

DFW Modeling

Electric Generation Utility Sensitivity Tests

Pete Breitenbach
Stakeholder Meeting
Austin, Texas
November 18, 2005

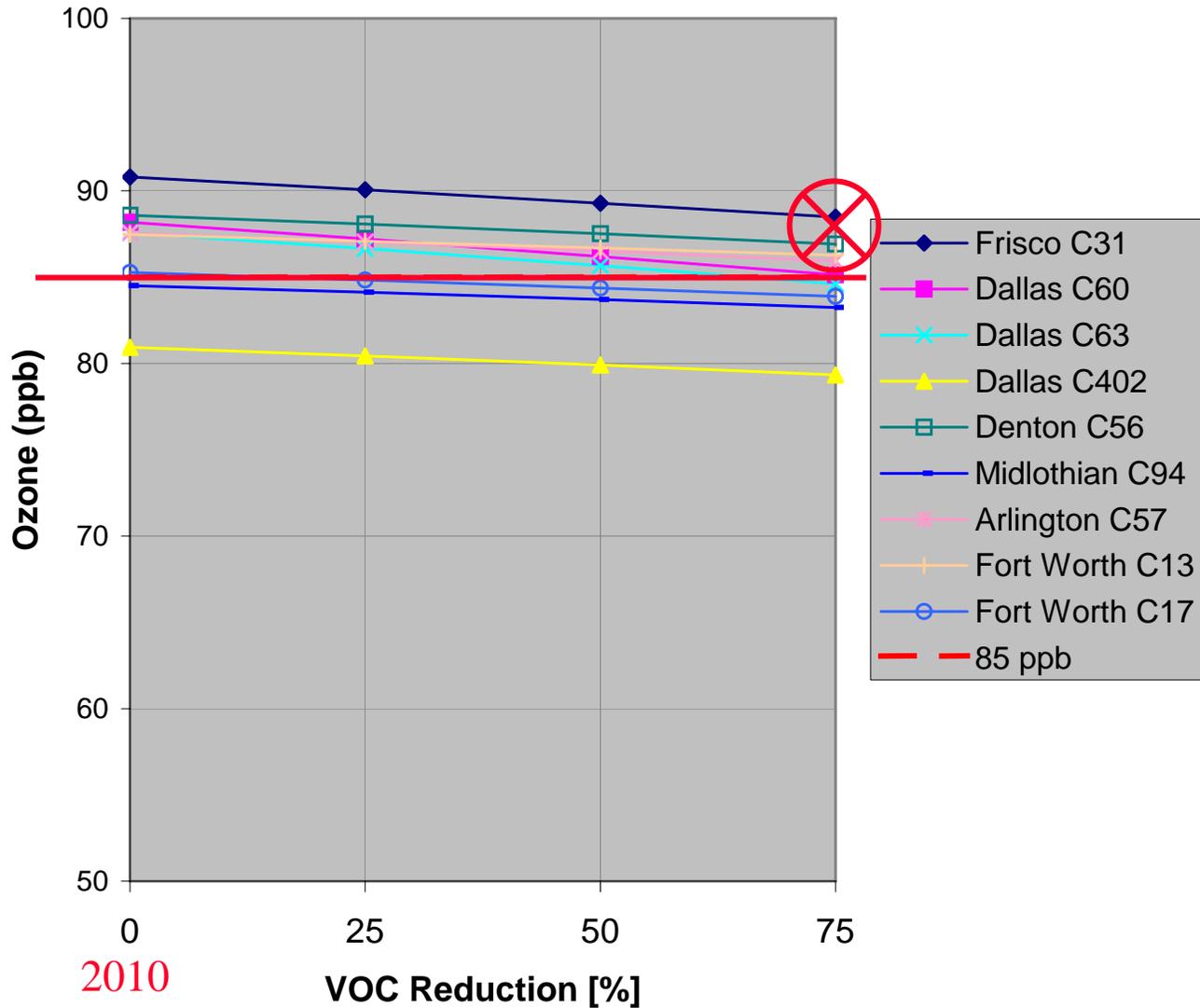
DFW Modeling Projects

- DFW (2010) Response Curves
 - VOC and NO_x Control Requirements
- Future Case (2010) Sensitivity Test
 - East Texas EGU Controls
- 2009 Future Case Modeling Plans

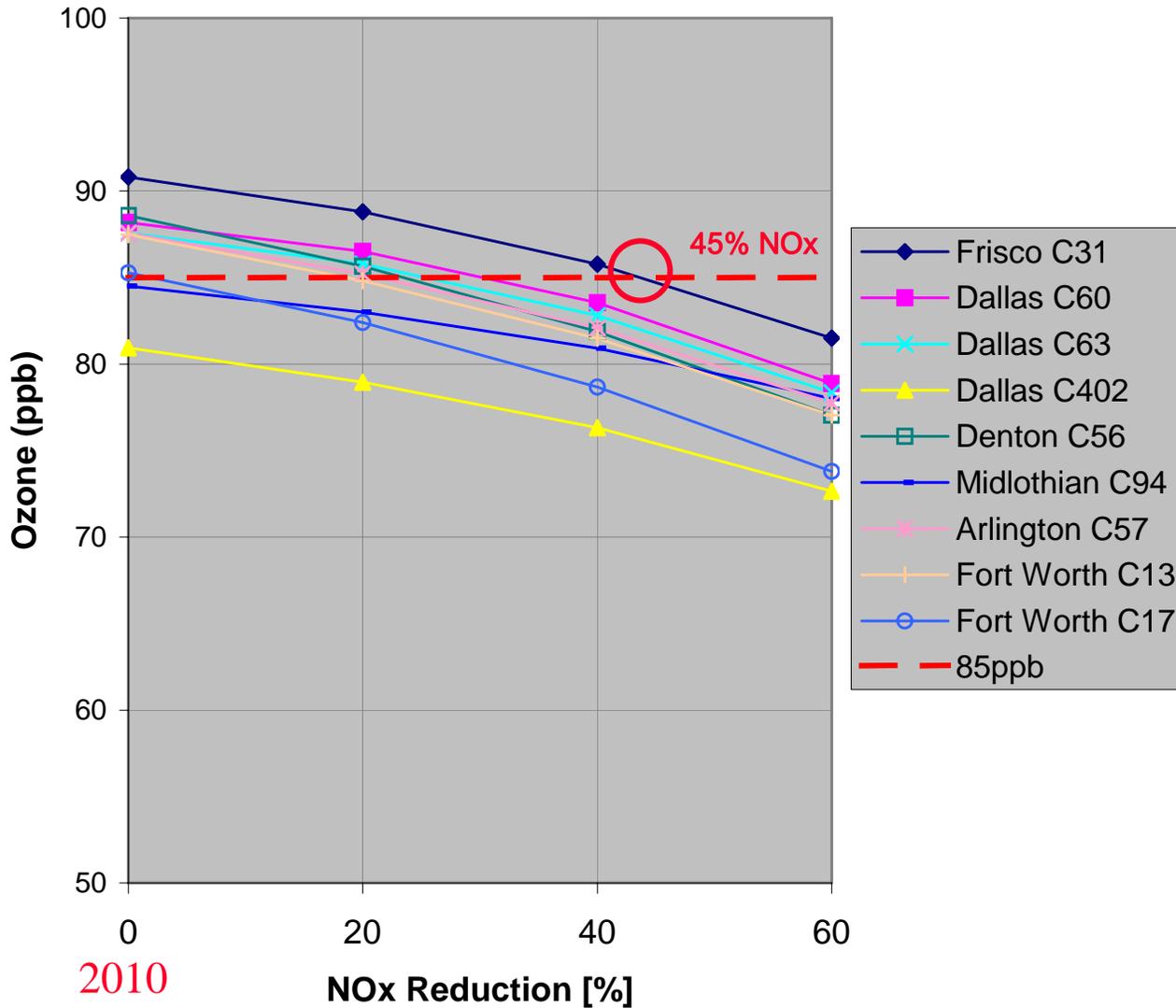
Background

- High background levels of ozone in Texas comprise a large portion of the 8-hour ozone standard.
- Dallas-Fort Worth (DFW), Houston-Galveston-Brazoria (HGB) and Beaumont-Port Arthur (BPA) areas are nonattainment for 8-Hour O₃.
 - San Antonio (SA), Austin (AUS), Tyler-Longview-Marshall (TLM) have Early Action Compacts
 - Corpus Christi and Victoria are considered near-nonattainment.
- Modeling indicates that these areas will be challenged to attain and/or maintain with just local reductions.

