



DFW Future Case Modeling

2009 Update
and

Recent Sensitivity Tests

Pete Breitenbach

Photochemical Modeling Technical
Committee

NCTCOG

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Overview

1. 2009 Future Case Update

- New run named Run44.fy2009(a1)
- EGUs now based upon 2005 Acid Rain Data
- Mobile, Area, Nonroad, and Bio unchanged

2. Future Case Sensitivity Tests

- Determine effectiveness of different options
- Test controls inside DFW 9-County area and
- Test Regional Controls outside DFW



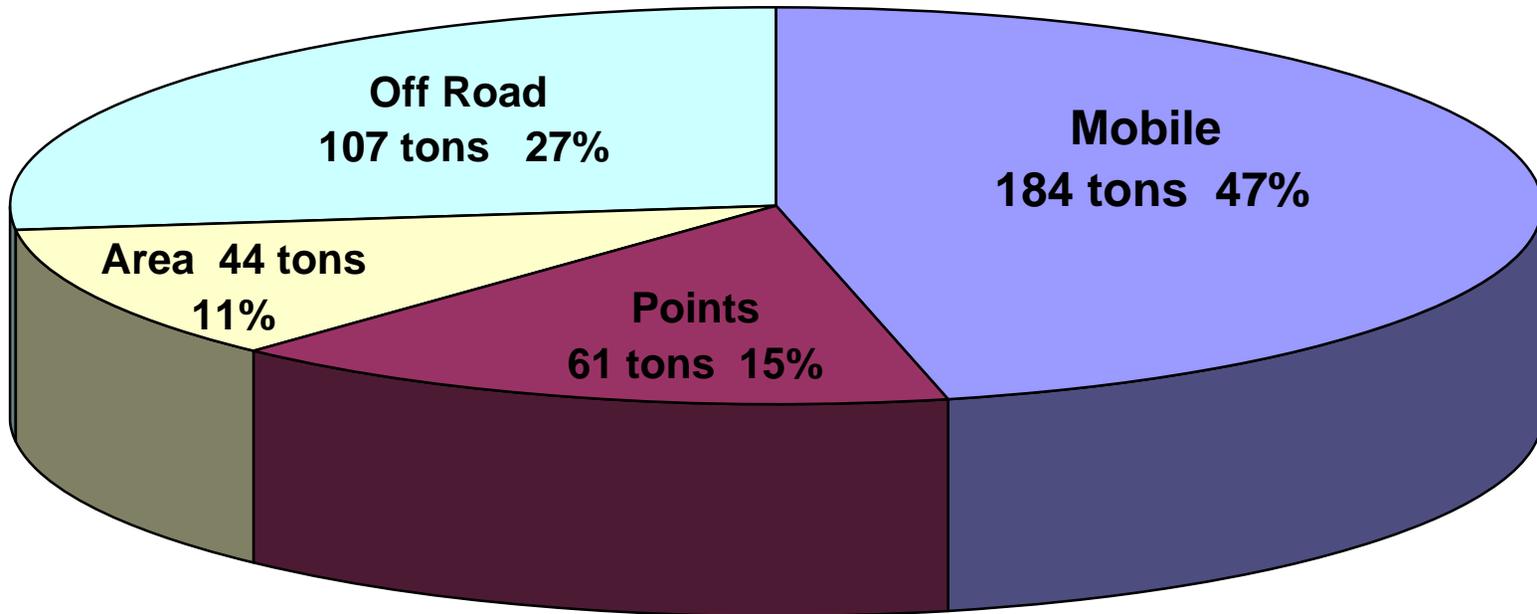
Part 1. Future Case Update

- Future Case 2009 Point Sources based upon 2005 Acid Rain Data. Other emissions were not changed.
 - As a result of the Point Source Acid Rain update, Texas NO_x emissions were reduced by 168 tons/day (-5.1%)
 - DFW 9-County Point Source NO_x Emissions were reduced by 26 tons/day (-6.4%) lower than before

NO _x Emissions used in Run44.fy2009.a1					
	Mobile	Points	Area	NonRoad	Total
DFW 9-cty	184	61	44	107	396
Texas	904	1,192	534	501	3,133
National	913	10,474	543	509	36,308



DFW 9-County Future Case (2009) NO_x Emissions Model Run44.fy2009.a1



**DFW Total 9-County Anthropogenic NO_x = 396 tons/day
6.4% less than in previous 2009.a0 model run**

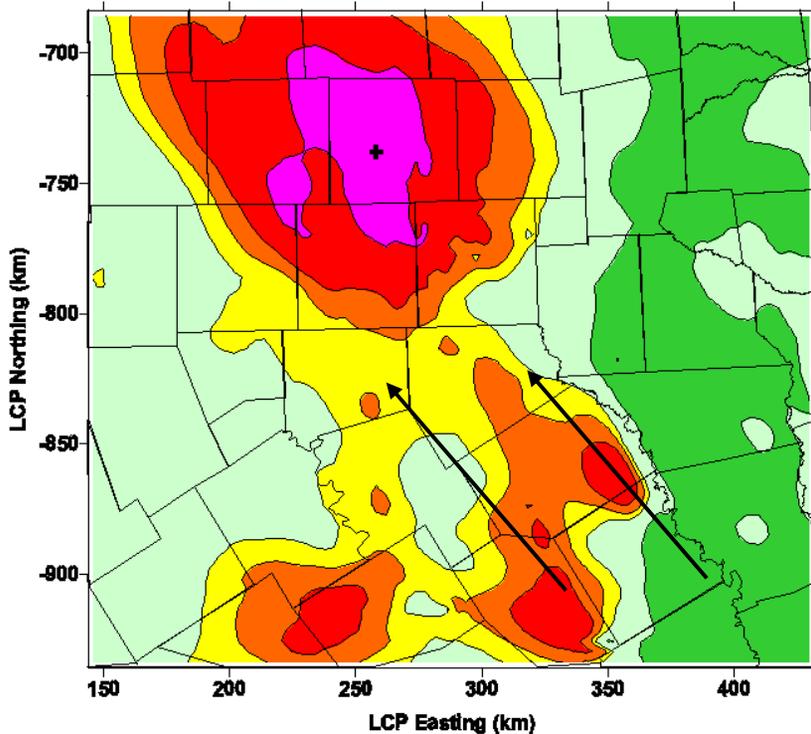


Baseline vs Future Ozone

Tuesday, August 17, 1999

1999 Baseline Run 44

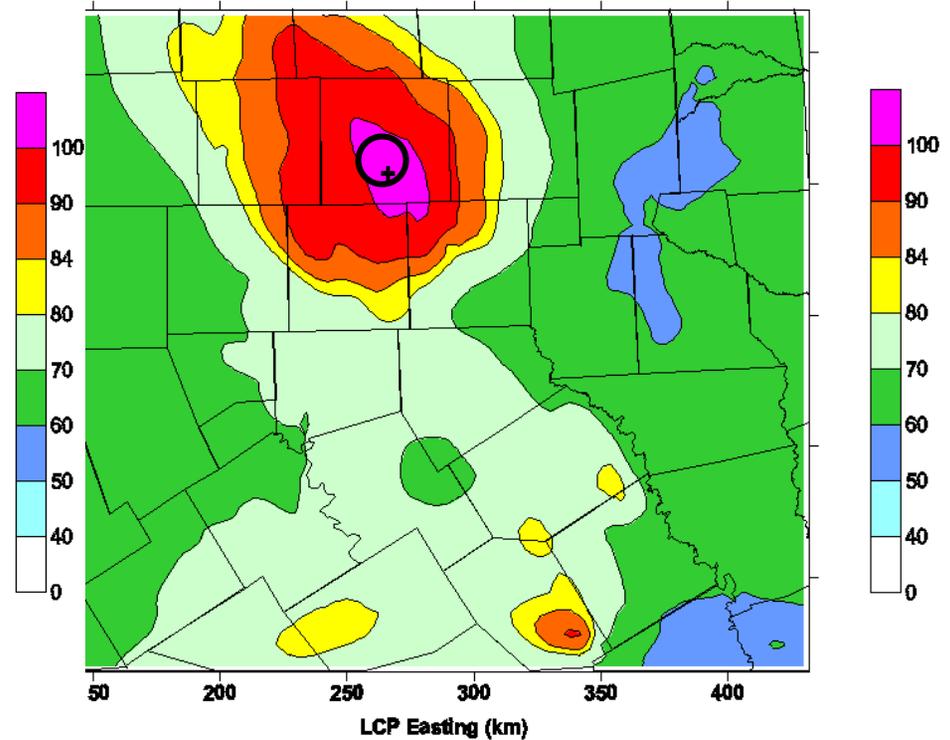
+ max = 108 PPB



Daily Max 8hr O3 (ppb)
DFW Baseline Run 44. 04km.
August 17, 1999

Run 44.fy2009.a1

+ max = 107 PPB



Daily Max 8hr O3 (ppb)
DFW Baseline for FY2009. Run 44.fy2009.a1 04km
August 17, 1999 for FY2009

