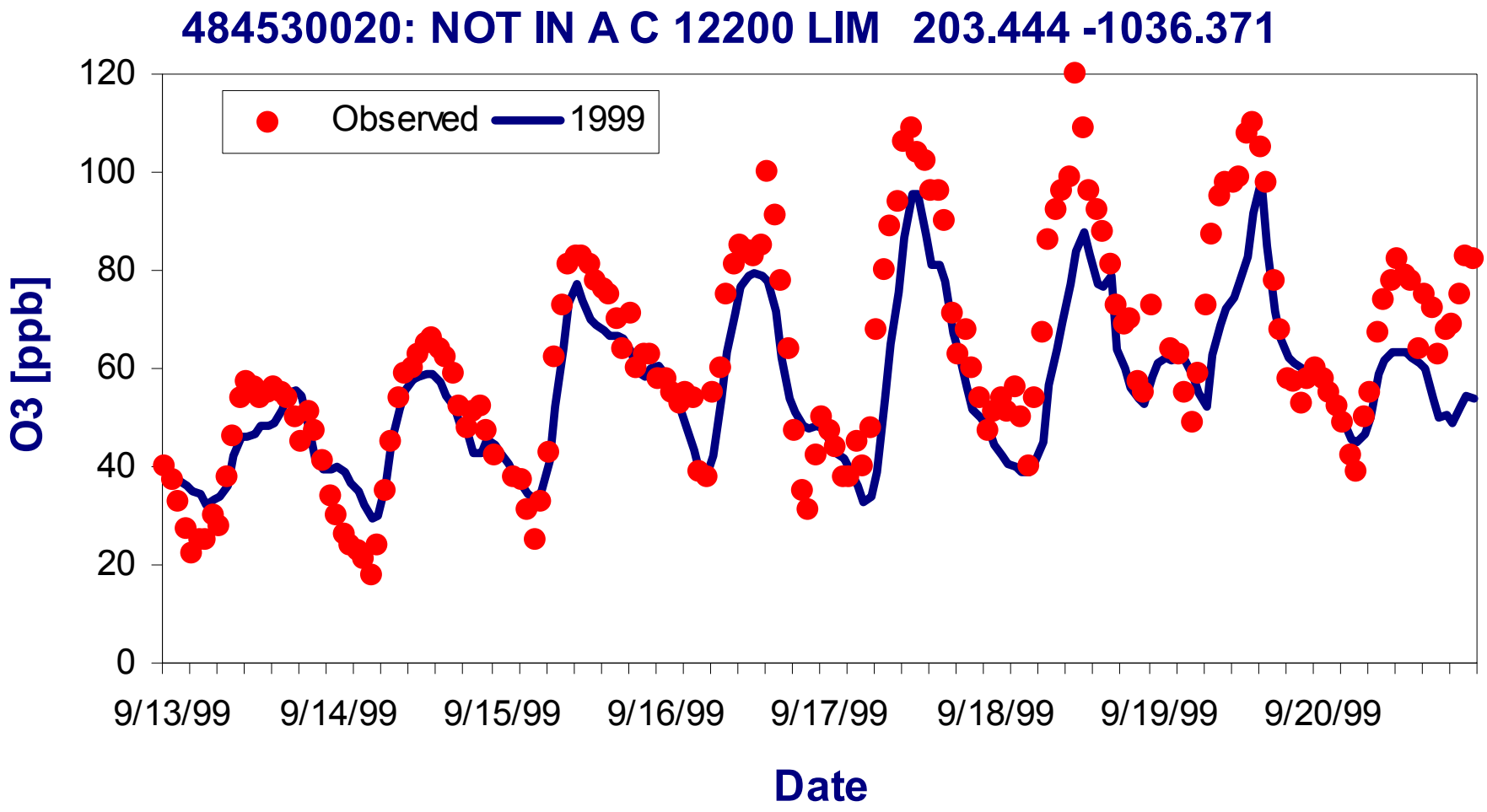
- Occurred during 2002-2004
- Extensive emission inventory refinements by NNAs
  - Examples:
    - Day-specific point-source data including emissions from upset and maintenance activities in Victoria.
    - Local point and area source data in Austin and San Antonio.
    - Link-based MOBILE6 emissions for NNAs
- New MM5 studies (13 runs) to examine PBL scheme, soil model, radiation scheme, FDDA analysis nudging
- Incorporated new dry deposition algorithm in final model for drought stress
- Boundary and initial condition studies