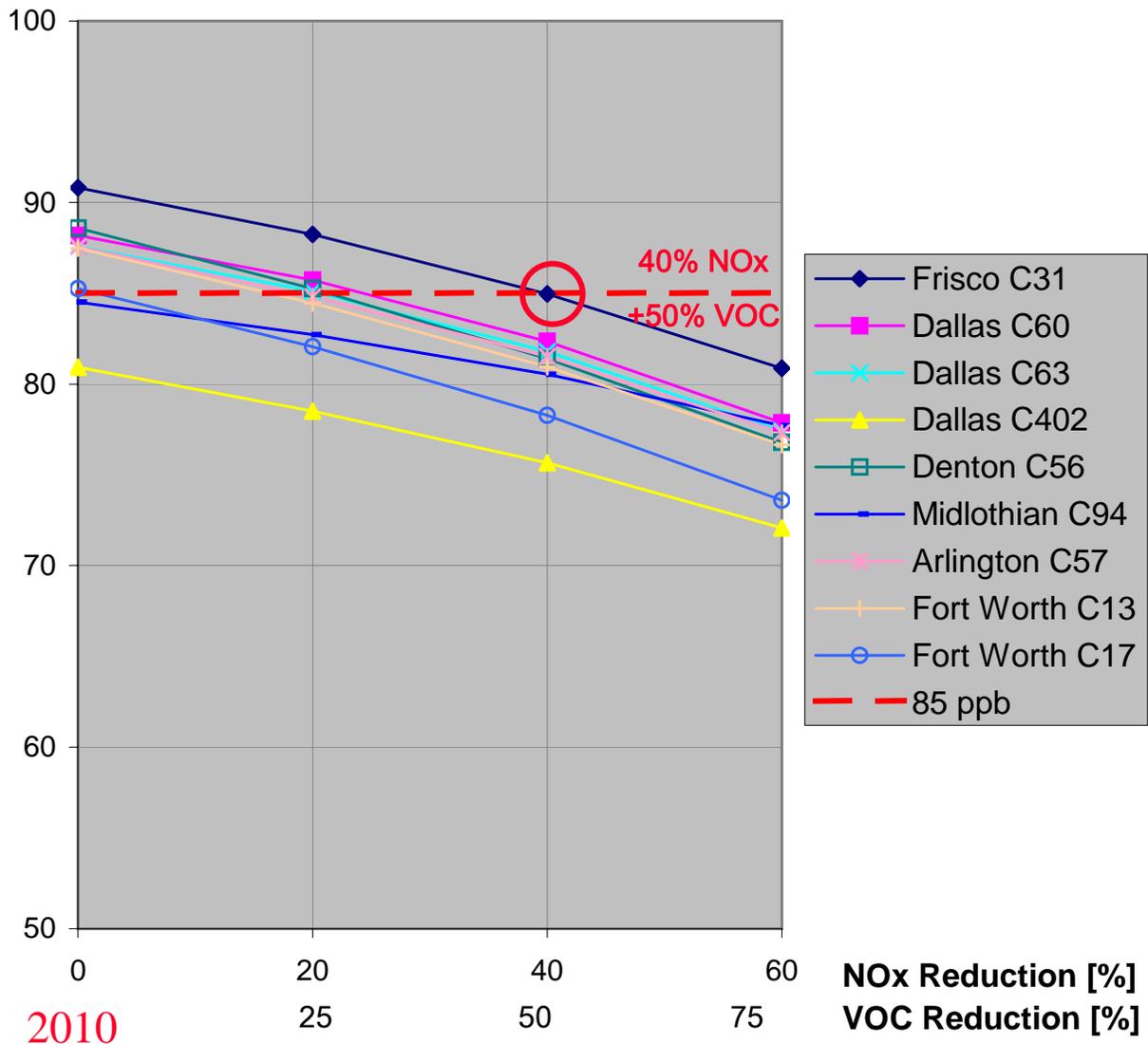
Design Value-Scaled 2010 DFW 8-Hour Ozone VOC Reductions. Aug 13-22, 1999 Core Period.



Design Value Scaled 2010 DFW 8-Hour Ozone NOx Reductions. Aug 13-22, 1999 Core Period.



Design Value-Scaled 2010 DFW 8-Hour Ozone NOx and VOC Reductions. Aug 13-22, 1999 Core Period.



2010

What Will it Take to Attain in DFW?

- The Frisco monitor has a high ‘Current Year’ (1999) Design Value, which results in a relatively high future year DV
 - The 8-hour future Design Value calculated at Frisco is 90.8 ppb
 - Need to reduce ozone by approximately 6 ppb
- Substantial NO_x reductions will be required
 - 45% NO_x Reduction in the DFW 9-county area
- A Combination of NO_x and VOC controls is more effective
 - 40% NO_x Reduction combined with a 50% VOC Reduction

East Texas EGU Controls

- Question: How much difference would it make in the DFW 9-county area if the Houston EGU controls were applied to the other EGUs in East Texas?
 - Houston and Dallas EGU sources have already reduced local emissions by approximately 80-88%
- Run 2010 sensitivity test to determine future case benefit from additional reductions.
 - Reduce emissions from other EGU sources in East Texas to match control levels established for Houston
 - Evaluate the difference plots and numerical data

Controls Applied to East Texas and BPA

HGB EGU ESADs Applied to ETx and BPA					
(as estimated by modelers)					
EGU Unit type	HGB ESAD¹ (lb NOx/MMBtu)	ETx SB7//Ch.117 rules (lb NOX/MMBtu)	BPA Ch.117 rule (lb NOX/MMBtu)	ETx Additional Proposed Reductions	BPA Additional Proposed Reductions
Gas-fired	0.03	0.14	0.10	79%	70%
Coal-fired	0.05	0.165		70%	

