Austin/Round Rock MSA Clean Air Action Plan For the Early Action Compact

The Clean Air Action Plan and complete appendices are online at
http://www.capco.state.tx.us/Clean_Air/CAPCOairquality/news.htm

For more information go to
www.cleanairforce.org or www.capco.state.tx.us
or call 343-SMOG or 1-866-916-4AIR

Prepared for the Central Texas Clean Air Coalition
By the EAC Task Force, the CLEAN AIR Force and CAPCO
March 29, 2004

TABLE OF CONTENTS

List of Frequently used Acronyms......3
Chapter 1: General Information......4
1.1 Background......4
1.1.1 Previous Work......4
1.1.2 The Early Action Compact......4
1.1.3 How the EAC Applies to the A/RR MSA......5
1.1.4 Geographic Coverage of the CAAP......5
1.2 Public Involvement Program......6
1.2.1 Local Programs......6
1.2.2 Stakeholder Involvement Activities......6
1.2.3 Public Involvement Activities......7
1.3 Policy Statements......7
1.3.1 Fair Share......7
1.3.2 Regional Emission Reduction Measures and Implementation Barriers 7
1.3.3 The Role of Transport in the CAAP......8
1.3.4 Texas Low Emission Diesel (Tx LED)......8
1.3.5 Proposed Mitigation Measures......8
1.3.6 Periodic Review......8
1.3.7 Modeling of Major New Sources......8
Chapter 2: Emissions Inventory......9
2.1 Overview......9
2.2 Point Sources......9
2.3 Area Sources......9
2.4 On-Road Mobile Sources......10
2.5 Non-Road Mobile Sources......10
2.6 Biogenic Sources......11
2.7 Emissions Summary......12
Chapter 3: Photochemical Modeling......16
3.1 Introduction......16
3.2 Episode Selection......16
3.3 1999 Meteorological Model......17
3.4 1999 Modeling Emissions Inventory......17
3.5 1999 Base Case Development......17
3.6 1999 Photochemical Model Base Case and Performance Evaluation......17
3.7 Future Case Modeling......19
3.8 Calculation Methodology for Relative Reduction Factors and Future Design Values......20
3.9 Base 2007 Model Results......21
3.10 Emission Reduction Measure Modeling Results......21
Chapter 4: Data analysis......23

4.1 Trends in Ozone Monitoring Data in Austin 23
4.2 Analysis of Potential 8-Hour Ozone Design Values for 2003 in Austin Based on Historical Monitoring Data 25
4.3 Meteorological Conditions for the 1999 Episode 25
4.4 Selection of Current Year for Estimating Future Year Design Values 27
4.5 Transport 27
Chapter 5: Emission Reduction Strategies 30
5.1 Introduction 30
5.3 State and Regional Reduction Strategies 31
5.4 Local Strategies 31
5.4.1 Introduction 31
5.4.2 State Assisted Measures 32
Chart 5.4.2 CAC Approved State Assisted Measures 32
5.4.3 Locally Implemented Emission Reduction Measures 48
Chapter 6: Maintenance for Growth and the Continuing Planning Process ....55~~56~~
Chapter 7: Tracking and Reporting ....61~~62~~

LIST OF FREQUENTLY USED ACRONYMS

A/RR MSA or MSA: Austin/Round Rock Metropolitan Statistical Area
CAAP: Clean Air Action Plan
CAF: CLEAN AIR Force of Central Texas
CAMPO: Capital Area Metropolitan Planning Organization
CAPCO: Capital Area Planning Council
CO: carbon monoxide
EAC: Early Action Compact
EI: Emissions Inventory
EPA: U. S. Environmental Protection Agency
MPO: Metropolitan Planning Organization
NOx: oxides of nitrogen
ppb: parts per billion
RRF: relative reduction factors
SIP: State Implementation Plan
TCEQ: Texas Commission on Environmental Quality
TERP: Texas Emission Reduction Program
TNRCC: Texas Natural Resource Conservation Commission
tpd: tons per day
tpy: tons per year
TTI: Texas Transportation Institute
TxDOT: Texas Department of Transportation
VOC: volatile organic compounds
VMT: vehicle miles travel