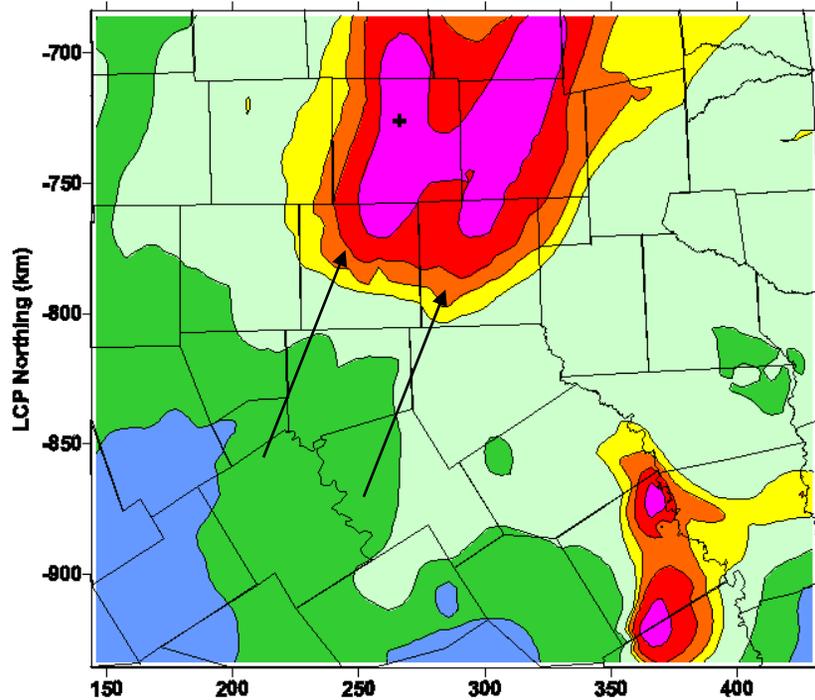


Baseline vs Future Ozone

Wednesday, August 18, 1999

1999 Baseline Run 44

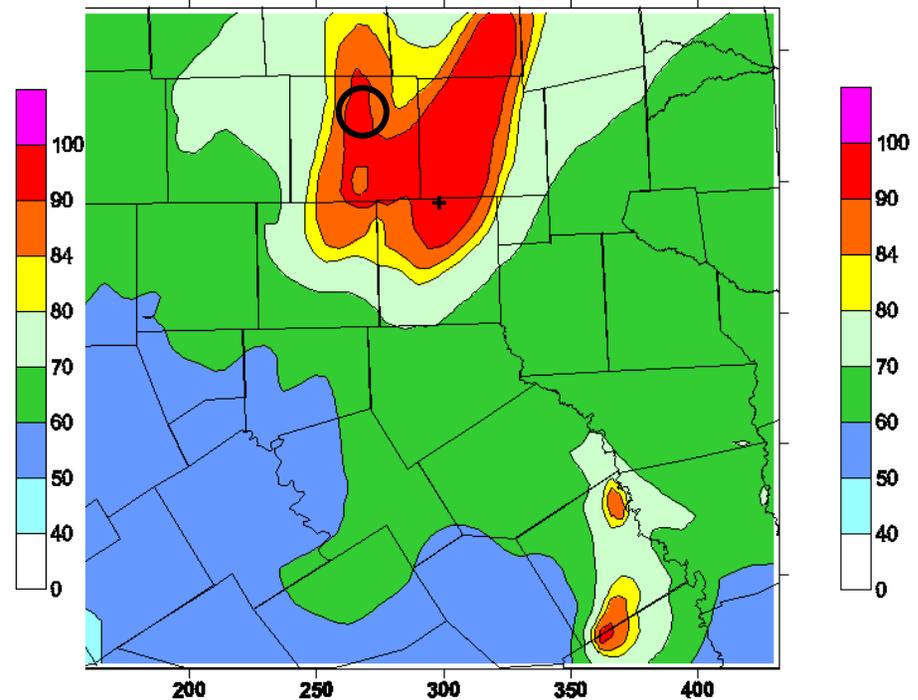
+ max = 113 PPB



LCP Easting (km)
Daily Max 8hr O3 (ppb)
DFW Baseline Run 44. 04km.
August 18, 1999

Run 44.fy2009.a1

+ max = 100 PPB



LCP Easting (km)
Daily Max 8hr O3 (ppb)
DFW Baseline for FY2009. Run 44.fy2009.a1 04km
August 18, 1999 for FY2009