ESAD: Emissions Specification for Attainment Demonstration

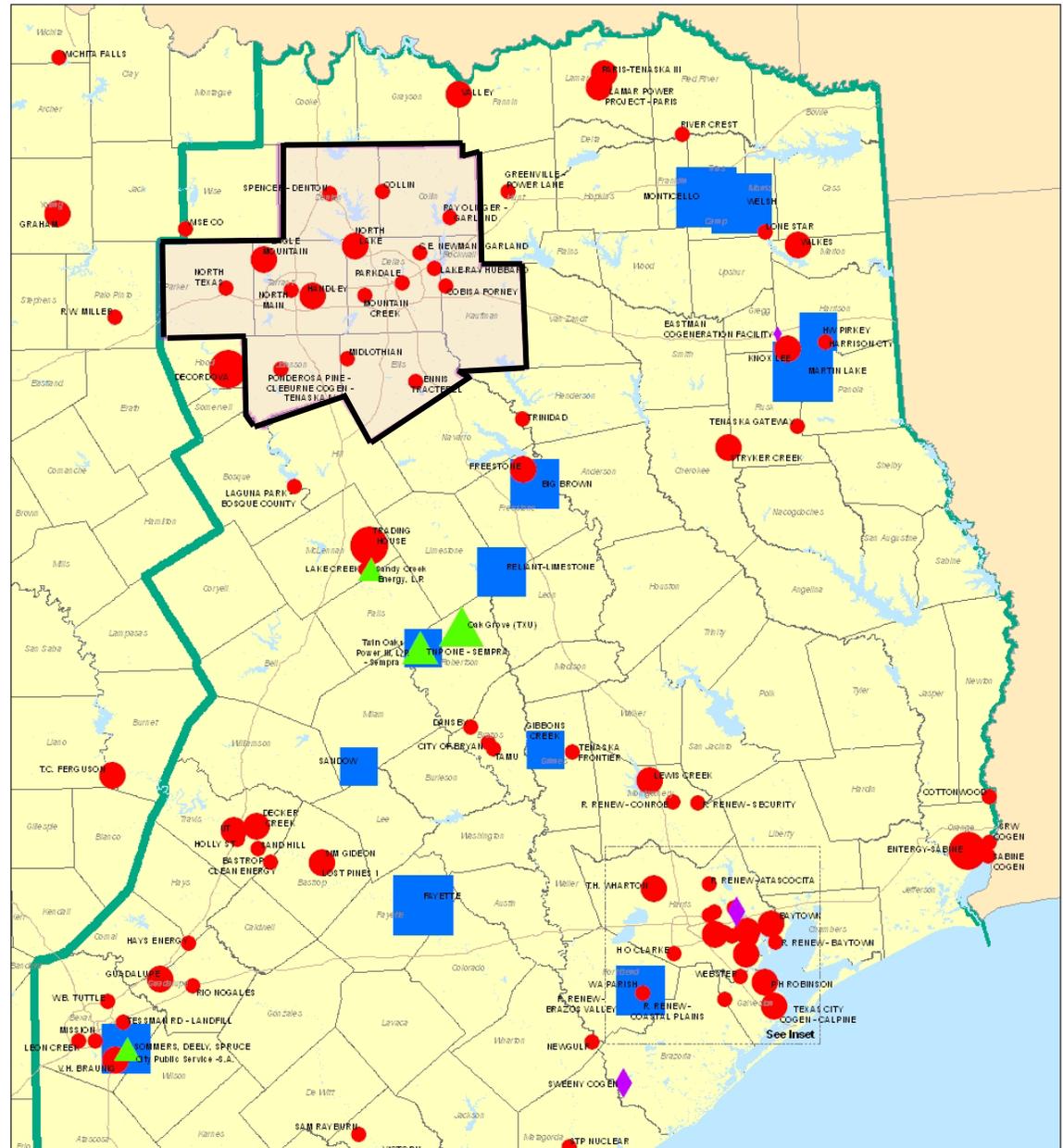
¹ These are the ESADs that apply to most of the EGU emissions in HGB, and are used in this sensitivity as an estimate. Technically, other HGB ESADs apply:

Gas-fired boilers and Auxillary boilers	0.03 lb NOx/MMBtu
Turbines	0.032 lb NOx/MMBtu
Coal or Oil Tangentially-fired boilers	0.045 lb NOx/MMBtu
Coal or Oil Wall-fired boilers	0.05 lb NOx/MMBtu

Texas Power Plant Emissions in E Texas

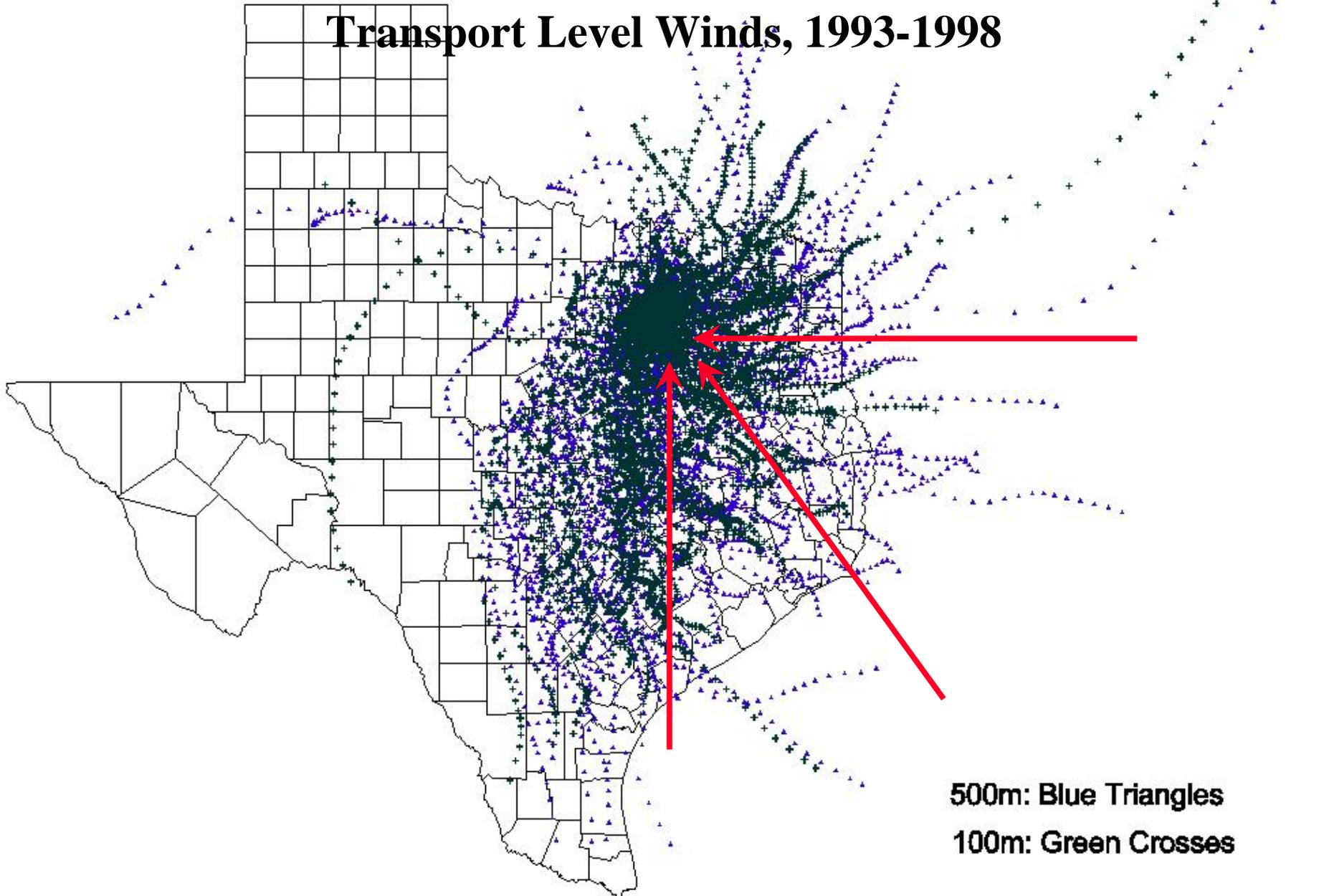
Numerous Electric
Generating Units all
Over eastern Texas
add to rural NOx