Base Case Model Performance for Austin's EAC

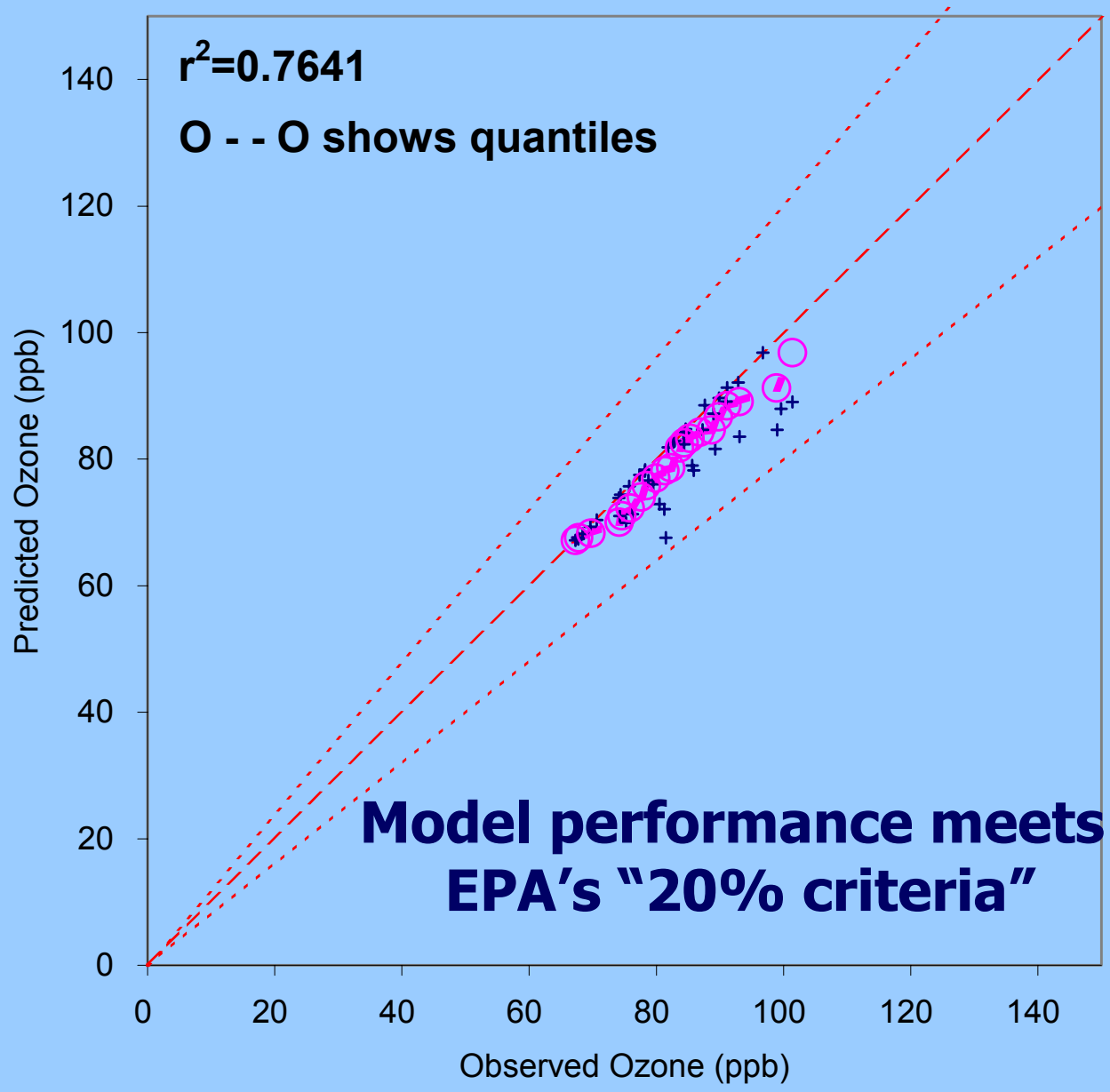




Base Case Model Performance at Austin's Audubon Monitor



Base Case Model for Austin's EAC



Projected 2007 Emissions Inventory Development

- Austin, San Antonio and Victoria
  - Link-based MOBILE6 emissions
  - NONROAD2002a