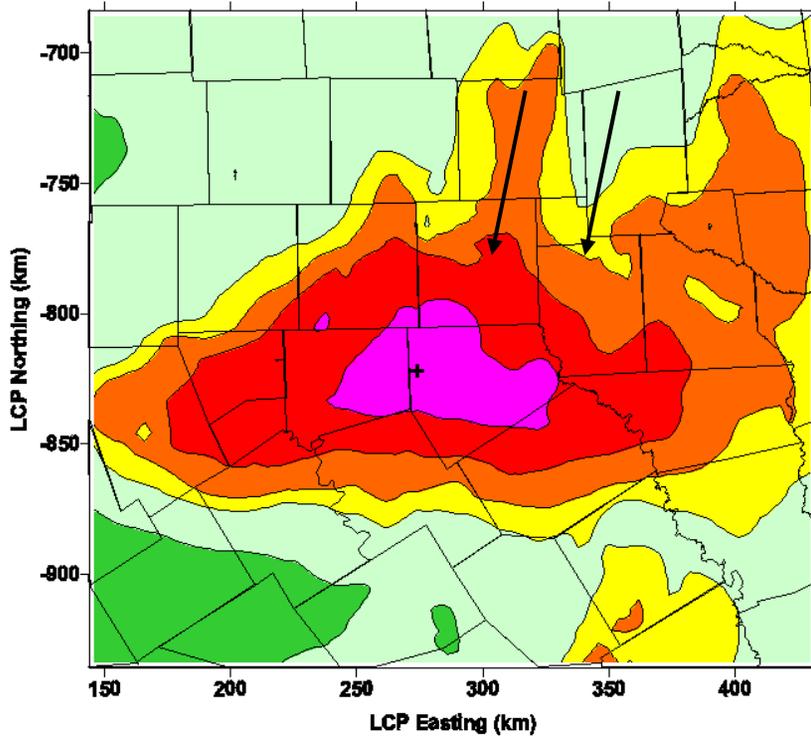


Baseline vs Future Ozone

Thursday, August 19, 1999

1999 Baseline Run 44

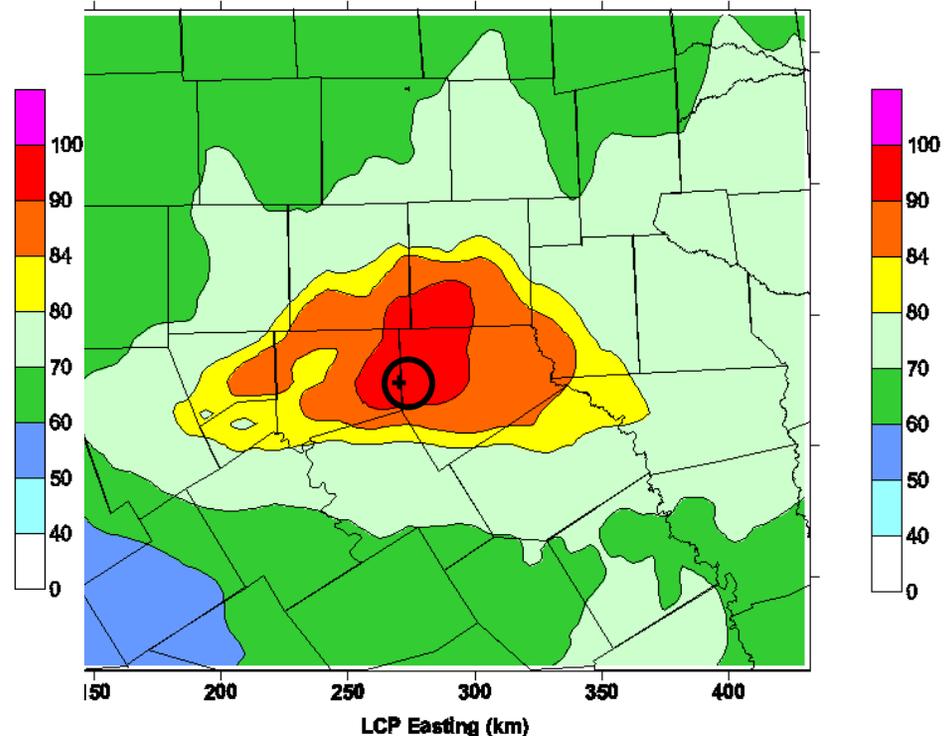
+ max = 112 PPB



Daily Max 8hr O3 (ppb)
DFW Baseline Run 44. 04km.
August 19, 1999

Run 44.fy2009.a1

+ max = 97 PPB



Daily Max 8hr O3 (ppb)
DFW Baseline for FY2009. Run 44.fy2009.a1 04km
August 19, 1999 for FY2009

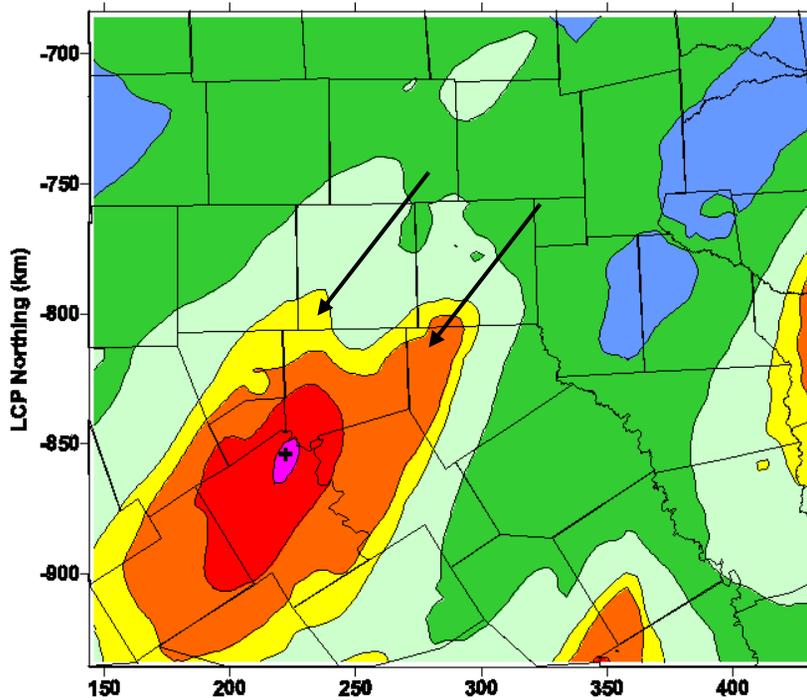


Baseline vs Future Ozone

Friday, August 20, 1999

1999 Baseline Run 44

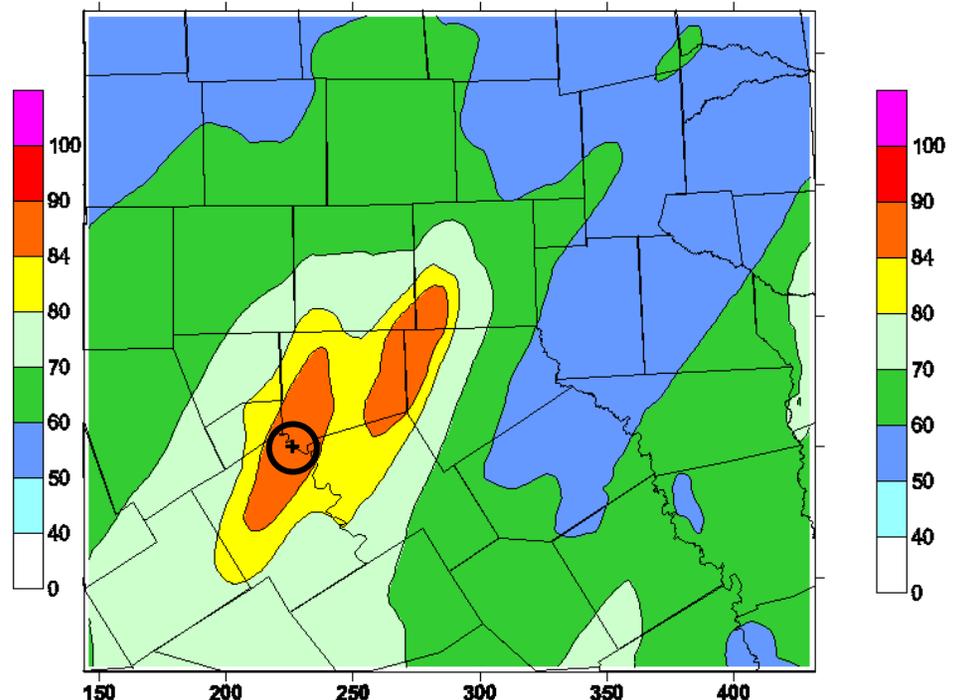
+ max = 101 PPB



Daily Max 8hr O3 (ppb)
DFW Baseline Run 44. 04km.
August 20, 1999

Run 44.fy2009.a1

+ max = 89 PPB



Daily Max 8hr O3 (ppb)
DFW Baseline for FY2009. Run 44.fy2009.a1 04km
August 20, 1999 for FY2009