CHAPTER 1: GENERAL INFORMATION

1.1 Background

Local governments, community and business leaders, environmental groups, and concerned citizens in Bastrop, Caldwell, Hays, Travis and Williamson Counties (ARR/MSA) are committed to improving regional air quality. The MSA is acting now to assure attainment and maintenance of the federal 8-hour standard for ground-level ozone. Using the Early Action Compact (EAC) Protocol, the MSA has prepared a Clean Air Action Plan (CAAP) that provides clean air sooner, maintains local flexibility and can defer the effective date of nonattainment designation.

1.1.1 Previous Work

Central Texas has a history of proactive air quality initiatives. Since 1996, the Texas Legislature has provided near-nonattainment area funding to the area for use in performing planning functions related to the reduction of ozone concentrations in the area. The region was among the first in the nation to adopt an O_3 Flex Agreement. Designed to help the region maintain compliance with the 1-hour standard, implementation of the O_3 Flex emission reduction measures started in the 2002 ozone season.

The region has conducted ambient air monitoring, following U.S. Environmental Protection Agency (EPA) guidelines, that is beyond that performed by the Texas Commission on Environmental Quality (TCEQ). The region developed emissions inventories, following EPA guidance, for 1996 and 1999. They also developed photochemical modeling episodes for July 1995 and September 1999. Results from the 1995 episode have been used for air quality planning. The 1999 episode has been used to develop the CAAP. Both episodes meet EPA photochemical model performance criteria.

Since 1993 the CLEAN AIR Force of Central Texas (CAF), a coalition of business, government, environmental and community leaders, has coordinated public awareness and education campaigns. Ten years of CAF outreach has provided a solid base of public understanding of air quality issues.

1.1.2 The Early Action Compact

EPA issued the *Protocol for Early Action Compacts Designed to Achieve and Maintain the 8-Hour Ozone Standard* (the Protocol) on June 1, 2002 and revised it in November 2002. The Protocol provides the framework for a voluntary commitment to develop and implement an emission reduction plan that assures attainment of the 8-hour ozone standard by 2007 and maintenance at least through 2012. Please see Appendix 1-1 for the full text of the Protocol.

A key point of the EAC is the flexibility it affords areas in selecting emission reduction measures. Based on State Implementation Plan (SIP)-quality science, signatories choose the combination of measures that meet both local needs and emission reduction targets. The EAC recognizes that not every entity will implement every measure. Please see Appendix 1-2 for the full text of the Central Texas EAC document.

On December 18, 2002, the cities of Austin, Bastrop, Elgin, Lockhart, Luling, Round Rock, and San Marcos; the counties of Bastrop, Caldwell, Hays, Travis, and Williamson;

TCEQ and EPA, entered into an EAC for the MSA. This compact commits the region to developing and implementing a CAAP in accordance with the following milestones:

EAC/CAAP Milestones	
June 16, 2003	Potential local emission reduction strategies identified and described
November 30, 2003	Initial modeling emissions inventory completed
	Conceptual modeling completed
	Base case modeling completed
December 31, 2003	Future year emissions inventory modeling completed
	Emissions inventory comparison and analysis completed
	Future case modeling completed
January 31, 2004	Attainment maintenance analysis completed
	Schedule for development of further episodes completed
	One or more modeled control cases completed
	Local emission reduction strategies selected
	Submission of preliminary CAAP to TCEQ and EPA
March 31, 2004	Final revisions to modeled control cases completed
	Final revisions to local emission reduction strategies completed
	Final revisions to attainment maintenance analysis completed
	Submission of final CAAP to TCEQ and EPA
December 31, 2004	CAAP incorporated into the SIP; SIP adopted by TCEQ
December 31, 2005	Local emission reduction strategies implemented no later than this date
December 31, 2007	Attainment of the 8-hour standard

All milestone documents may be found at:
http://www.capco.state.tx.us/Clean_Air/CAPCOairquality/news.htm

1.1.3 How the EAC Applies to the A/RR MSA

Participation in an EAC is available for areas that are in attainment of the 1-hour ozone standard but approach or monitor exceedances of the 8-hour ozone standard.