Blue – Coal Fired
Red – Gas fired
Purple – CoGen
Green - Proposed



DFW Back Trajectories for 8-Hour Ozone

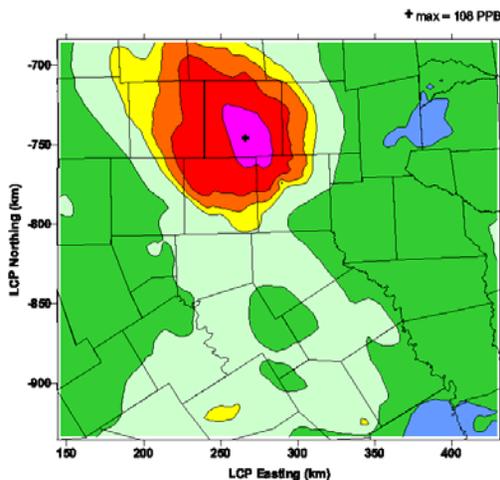
Transport Level Winds, 1993-1998



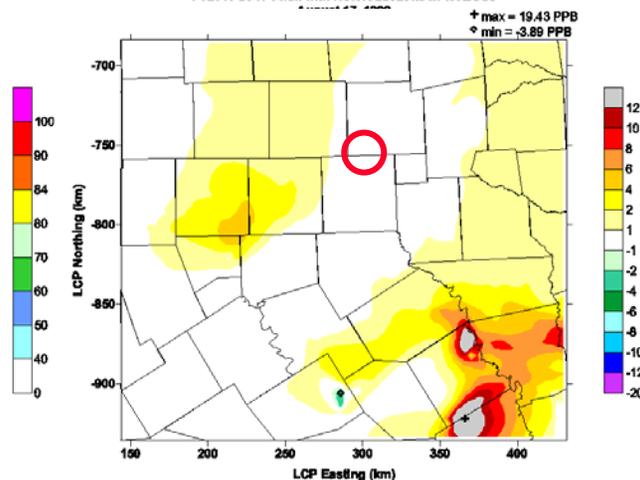
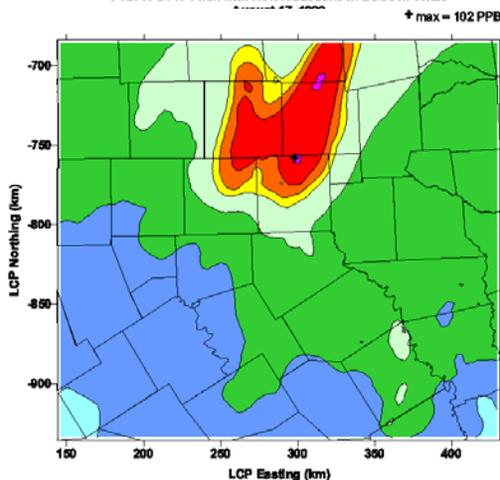
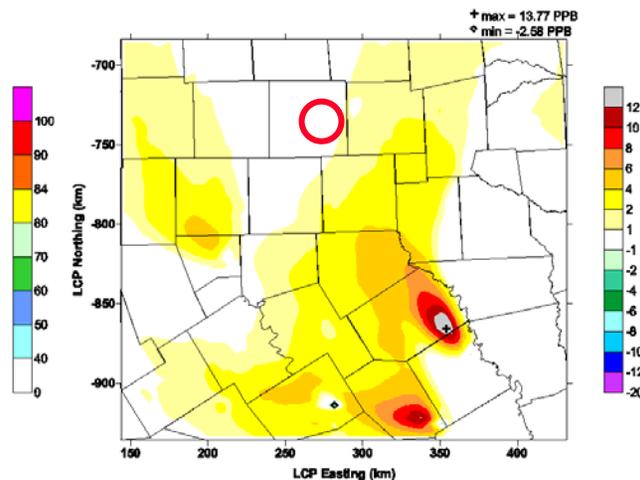
Impact of East TX EGU Controls

DFW Area - August 17th and 18th

Max 8-Hour Ozone



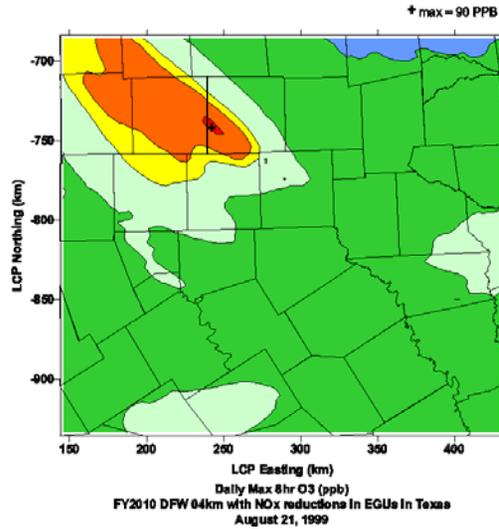
Difference Plot



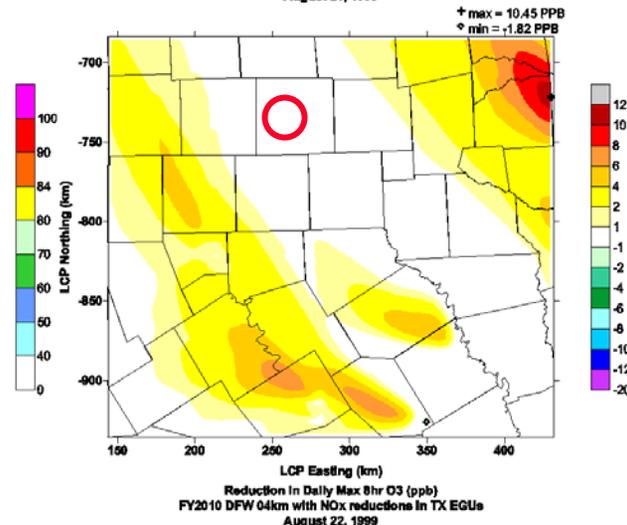
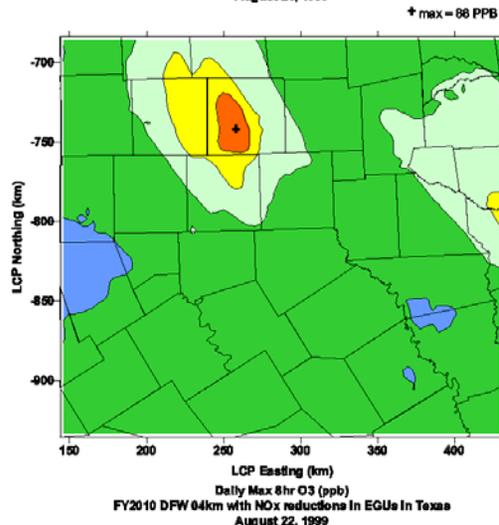
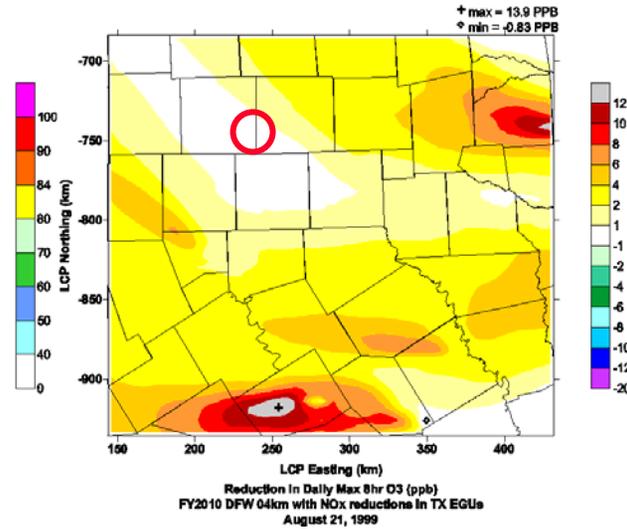
Impact of East TX EGU Controls