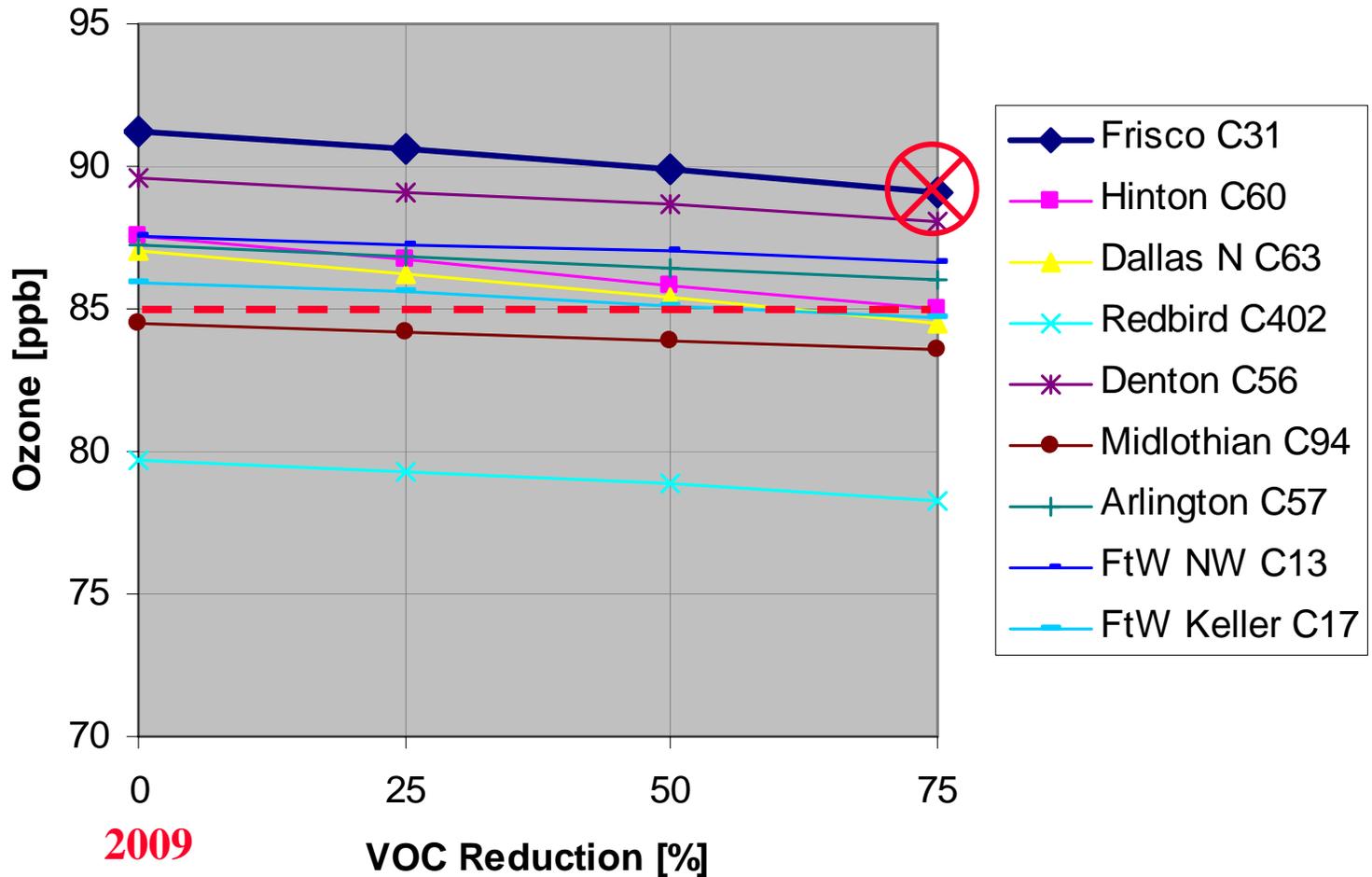


Updated Future Design Values

Site	2009.a0 run	2009.a1 run
Frisco C31	91.9	91.2
Hinton C60	88.0	87.6
Dallas N C63	87.9	87.0
Redbird C402	80.5	79.7
Denton C56	90.7	89.6
Midlothian C94	85.4	84.5
Arlington C57	88.4	87.2
FtW NW C13	88.9	87.6
FtW Keller C17	86.9	86.0

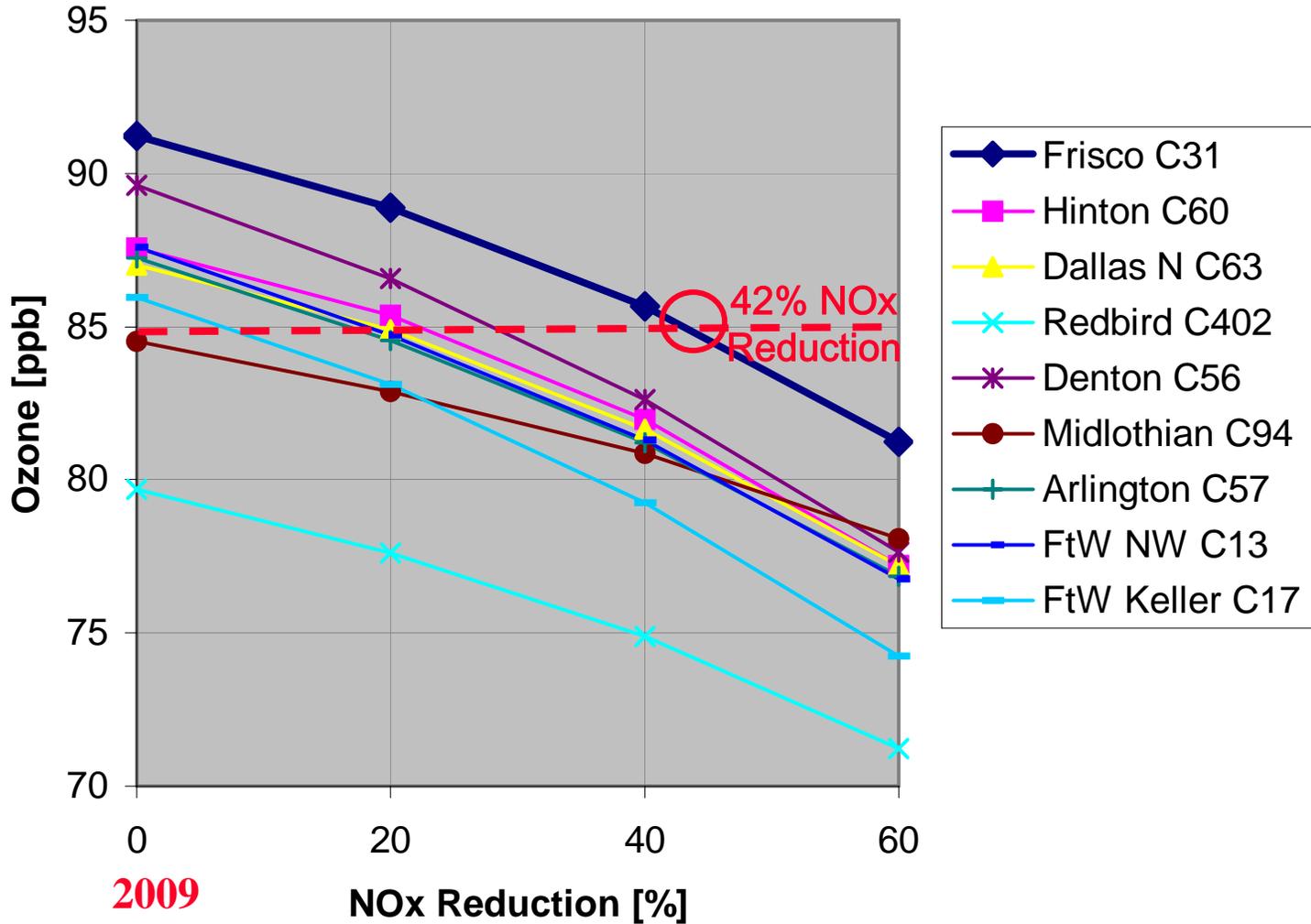


DFW 2009 Design Value Scaled 8-Hour Ozone. VOC Reductions. Run44.fy2009.a1 Aug 13-22, 1999