  - Local point and area source projections
- Other Areas within Texas and in Regional Domain
  - ENVIRON HDD inventory provided by TCEQ (to be used in current midcourse SIP development)
- Done in collaboration with the TCEQ

New Attainment Demonstrations under 8-Hour NAAQS

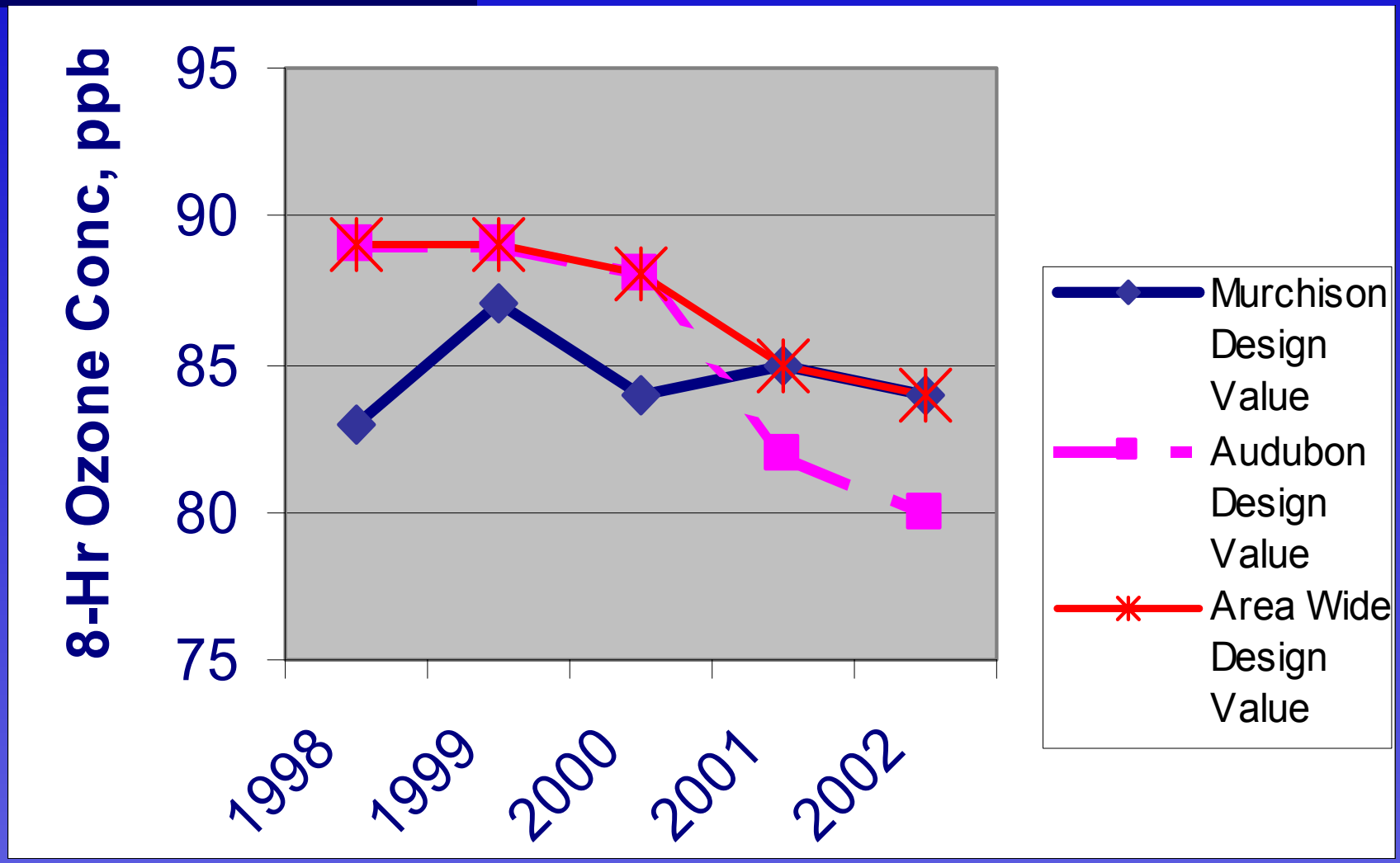
- Based on Relative Reduction Factors (RRFs)