DFW Area - August 21st and 22nd

Max 8-Hour Ozone



Difference Plot



DFW 2010 Monitor Specific Benefits from EGU NO_x Reductions

DFW Site	08/15/99	08/16/99	08/17/99	08/18/99	08/19/99	08/20/99	08/21/99	08/22/99	Average
FRIC	-1.03	-1.31	-1.15	-0.47	-1.55	-1.90	-2.39	-0.26	-1.26
ANNA	-5.28	-0.50	-1.39	-0.43	-7.69	-5.76	-3.59	-1.40	-3.26
DHIC	-1.28	-2.14	-1.27	-0.58	-1.13	-0.14	-0.97	-0.24	-0.97
DALN	-1.14	-1.83	-1.55	-0.49	-2.13	-0.21	-1.22	-0.24	-1.10
REDB	-2.17	-3.07	-1.93	-0.54	-0.79	-0.03	-0.88	-0.36	-1.22
LGCK	-0.97	-1.00	-2.50	-0.41	-1.56	-0.06	-1.21	-0.18	-0.99
DENT	-1.26	-1.23	-0.50	-1.45	-0.74	-0.21	-1.29	-0.37	-0.88
MDLT	-3.07	-4.52	-2.67	-0.50	-0.67	-0.04	-2.16	-1.04	-1.83
GRAN	-5.29	-5.25	-4.11	-3.48	-0.48	-0.14	-3.58	-1.76	-3.01
CLEB	-1.88	-2.60	-1.35	-0.67	-0.71	-0.03	-1.94	-2.84	-1.50
KAUF	-2.51	-0.72	-3.46	-0.97	-0.94	-0.04	-1.72	-0.15	-1.31
WTFD	-1.93	-3.79	-1.94	-1.41	-0.79	-0.01	-1.24	-3.02	-1.77
RKWL	-0.70	-0.59	-2.34	-0.40	-1.72	-0.05	-1.75	-0.25	-0.98
ARLI	-2.24	-2.96	-1.38	-0.87	-0.78	-0.11	-0.83	-0.68	-1.23
EMTL	-1.56	-2.05	-0.42	-1.63	-0.69	-0.05	-0.67	-0.62	-0.96
FWMC	-2.12	-2.68	-0.42	-1.95	-0.69	-0.09	-0.72	-0.60	-1.16
KELC	-1.57	-2.30	-0.51	-1.90	-0.78	-0.18	-0.62	-0.51	-1.05
GRAP	-1.25	-1.47	-0.57	-1.31	-0.85	-0.45	-0.90	-0.31	-0.89
Average	-2.07	-2.22	-1.64	-1.08	-1.37	-0.53	-1.54	-0.82	-1.41

The average reduction for all days over all the DFW monitors was
1.41 ppb

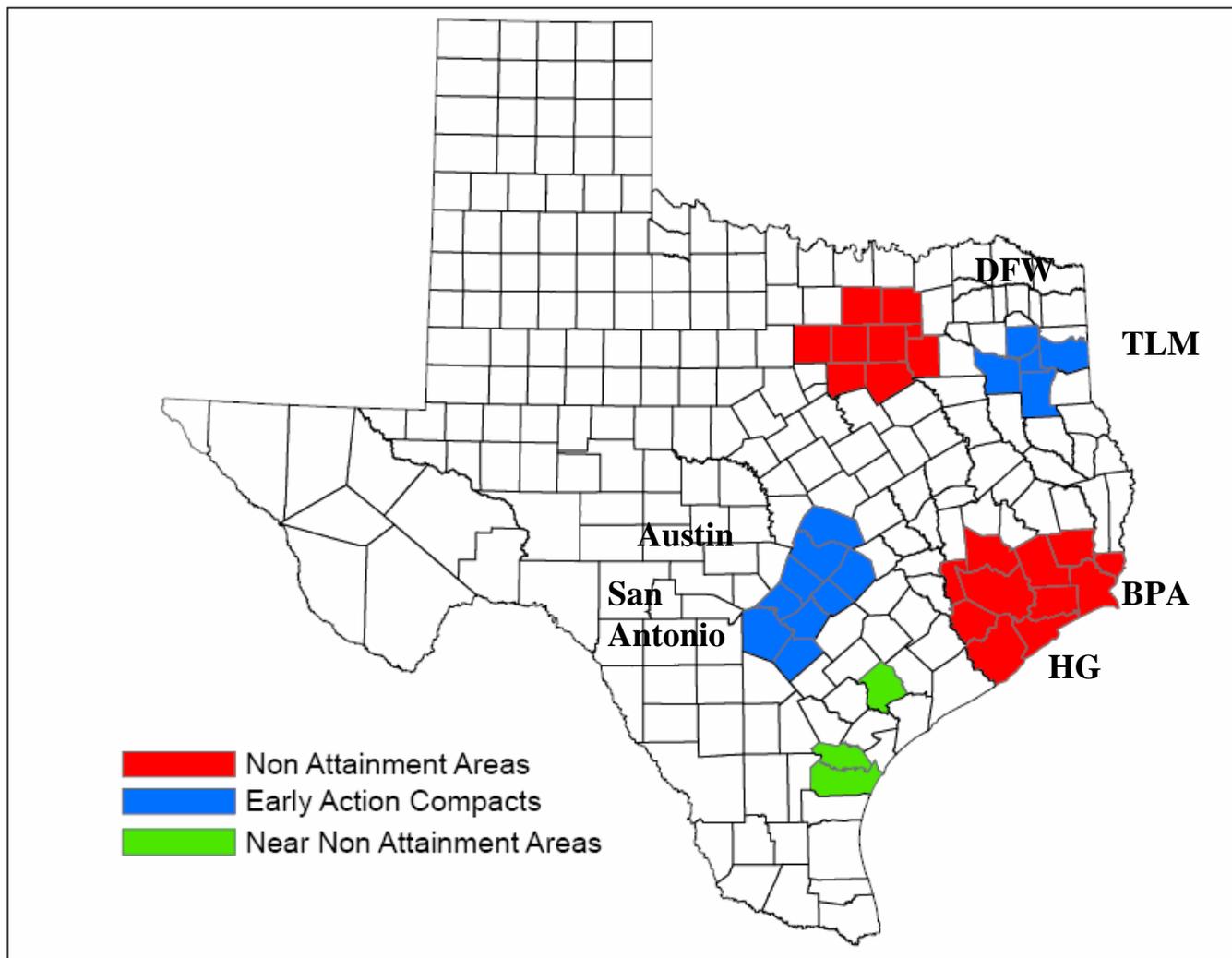
DFW 2010 Monitor Specific Benefits on 'High' Days