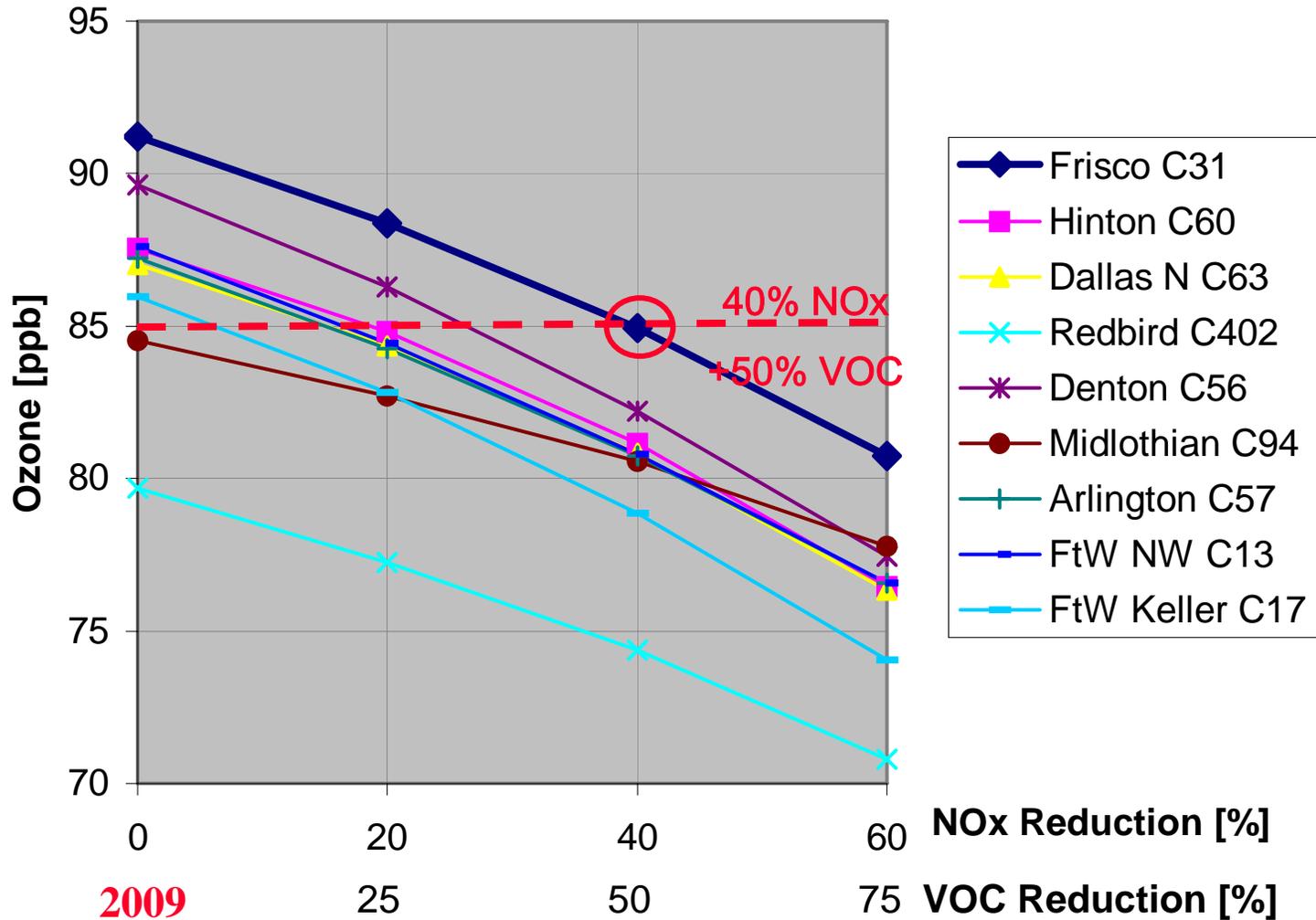


DFW 2009 Design Value Scaled 8-Hour Ozone. NOx Reductions. Run44.fy2009.a1 Aug 13-22, 1999





DFW 2009 Design Value Scaled 8-Hour Ozone. NOx and VOC Reductions. Run44.fy2009.a1 Aug 13-22, 1999





How Much Reduction Do We Need?

Updated Future Case (Run 44.fy2009.a1)			
Ozone Precursor	Reduction Required (%)	9-County Emissions Inventory	Reduction Required (Tons)
VOC	---	333 Tons	---
NO _x	42%	396 Tons	166.3 Tons
NO _x + VOC	40%	396 Tons	158.4 Tons
	50%	333 Tons	166.5 Tons



Conclusion: Minor Changes

- Ozone is still more sensitive to NO_x reductions than to VOC reductions.
 - A 20% NO_x reduction is more effective than a 50% VOC reduction.
- Frisco continues to be the most difficult monitor.
 - The Future Design value at Frisco is 91.2 ppb.
 - It will take about 6.2 ppb of ozone reduction to meet the standard
- Frisco now requires a 42% NO_x reduction to reach attainment (previously 47%).
 - The new target for NO_x reductions inside the DFW 9-county area is 166 tons per day. (previously 198 tpd)



Part 2. Sensitivity Tests

- Future Case Sensitivities
 - ✓ Texas EGU NO_x Emissions (2010)
 - Texas New/Retired EGUs (2010)
 - DFW Cement Kilns (Hi/Lo)
 - East Texas Engine Rules
 - DFW 9-County Major Sources
 - NCTCOG Local Controls



Sensitivity Test Summary

- Purpose of sensitivity tests is to determine how the model responds to reductions.
 - Need to know whether a potential strategy is worth pursuing
- Purpose of control strategy tests is to determine how model responds to rules.
 - Need to aggregate enough rule based controls to show attainment



DFW New/Retired EGUs

Purpose: Evaluate combined impact of adding new EGUs and retiring some old ones in 2010 modeling.

Results:

- New Facilities create hot spot in central Texas
- Old facilities smaller, spread out over Texas
- Increased NO_x emissions from proposed facilities outweigh the decreases from retired facilities
- The proposed EGUs increased the Future DV at Frisco by +0.1 ppb

Proposed Controls	Emissions Changes		Results in DFW Area		
	NO _x (tpd)	VOC (tpd)	Avg Change @ Monitors	Avg Change @ Frisco	Change in Exc Area
New EGUs	+55.7	+3.1	+0.1 ppb	+0.1 ppb	---
Retired EGUs	-17	-0.4	-0.06 ppb	0.0 ppb	---
New + Retired	+38.7	+2.7	0.0 ppb	0.0 ppb	---

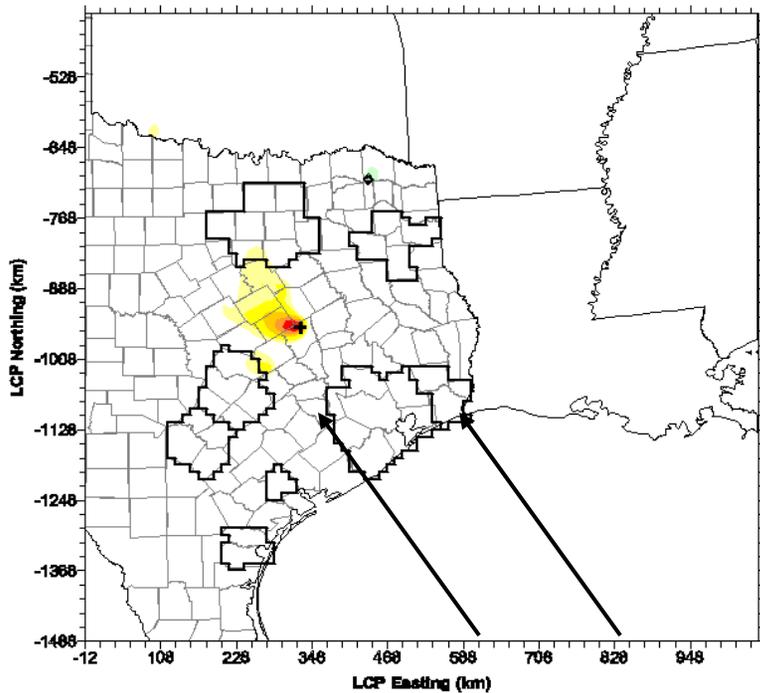


DFW New/Retired EGUs

2010 Difference Plots – New and Retired Combined

August 17th

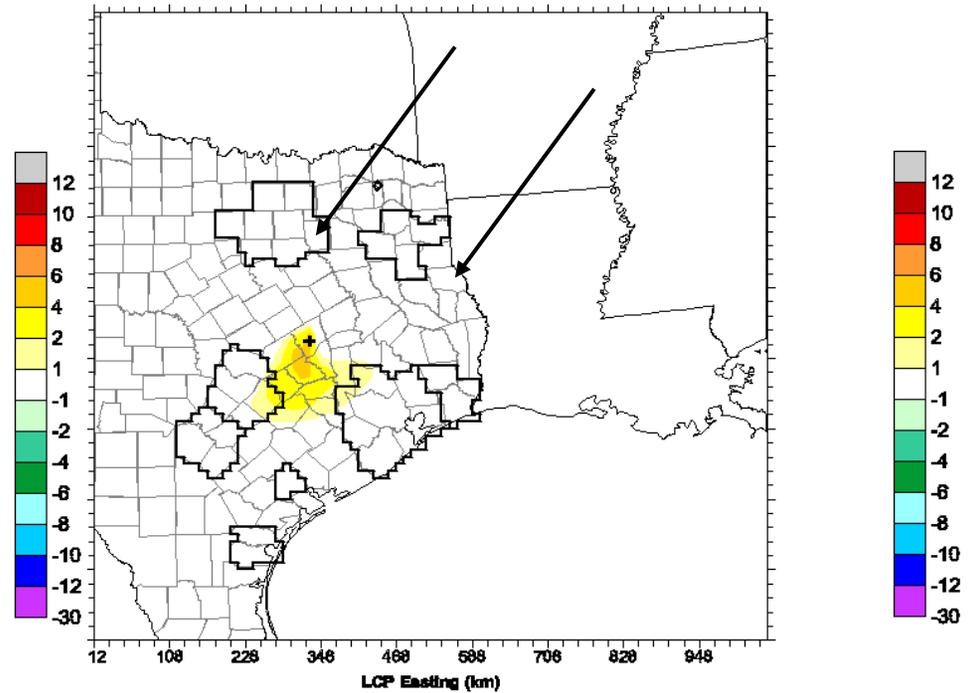
+ max = 11.64 PPB
◇ min = -2.09 PPB



Difference in Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with proposed and retired TX EGUs
August 17, 1999