The MSA is designated attainment for the 1-hour ozone standard and continues to monitor attainment of that standard. The region has not exceeded the 1-hour standard since 1985. The MSA has intermittently monitored violations of the 8-hour ozone standard from 1998 through 2002 and is currently in attainment. (In order to comply with the 8-hour standard, each monitor's three-year average of the annual fourth-highest 8-hour ozone reading must be less than 85 ppb.) As such, the region meets the criteria for participation in an EAC.

Elected officials in the MSA entered into the EAC with EPA and TCEQ because monitored exceedances of the 8-hour standard indicate concentrations of ground-level ozone inconsistent with protecting public health and the environment.

1.1.4 Geographic Coverage of the CAAP

The CAAP applies to the five counties included in the MSA. These counties are Bastrop, Caldwell, Hays, Travis, and Williamson. The U.S. Office of Management and Budget decides the MSA based on data generated by the U.S. Census Office. EPA typically uses MSA boundaries to define nonattainment areas; hence their use for the CAAP. Sources of regional anthropogenic, or man-made, emissions reflect the growing urbanization of the area (e.g., population densities, urban/suburban growth, commuting patterns).

1.2 Public Involvement Program

1.2.1 Local Programs

In January 2003 the CAF launched an extensive program to ensure widespread public and stakeholder participation in developing the region's CAAP. CAF contracted with an established local opinion research company, NuStats Partners, to assist. Additional information on the CAF is found in Appendix 1-3.

The involvement project had two goals: (1) to provide venues for participation by interested parties; and (2) to provide air quality information to the general public. Stakeholder involvement activities included those aspects of the project directly related to gathering input on the emission reduction strategies. Public involvement activities, while also soliciting input, focused on increasing public understanding of air quality issues and the EAC process.

The local EAC signatory jurisdictions played a key role. They facilitated public participation by hosting public meetings. They also reviewed and selected CAAP strategies. The Clean Air Coalition, composed of one elected-official representative from each of the local EAC signatory jurisdictions, bore primary responsibility for CAAP development decisions. The EAC Task Force, composed of staff from local signatory jurisdictions, participating agencies, business and environmental groups, developed and recommended the initial CAAP for CAC and signatory consideration. The CAC met at least quarterly throughout the CAAP development process and continues to meet regularly. The EAC Task Force met twice monthly during CAAP development and continues to meet regularly. Both CAC and EAC Task Force meetings are open to the public. Additional information on the CAC and EAC Task Force is found in Appendices 1-4 and 1-5, respectively.

1.2.2 Stakeholder Involvement Activities

The kickoff stakeholder meeting was on January 31, 2003. Advertisements for the event ran for two weeks in the region's major daily newspaper, the Austin American-Statesman, and in 15 community newspapers in the five counties. Ninety people attended. They represented a broad spectrum of interests and perspectives. They included environmental groups, community activists, manufacturing companies, real estate companies, elected officials and transportation planners. Meeting facilitators lead four stakeholder work groups to develop emission reduction strategies for each emission source—on-road, non-road, area, and point.

These work groups continued to meet regularly throughout 2003. Each work group drafted a list of strategies to be considered for inclusion in the CAAP. Their work is the backbone of the plan development. Additional information on stakeholder involvement activities is found in Appendices 1-6 and 1-7.

1.2.3 Public Involvement Activities

In addition to the public meetings held throughout the MSA, NuStats staff provided the work plan for general public involvement. Outreach avenues included a website, hotline, presentations to organizations and community groups, distribution of comment cards at meetings and events, publishing the comment cards in the region's daily newspaper and in over 15 community newspapers, and information kiosks in public areas (libraries, shopping malls, etc.). NuStats maintained a database of participating stakeholders and groups/individuals. They coded and recorded responses to allow real-time evaluation of opinion trends and to identify segments of the region that were under responding and in need of additional efforts. Please see Appendices 1-6 and 1-7 for details of outreach activities and comment card survey results. Appendix 1-8 contains documentation of all public comments. It also includes resolutions of support from area jurisdictions that, while not signatories, support the air quality goals of the EAC.