- Key issues:
  1. What is design value?
  2. How do we demonstrate attainment with the model?
     - What is the importance of regional transport?
     - What is the relative response to local VOC and NOx reductions?
     - What are the RRFs?

Relative Reduction Approach for 8-hour Attainment Demonstrations

- Future Design Values estimated with relative response of the model, which is a conceptually different approach than for demonstrations under 1-hour NAAQS.
- Approach normalizes under or over prediction
- Relative Reduction Factor (RRF) calculated at each monitor site using maximum concentration "near" monitor
  (for 4 km grid, near = within a 7x7 grid around monitor)
- RRF = Daily avg. of max in future case/Daily avg. of max in current year
- Future Design value = RRF x design value for "current" year
- Area design value is largest design value over all monitors

8-Hour Design Values for Austin: 1998 to 2002



"Current Year" for Austin

- Current year is year with highest design value from:
  1. Three-years straddling latest emission inventory year:
     1999 (1998-2000) with DV of 89 ppb

     OR

  2. Three-years straddling year used for 8-hour attainment designation:
     2002 (2001-2003) with DV of 84 ppb

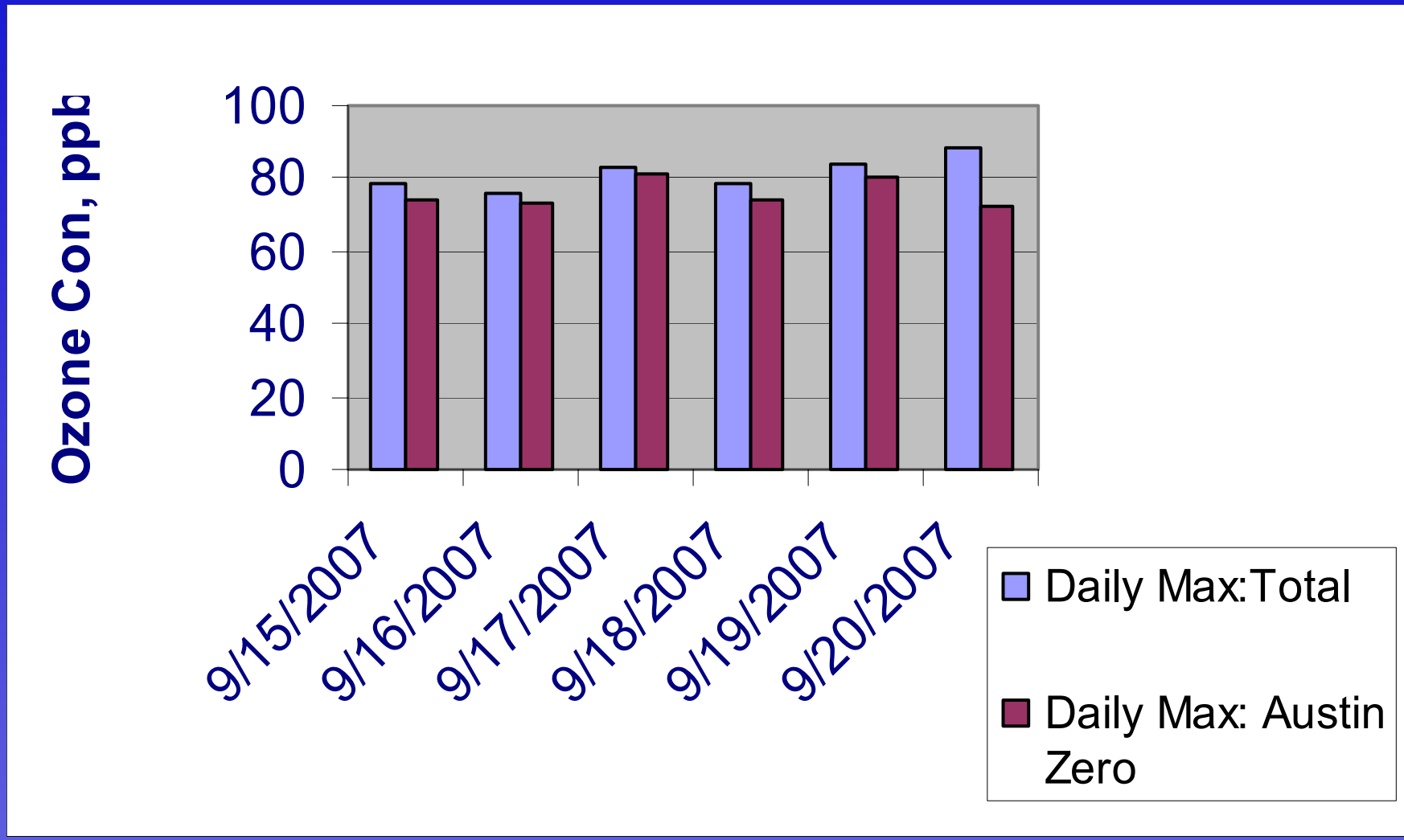
Analysis of Historical Monitoring Data

- 1999 was a year when meteorological conditions for formation of ozone occurred more often than any other year since 1997