August 20th

+ max = 5.21 PPB
◇ min = -0.98 PPB



Difference in Daily Max 8hr O3 (ppb)
FY2010 DFW 12km with proposed and retired TX EGUs
August 20, 1999



DFW Cement Kilns

Purpose: Evaluate Model Response to two levels of reductions in cement kiln emissions

Results:

- More response with higher level of controls
- Impacts primarily on south and west of DFW area
- Urban plume did not go over Frisco, so little response
- The high controls reduced the Future DV at Frisco by -.01 ppb

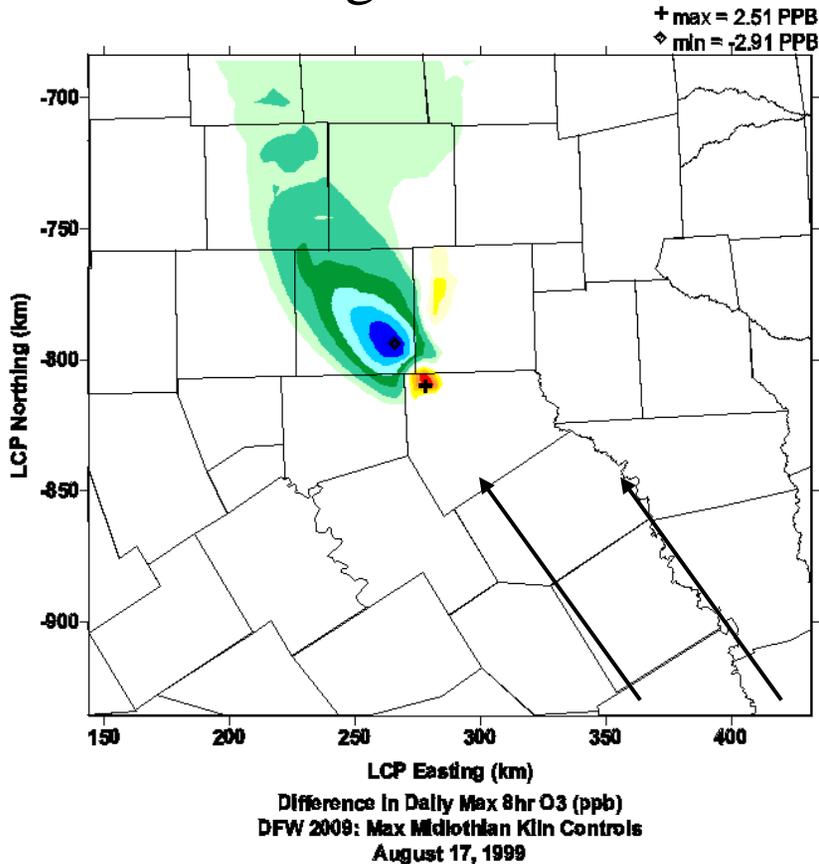
Proposed Controls	Emissions Reductions		Results		
	NOx (tpd)	VOC (tpd)	Avg Change @ Monitors	Avg Change @ Frisco	Change in Exc Area
High Control	-20	---	-0.30 ppb	0.00 ppb	-4.33%
Low Control	-10	---	-0.09 ppb	0.00 ppb	1.58%



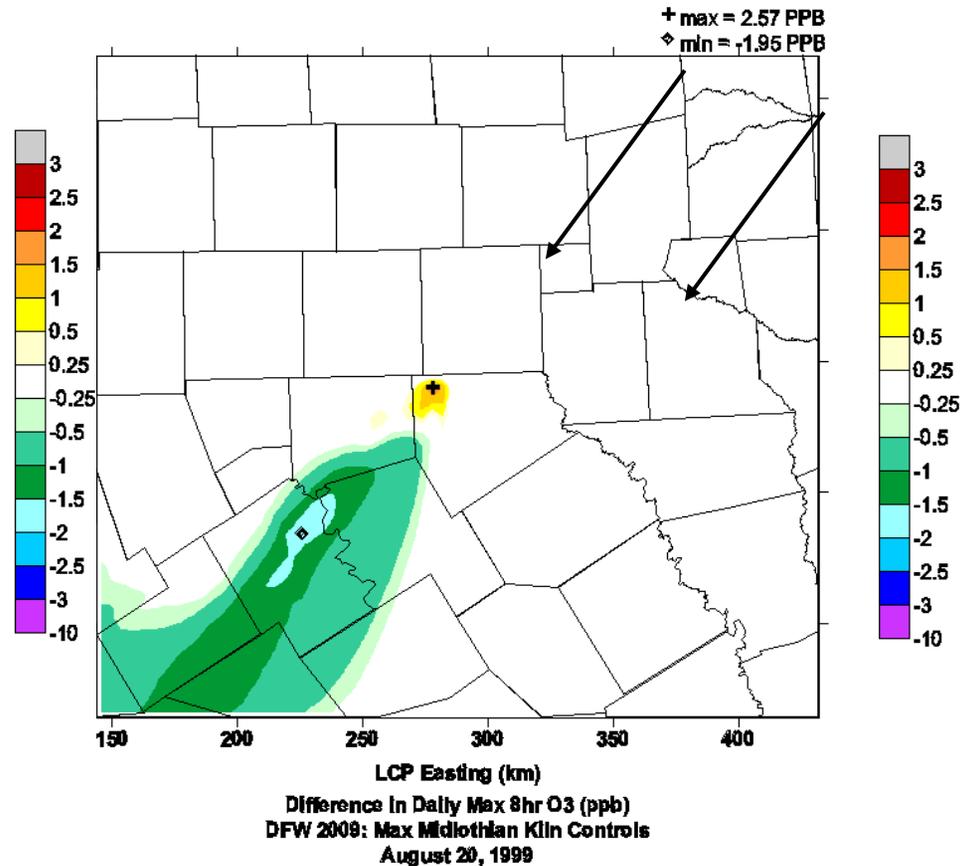
Cement Kilns – High Option

Difference Plots

August 17th



August 20th





East Texas Engines

Purpose: Evaluate response to controls on engines over all of East Texas and inside of 200 km

Results:

- Largest impact in East Texas near gas wells
- Largest DFW benefits on days with easterly winds
- Not much benefit from including distant sources
- The 200 km test reduced the Future DV at Frisco by -.32 ppb