1.3 Policy Statements

The following statements reflect the positions of the local EAC signatories.

1.3.1 Fair Share

The local EAC signatories support air quality improvement initiatives that are based on a fair share approach; the amount of man-made emissions reduced by any source, geographic area or jurisdiction should be proportional to the amount of emissions contributed. No source, area or jurisdiction should be required to bear more than its fair share of the emission reduction burden. The CAAP emission reduction measures address all man-made emission sources in proportion to their levels of contribution. Also, it comparably burdens the general public, businesses and the public sector.

1.3.2 Regional Emission Reduction Measures and Implementation Barriers

The EAC is intended to allow for increased local control of air quality planning. The nature of air pollution, however, requires that emission reduction measures be implemented on a regional basis in order to be effective.

Typically, one city or county cannot tackle the issue alone. Indeed, “local” in this case covers a five-county region in Texas and 12 local governmental jurisdictions. It is important to note that the latter represent only a handful of the total number of governmental jurisdictions in the region. For example, while the City of Austin and Travis County are the only two EAC signatories from the county, there are more than 20 other municipalities with jurisdiction in Travis County alone. Each has authority over adoption of ordinances and regulations. Note that the State of Texas does not grant ordinance authority to counties. Consequently, it is almost impossible to implement regional emission reduction measures in the absence of state regulations; hence the need for the State Assisted Measures outlined in Chapter 5. The only alternatives to this approach require substantial legislative actions. These have been introduced in past legislative sessions and routinely defeated.

1.3.3 The Role of Transport in the CAAP

The EAC signatories ask that state and federal partners act with diligence to ensure that assumptions about emission reduction measures implemented outside the MSA, and consequently assumptions about the associated transport to our region, hold true.

The 2007 Base Case assumes substantial emission reduction measures will be implemented by federal, state, other local and private entities located outside the five-county A/RR MSA. For example, the model assumes the Houston/Galveston SIP will be successful in 2007 and that the ALCOA Consent Decree will be implemented no later than March 2007. While these assumptions are reasonable and necessary, their validity remains uncertain.

1.3.4 Texas Low Emission Diesel (Tx LED)

The EAC signatories urge TCEQ and, if applicable, EPA to work with the MSA to correct a "Catch-22" in TCEQ's interpretation of the Tx LED rule. Current policy penalizes the MSA and hinders our air quality improvement efforts. Because TCEQ approved an Alternative Emission Reduction Plan for Flint Hills Resources (FHR), the MSA will receive no Tx LED via the traditional pipeline distribution system. At the same time, TCEQ staff has concluded that TERP funds are not available for importation and distribution of Tx LED into the region after 2005. Without Tx LED, our region will lose over 1.7 tons per day of creditable NOx emissions reductions in 2007. Consequently, the EAC signatories request that the TCEQ reconsider its approval of FHR's Alternative Emission Reduction Plan or, alternatively, allow the MSA to use TERP funds for procuring Tx LED.

1.3.5 Proposed Mitigation Measures

The EAC signatories are committed to supporting policy initiatives that lead to distinct regional air quality improvements. To that end, signatories urge TCEQ and EPA to ensure a clear nexus between all proposed mitigation measures and alleged violations of the Clean Air Act. All aspects of future Supplemental Environmental Projects and Beneficial Environmental Projects, when related to air quality violations, should have a direct air quality benefit.

1.3.6 Periodic Review

Throughout the EAC's duration the signatories will initiate periodic program evaluations. These will determine the necessity for revision or modification and will be addressed accordingly.

1.3.7 Modeling of Major New Sources

The EAC signatories, to facilitate planning, request that TCEQ notify CAPCO of anticipated new major sources within its boundaries, or within 25 miles of its boundaries. This allows the region to model effects and modify the CAAP if necessary. The signatories also encourage TCEQ to model effects of all large new NOx sources in the eastern half of the state as a permanent part of its review process.