DFW Site	08/15/99	08/16/99	08/17/99	08/18/99	08/19/99	08/20/99	08/21/99	08/22/99	Average
FRIC	---	-1.31	-1.15	-0.47	---	---	---	---	-0.98
ANNA	---	---	---	-0.43	-7.69	---	---	---	-4.06
DHIC	---	-2.14	-1.27	-0.58	-1.13	---	---	---	-1.28
DALN	---	-1.83	-1.55	-0.49	-2.13	---	---	---	-1.50
REDB	---	---	-1.93	-0.54	-0.79	-0.03	---	---	-0.82
LGCK	---	---	---	-0.41	-1.56	---	---	---	-0.98
DENT	---	-1.23	-0.50	-1.45	---	---	-1.29	-0.37	-0.97
MDLT	---	---	---	---	-0.67	-0.04	---	---	-0.36
GRAN	---	---	---	---	-0.48	---	---	---	-0.48
CLEB	---	---	---	---	-0.71	-0.03	---	---	-0.37
KAUF	---	---	---	---	-0.94	---	---	---	-0.94
WTFD	-1.93	---	---	---	---	---	-1.24	---	-1.58
RKWL	---	---	---	-0.40	---	---	---	---	-0.40
ARLI	---	-2.96	-1.38	---	-0.78	-0.11	---	---	-1.31
EMTL	-1.56	-2.05	-0.42	---	---	---	-0.67	-0.62	-1.06
FWMC	---	-2.68	-0.42	-1.95	---	---	---	---	-1.68
KELC	-1.57	-2.30	-0.51	-1.90	---	---	-0.62	-0.51	-1.24
GRAP	-1.25	-1.47	-0.57	-1.31	---	---	-0.90	-0.31	-0.97
Average	-1.58	-2.00	-0.97	-0.90	-1.69	-0.05	-0.94	-0.45	-1.07

The average reduction for all days over all 'high' DFW monitors

(> 80 ppb) was 1.07 ppb.

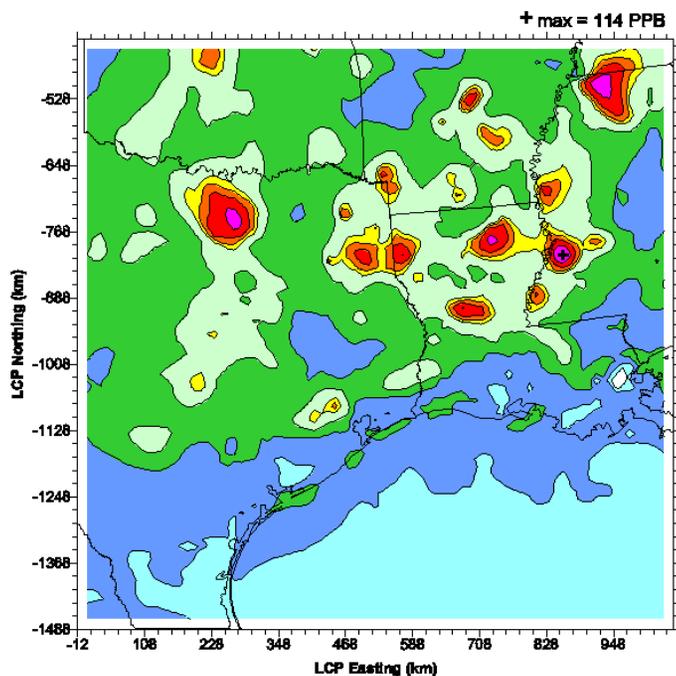
What Impact will the Proposed Controls have in other Areas?



Impact of East TX EGU Controls

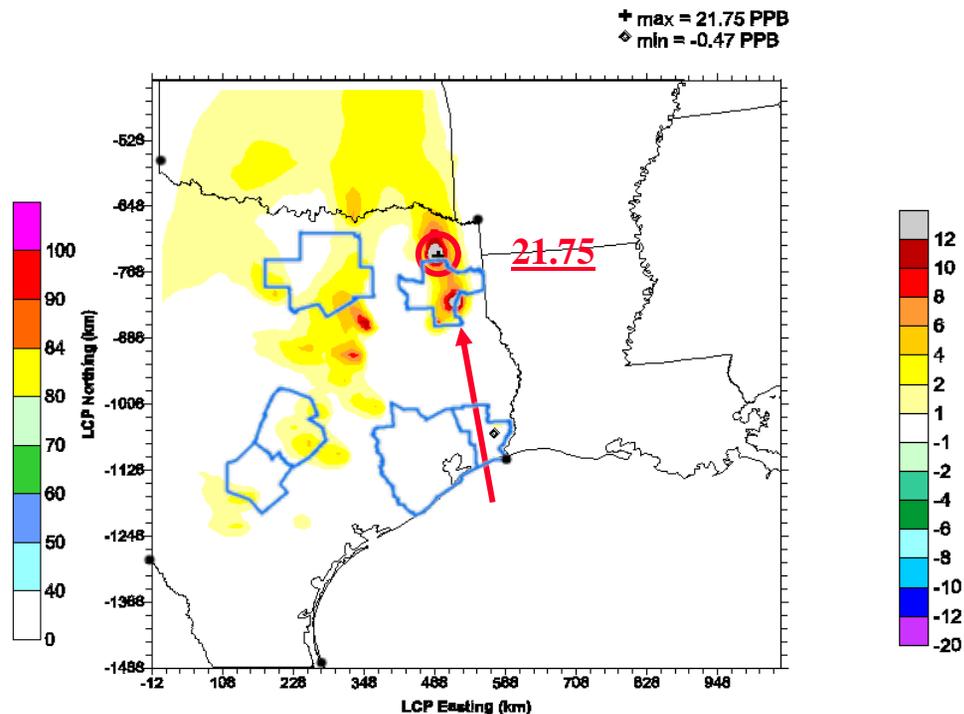
East Texas Impacts - August 17th

Max 8-Hour Ozone



Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in EGUs in Texas
August 17, 1999

Difference Plot

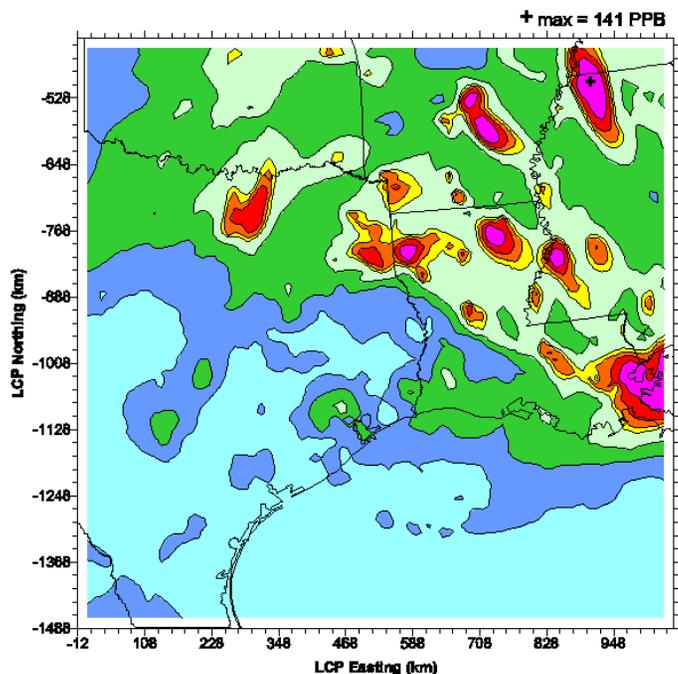


Reduction in Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in TX EGUs
August 17, 1999