- 2001 was a year when meteorological conditions for formation of ozone occurred less often than any other year since 1997

Analysis of Austin Design Values

- Current year 1999 design values are highest ever measured:
  - Murchison 87 ppb
  - Audubon 89 ppb
- Latest design value (2001–2003): Austin is currently in attainment
  - Murchison 84 ppb
  - Audubon 80 ppb
- Most probable design values for 2002, 2003 and 2004 estimated using highest fourth highest monitored value from 1997 to 2003 for fourth highest value for 2004:
  - Murchison 87 ppb
  - Audubon 82 ppb

Preliminary Studies: Regional transport into Austin is an important factor regardless of DV



Preliminary Results for Austin with **89** ppb Design Value for "Current Year"

Scenario	NOx Reduction (tpd)	VOC Reduction (tpd)	Future Design Value (ppb)
Base 2007	-	-	**85.08**
Base 2007 with TCEQ Regional Point Source Revisions	-	-	**84.91**
I&M only	3.19	4.19	84.73
Point sources only	7.08	0	84.82
TERP only	2	-	84.995
Area sources only	0	18.81	84.91
I&M+point+area+ TERP+TERMS+idling restrictions	12.76	24.43	83.93

Summary

- Austin's predicted 2007 emission inventory indicates that Austin will be on the cusp of attainment or non-attainment with the 8-hour NAAQS.

- Area proceeding with evaluating control strategies that will provide a margin of safety in attaining the standard.