CHAPTER 2: EMISSIONS INVENTORY

2.1 Overview

An emissions inventory (EI) is a list of the air pollutants emitted by all types of sources. Typically an EI is divided into five types of sources: point sources, area sources, on-road mobile sources, non-road mobile sources and biogenic sources. Each category is further divided into source categories. Because ozone is formed in the atmosphere, not emitted directly, the EI quantifies emissions from ozone precursors. Pollutants covered are carbon monoxide (CO), volatile organic compounds (VOC) and oxides of nitrogen (NOx).

Details for the development of the 1999 and 2007 EIs, developed per EPA and EAC guidance, are found in Appendices 2-1 and 2-2.

2.2 Point Sources

Point sources in attainment areas are stationary commercial or industrial operations that have actual emissions of more than 100 tons per year (tpy) of any criteria pollutant. Typically these are individual stacks or points that emit pollutants directly into the atmosphere. These are usually readily identifiable as emission sources. Modeling requires data from several parameters for the stacks: emission rate, stack diameter, stack height, stack velocity, stack temperature and composition of VOC. Modeling also requires data on the type of manufacturing facility and air pollution control devices. TCEQ collects this data through a required emissions inventory questionnaire. After quality assurance review, TCEQ stores the data in its Point Source Data Base.

2.3 Area Sources

Area sources are those emission points that are not easily separated into individual stacks because of the large number of sources or the lack of discrete identifiable sources. They are commercial, small-scale industrial, or residential users of materials or processes that generate emissions. Hydrocarbon evaporation and fuel combustion are the typical causes of area source emissions. Examples of evaporative emissions include printing, industrial coatings, degreasing solvents, house paints, leaking underground storage tanks, gasoline service station underground tank filling and vehicle fueling operations. Examples of fuel combustion sources include fossil fuel use at residences and businesses, and also outdoor burning, structural fires and wildfires.

These emissions fall below point source reporting levels and are too numerous or too small to identify individually. Emissions-estimate calculations use an established emission factor (emissions per unit of activity) multiplied by the incidence of the relevant activity or activity surrogate. Population is the most common activity surrogate. Others include gasoline sales, employment by industry type and acres of cropland. Bottom-up approaches estimate activity factors from surveys. Top-down approaches use generic activity factors based on national, state or county data. Emission factors can be a category-specific generic estimate or can be developed locally (e.g., based on product usage).

2.4 On-Road Mobile Sources

On-road sources are automobiles, trucks, motorcycles, and other motor vehicles operating on roadways in the MSA. Emissions estimates account for vehicle engine exhaust and associated evaporative emissions. These emissions are calculated with an activity factor, such as vehicle miles traveled (VMT), and an emissions factor. The road network is divided into roadway links. For detailed photochemical modeling, hourly day-specific emissions are calculated for each roadway link by developing link-specific activity data and emissions data. For each link the emissions factor is calculated with a version of the EPA MOBILE model.

The MSA EI uses EPA's mobile emissions factor model, MOBILE6. Model inputs simulate vehicle fleet driving and include vehicle speeds by roadway type, vehicle registration by type and age, percentage of vehicles in cold and hot start and stabilized modes, percentage of miles traveled by vehicle type and age, and use of a vehicle Inspection and Maintenance Program (I/M), where applicable. Model inputs also include gasoline parameters such as sulfur content and Reid vapor pressure, temperature and humidity. Input parameters reflect local conditions to the extent possible. The MOBILE model emission factors multiplied by VMT estimates complete the emissions estimate.

Future VMT estimates use the Capital Area Metropolitan Planning Organization (CAMPO) travel demand model for Hays, Travis and Williamson Counties. Future VMT estimates for Bastrop and Caldwell Counties use a GIS-based highway performance monitoring system methodology developed by Texas Transportation Institute (TTI). The CAMPO travel model inputs include future population and employment estimates spatially allocated by traffic serial zone. Model inputs also include a roadway network of all regionally significant roads expected to be open and operational in the timeframe modeled. The spatial allocation of the population and employment estimates takes into account all new roads that will be open and operational in the timeframe modeled. This addresses development and induced demand created by new roads. The travel model estimates VMT associated with the transportation system as a whole. Because a change in one part of the transportation system often affects another part of the system (e.g., adding a new road may reduce VMT on another road), a system-wide analysis produces the best estimate of emissions associated with vehicles using existing and new roadways.