Impact of East TX EGU Controls

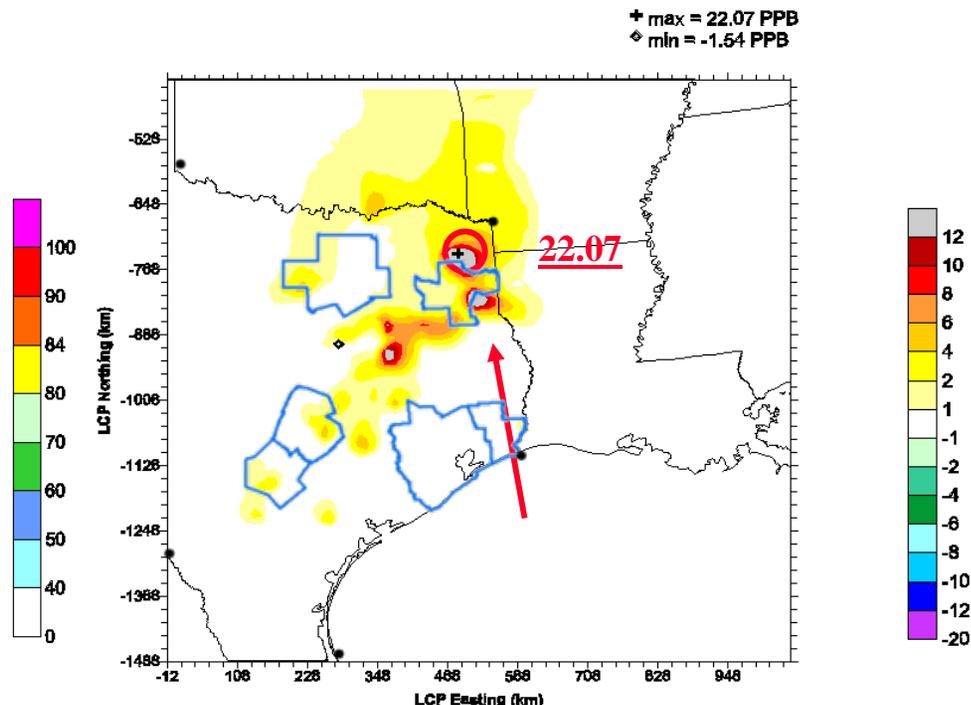
East Texas Impacts - August 18th

Max 8-Hour Ozone



Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in EGUs in Texas
August 18, 1999

Difference Plot

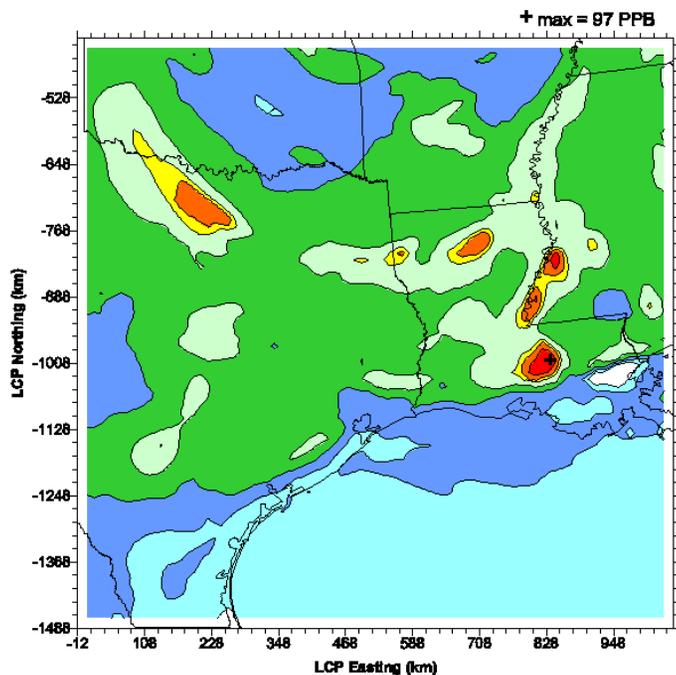


Reduction in Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in TX EGUs
August 18, 1999

Impact of East TX EGU Controls

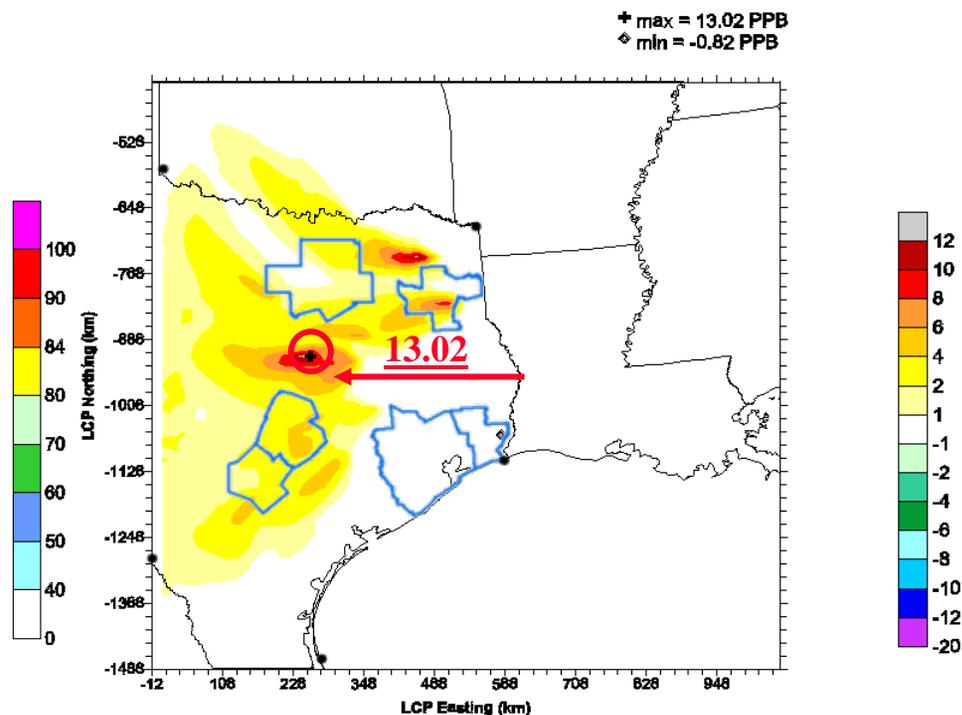
East Texas Impacts - August 21st

Max 8-Hour Ozone



Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in EGUs in Texas
August 21, 1999

Difference Plot

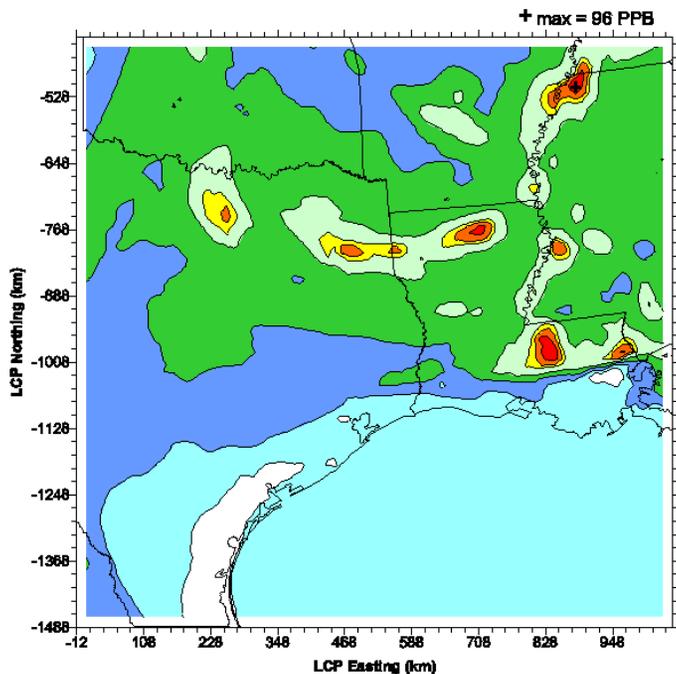


Reduction in Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in TX EGUs
August 21, 1999