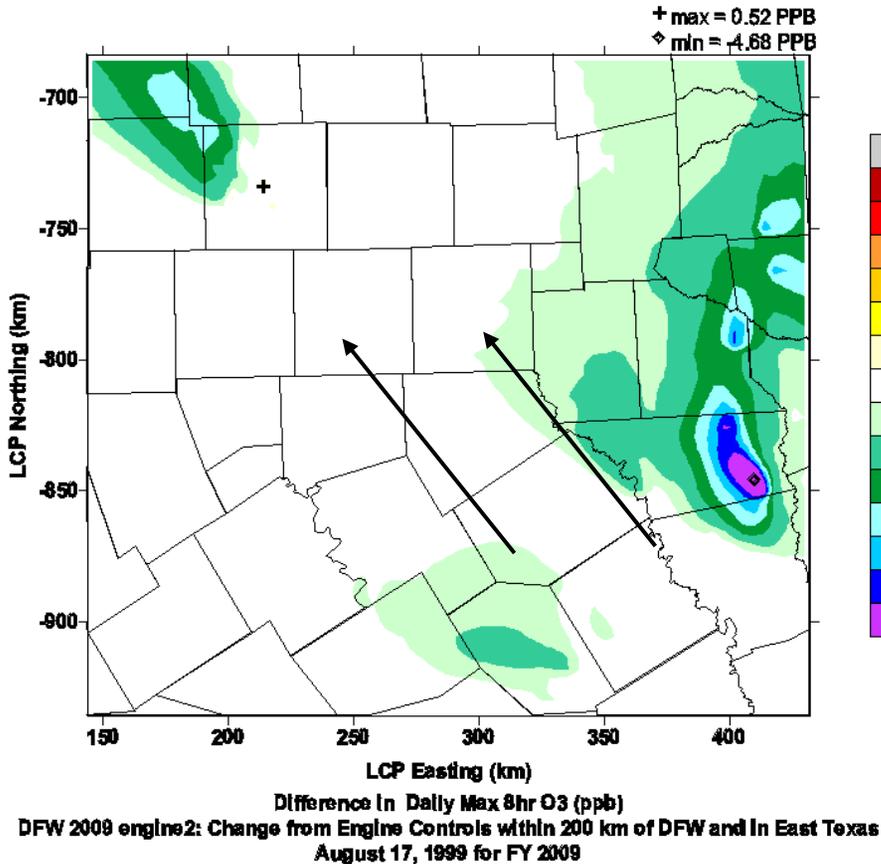
Proposed Controls	Emissions Reductions		Results		
	Point NOx (tpd)	VOC (tpd)	Avg Change @ Monitors	Avg Change @ Frisco	Change in Exc Area
Inside of 200 km	40.9 tons	---	-0.28 ppb	-0.29 ppb	1.83%
All of East Texas	83 tons	---	-0.29 ppb	-0.30 ppb	2.16%



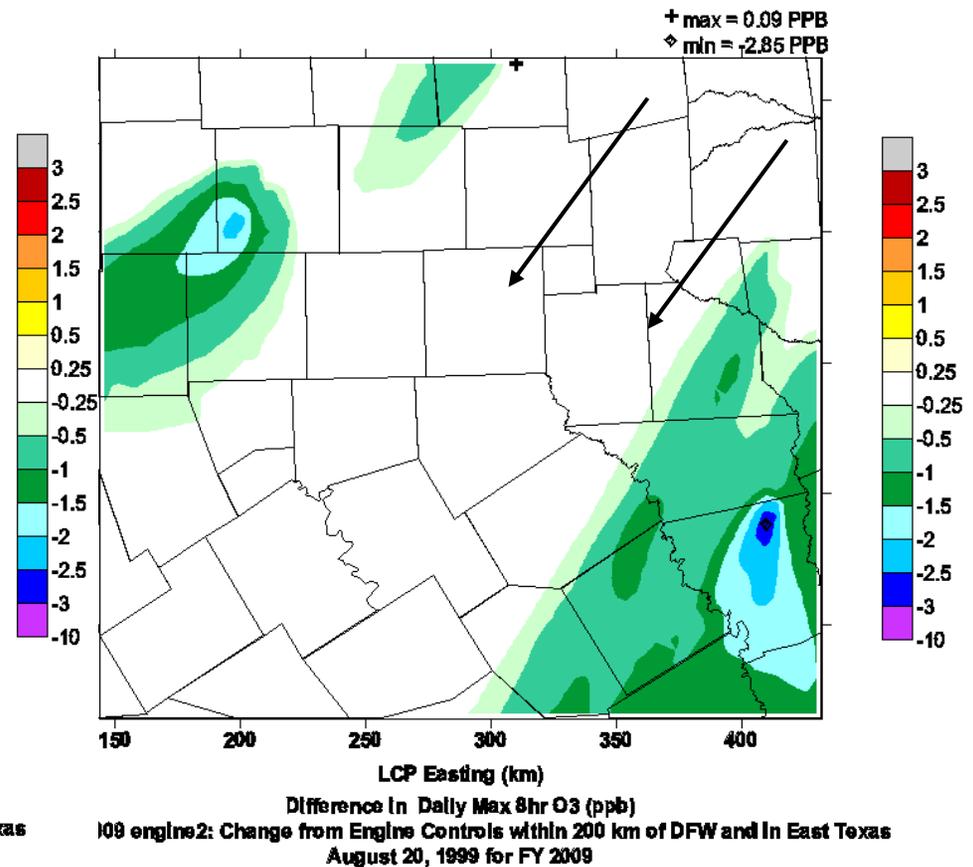
East Texas Engines

Difference Plots – Inside 200 km

August 17th



August 20th





DFW 9-County Major Sources

Purpose: Evaluate response to Houston ESAD controls applied to all the DFW Major Sources

- Major Point Sources and EGUs tested together

Results:

- Relatively few large point sources in DFW
- DFW benefits in narrow plumes oriented with winds
- Major Source test reduced the Future DV at Frisco by -.36 ppb

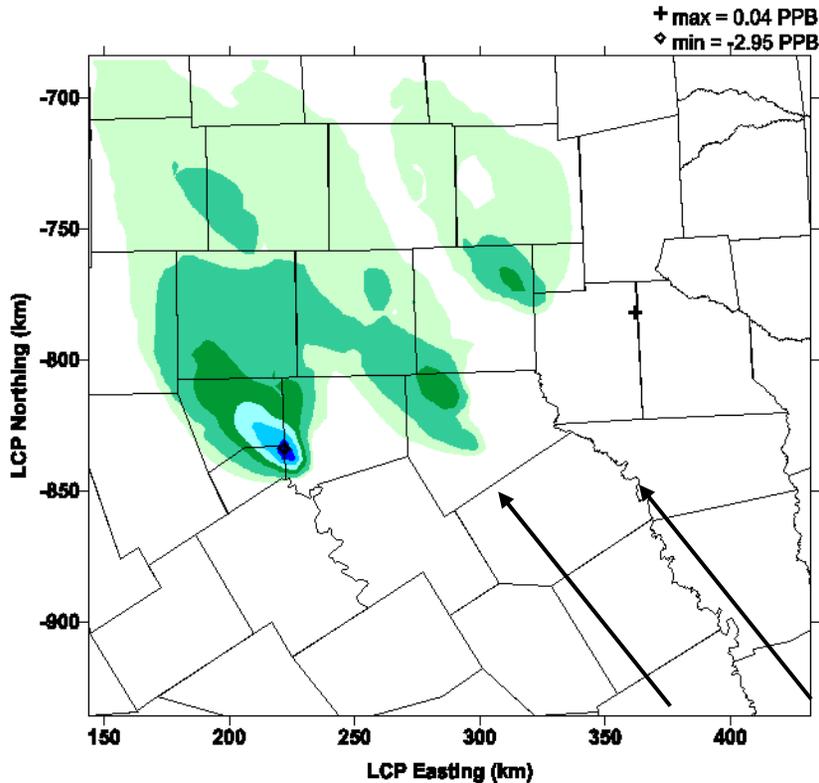
Proposed Controls	Emissions Reductions		Results		
	NO _x (tpd)	VOC (tpd)	Avg Change @ Monitors	Avg Change @ Frisco	Change in Exc Area
DFW 9-County Major Sources					
Major + EGUs	-15	---	-0.40 ppb	-0.34 ppb	-4.08 %