2.5 Non-Road Mobile Sources

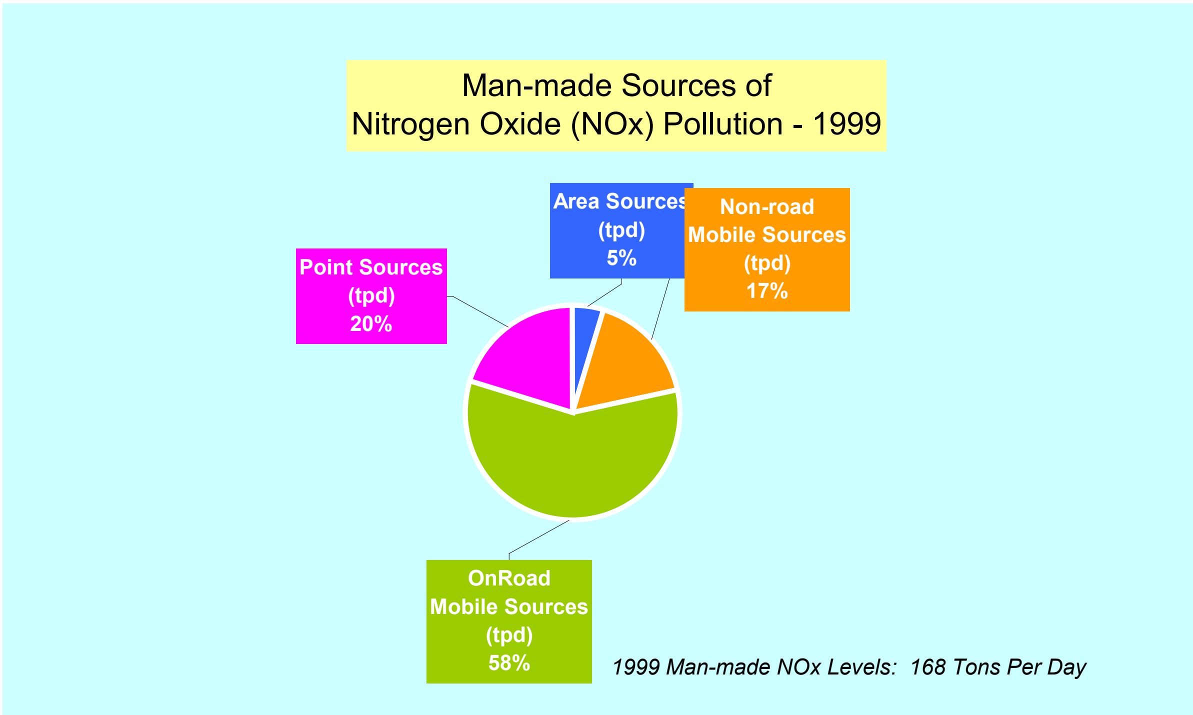
Non-road mobile sources are mobile sources that typically do not operate on roads. Examples include lawn and garden equipment, aircraft, recreational boats, commercial marine equipment and railroad locomotives. The category also covers a broad range of off-road equipment, typically for construction, landscaping or farm use. Calculations of emissions from non-road engine sources use estimates from EPA's NONROAD and EDMS emissions models, along with additional procedures specified by EPA's Office of Transportation and Air Quality. They consider equipment population, engine horsepower, load factor, emission factors, and annual usage. Calculations for aircraft emissions use an EPA-developed multiplier and airport landing/takeoff data.

2.6 Biogenic Sources

Biogenic sources include hydrocarbon emissions from vegetation and small amounts of NOx emissions from soils. Plants are sources of the VOCs isoprene, monoterpene, and alpha-pinene. Biogenic emissions are important in determining the overall emissions profile and are required for regional air quality photochemical modeling. Emissions calculations normally use the density or number of species, land use data, species specific emissions factor, light intensity and temperature. Field surveys determine the species population and land use data for a large area of Texas. The MSA EI used the biogenic model GLOBEIS to estimate emissions. Because emissions from biogenic sources are largely beyond the scope of reasonable emission reduction measures, the CAAP does not include biogenic emission reduction measures.