Impact of East TX EGU Controls

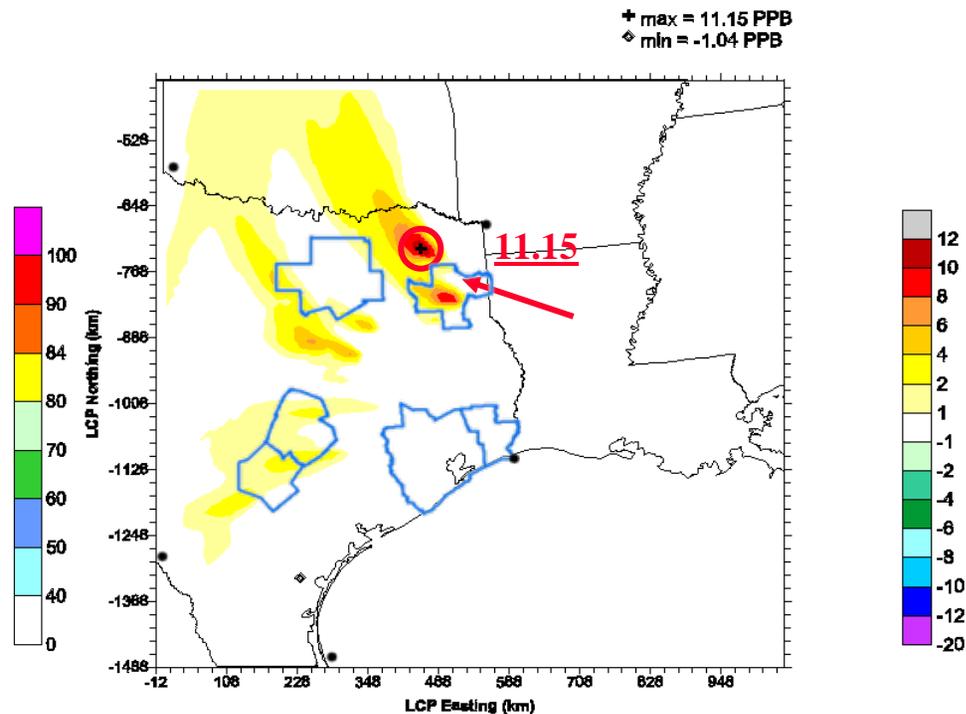
East Texas Impacts - August 22nd

Max 8-Hour Ozone



Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in EGUs in Texas
August 22, 1999

Difference Plot



Reduction in Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with NOx reductions in TX EGUs
August 22, 1999

What Areas in East Texas Get the Biggest Benefits?

Episode Day	Peak 8-Hour Ozone	Max Difference Downwind	East Texas Location
Aug 15	97	-12.71	NE Texas
Aug 16	111	-16.02	NE Texas
Aug 17	114	-21.75	NE Texas
Aug 18	141	-22.07	NE Texas
Aug 19	130	-13.11	NE Texas
Aug 20	107	-11.24	NE Texas
Aug 21	97	-13.02	Central Texas
Aug 22	96	-11.15	NE Texas

The average of the maximum differences in East Texas was 15.13 ppb

NNA 2010 Monitor Specific Benefits from EGU NO_x Reductions

NNA Site	08/15/99	08/16/99	08/17/99	08/18/99	08/19/99	08/20/99	08/21/99	08/22/99	Average
ANWA	-3.66	-2.58	-1.50	-0.50	-1.14	-1.95	-2.92	-1.85	-2.01
AUDU	-2.71	-1.67	-0.83	-0.40	-0.83	-2.21	-2.21	-1.61	-1.56
BOER	-1.60	-0.45	-0.25	-1.42	-2.05	-1.46	-1.59	-1.23	-1.26
CALA	-2.90	-3.71	-2.09	-2.23	-1.09	-0.92	-3.89	-1.80	-2.33
SAWC	-2.30	-0.82	-0.41	-1.58	-2.48	-1.25	-1.77	-1.34	-1.49
TYLA	-4.86	-1.20	-0.14	-1.41	-1.06	-6.09	-4.52	-1.52	-2.60
GUGC	-4.06	-6.88	-7.39	-2.13	-4.38	-2.10	-4.59	-9.20	-5.09
T04A	-0.12	0.09	-0.17	0.00	0.54	0.13	0.14	0.69	0.16
T21A	-0.17	0.00	-0.14	0.11	0.07	-0.14	-0.06	-0.02	-0.04
VCTC	-0.41	-0.29	-0.04	-0.22	-0.99	-1.01	-0.04	0.94	-0.26
Average	-2.28	-1.75	-1.30	-0.98	-1.34	-1.70	-2.15	-1.69	-1.65

The average reduction for all days over all the NNA monitors was
1.65 ppb

NNA 2010 Monitor Specific Benefits on 'High' Days

NNA Site	08/15/99	08/16/99	08/17/99	08/18/99	08/19/99	08/20/99	08/21/99	08/22/99	Average
ANAC	—	-2.58	-1.50	—	—	—	—	—	-2.04
ALDU	—	-1.67	-0.83	—	—	—	—	—	-1.25
BOER	—	—	—	—	—	—	—	—	—
CALA	—	—	—	—	—	—	—	—	—
SAWC	—	—	—	—	—	—	-1.77	—	1.77
TYLA	—	—	—	—	—	—	-4.52	—	-4.52
GGGC	—	-6.88	-7.39	-2.13	-4.38	—	-4.59	-9.20	-5.76
T047	—	—	—	—	—	—	—	—	—
T21A	—	—	—	—	—	—	—	—	—
VCTC	—	—	—	—	—	—	—	—	—
Average	—	-3.71	-3.24	-2.13	-4.38	—	-3.63	-9.20	-4.38

The average reduction for 'high' days at all the the NNA monitors
was 4.38 ppb

Impact of EGU NO_x Reductions

- Additional NO_x reductions applied to East Texas EGUs in 2010 lead to widespread reductions in DFW 8-hour ozone on all days.
 - The largest ozone reductions occur primarily in central and northeast Texas, but benefits extend into the DFW area on all days
 - DFW benefits on all days average 1.41 ppb
 - DFW benefits on ‘high’ days average 1.07 ppb
- Additional NO_x reductions also reduce ozone in other areas of Texas.
 - Max Differences in East Texas average 15.13 ppb
 - Benefits at NNAs on ‘high’ days average 4.38 ppb

Change in DFW 2010 Design Value from EGU NO_x Reductions

Site	Projected 2010 Design Value (ppb)		
	Future Base Case	EGU NO _x Control	EGU NO _x Benefit
Frisco C31	90.8	89.5	-1.3
Dallas C60	88.2	87.3	-0.9
Dallas C63	87.6	86.6	-1.0
Dallas C402	80.9	79.9	-1.0
Denton C56	88.6	87.8	-0.8
Midlothian C94	84.5	82.9	-1.6
Arlington C57	87.6	86.3	-1.3
Fort Worth C13	87.5	86.4	-1.1
Fort Worth C17	85.3	84.4	-0.9

The average reduction over all the DFW monitors was 1.1 ppb

What's Next?

- Finalize 2009 Emissions Inventory
 - Mobile Source Update (base and 2009)
 - Point, Area/Nonroad (2009)
- Modeling Plans
 - Redo 1999 Base Case with Weekend Mobile Emissions
 - Run 2009 Future Base, Get Future DV
 - Evaluate Impact of Transport (CENRAP 2002)
 - Run Sensitivity Tests on Texas Regional Controls
 - Run DFW Specific Local Control Packages