DFW 9-County Major Sources

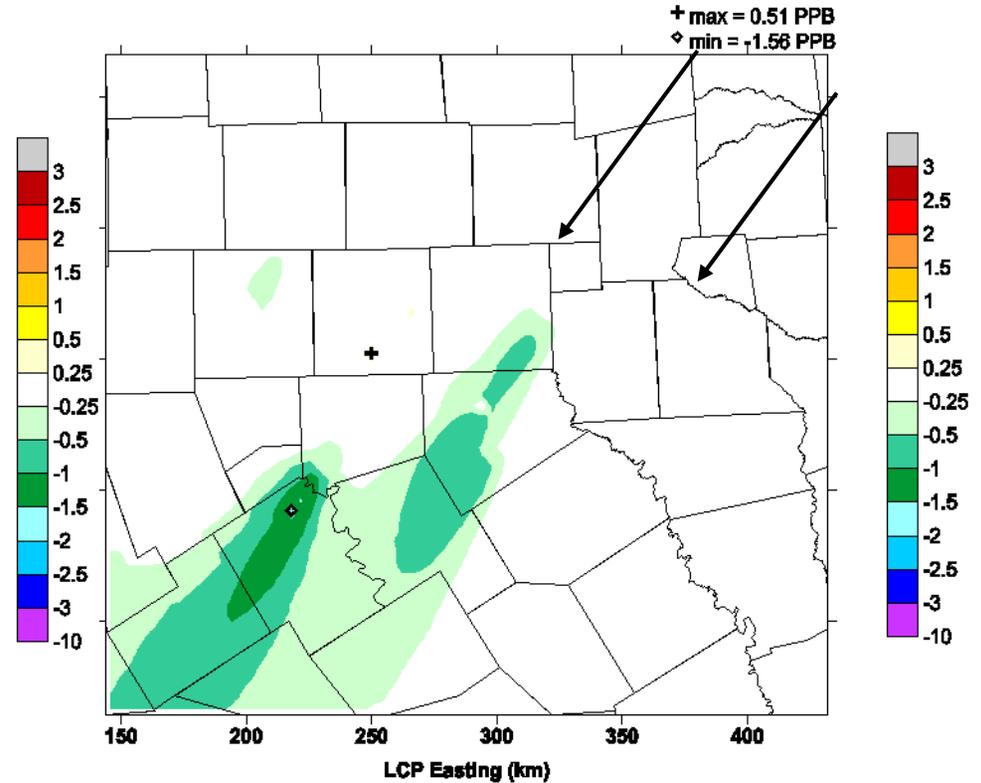
Difference Plots

August 17th



Difference In Daily Max 8hr O3 (ppb)
DFW 2009 dfw_major: Change from DFW Major Source and EGU Controls
August 17, 1999 for FY 2009

August 20th



Difference In Daily Max 8hr O3 (ppb)
DFW 2009 dfw_major: Change from DFW Major Source and EGU Controls
August 20, 1999 for FY 2009



NCTCOG Local Controls

Purpose: Evaluate response to two levels of local controls proposed by NCTCOG

Results:

- Controls distributed over DFW area, so relatively large area of impact
- High Level of controls more effective than Low Level
- NCTCOG-Hi reduced the Future DV at Frisco by -1.00 ppb

Proposed Controls	Emissions Reductions		Results		
	NOx (tpd)	VOC (tpd)	Avg Change @ Monitors	Avg Change @ Frisco	Change in Exc Area
NCTCOG Local Controls					
High Control	-33.2	-8	-0.93 ppb	-0.85 ppb	-13.42%
Low Control	-16.3	-8	-0.46 ppb	-0.43 ppb	-6.75%

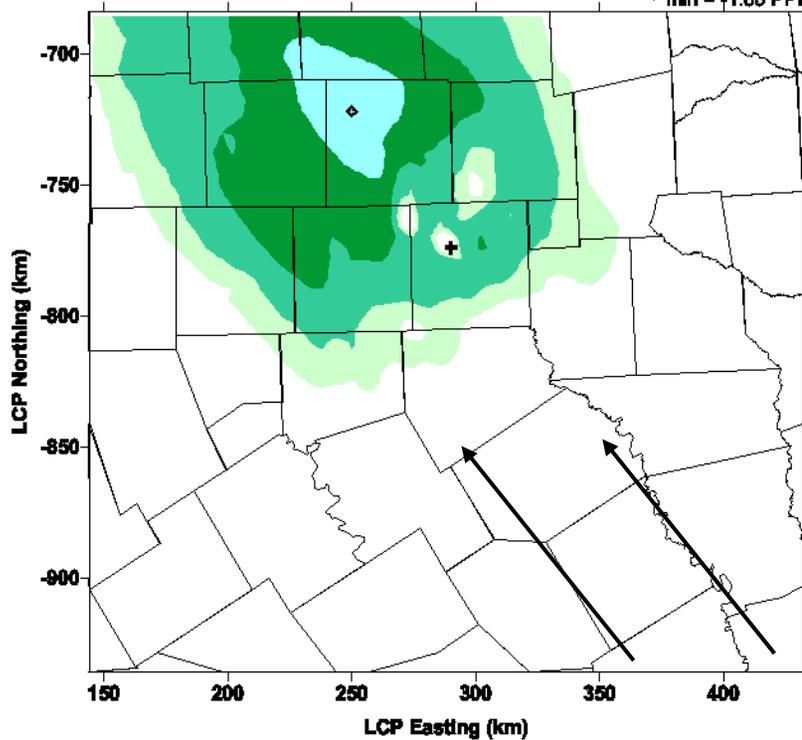


NCTCOG Local Controls

Difference Plots – High Controls

August 17th

+ max = 0.21 PPB
◇ min = -1.88 PPB

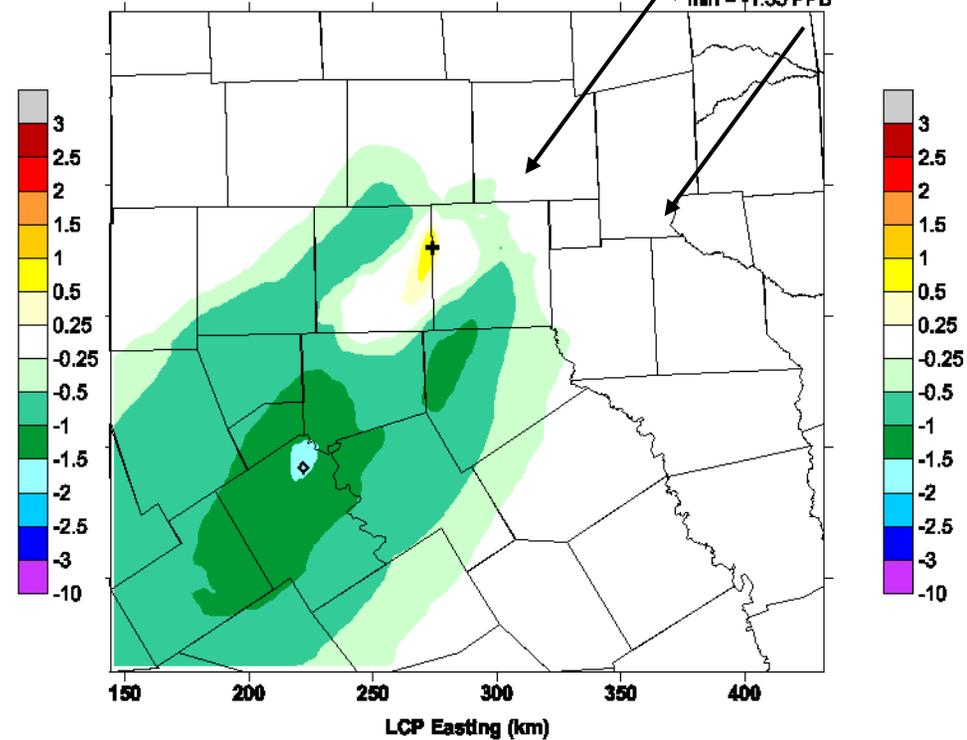


Difference in Daily Max 8hr O3 (ppb)

DFW 2009 NCTCOG_hi: Change from NCTCOG High-End Onroad and Off-road Controls in DFW
August 17, 1999 for FY 2009

August 20th

+ max = 0.86 PPB
◇ min = -1.55 PPB



Difference in Daily Max 8hr O3 (ppb)

DFW 2009 NCTCOG_hi: Change from NCTCOG High-End Onroad and Off-road Controls in DFW
August 20, 1999 for FY 2009



What's Next?

- Sensitivities Planned
 - DFW 9-County EGU Run (EGUs only)
 - DFW 9-County Minor Sources
 - Update EGU APCA to 2009
 - DFW Combination Strategies (not yet defined)