2.7 Emissions Summary

Figure 2.7-1

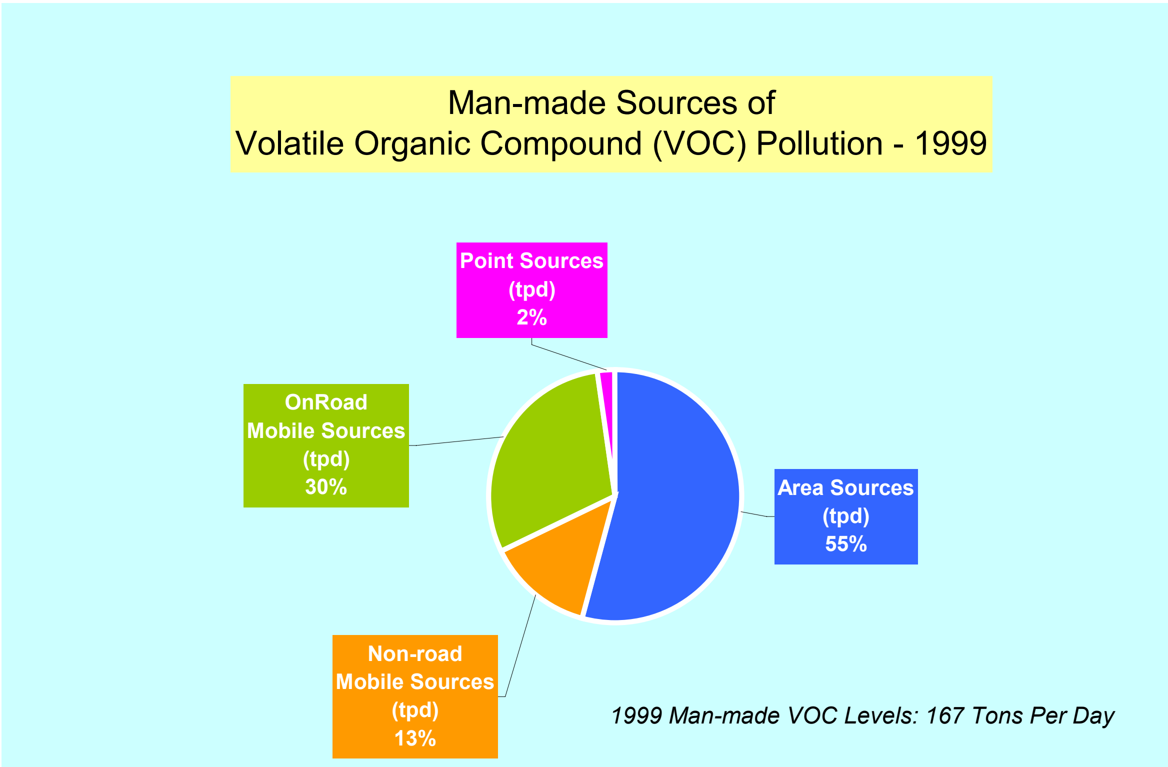


Sources of man-made NOx for the 1999 base case EI comprise 58% on-road, 20% point, 17% non-road and 5% area.

Table 2.7-1. Total daily (weekday) NOx emissions in 1999 from anthropogenic sources in the MSA

	Area Sources (tpd)	Non-road Mobile Sources (tpd)	OnRoad Mobile Sources (tpd)	Point Sources (tpd)	**TOTAL (tpd)**
Bastrop	0.60	1.72	3.95	7.25	**13.52**
Caldwell	0.54	1.42	2.32	3.55	**7.82**
Hays	0.54	1.88	11.44	7.28	**21.14**
Travis	3.17	16.69	63.06	15.34	**98.27**
Williamson	2.97	6.73	17.09	0.56	**27.35**
TOTAL (tpd)	**7.82**	**28.44**	**97.86**	**33.98**	**168.10**

Figure 2.7-2

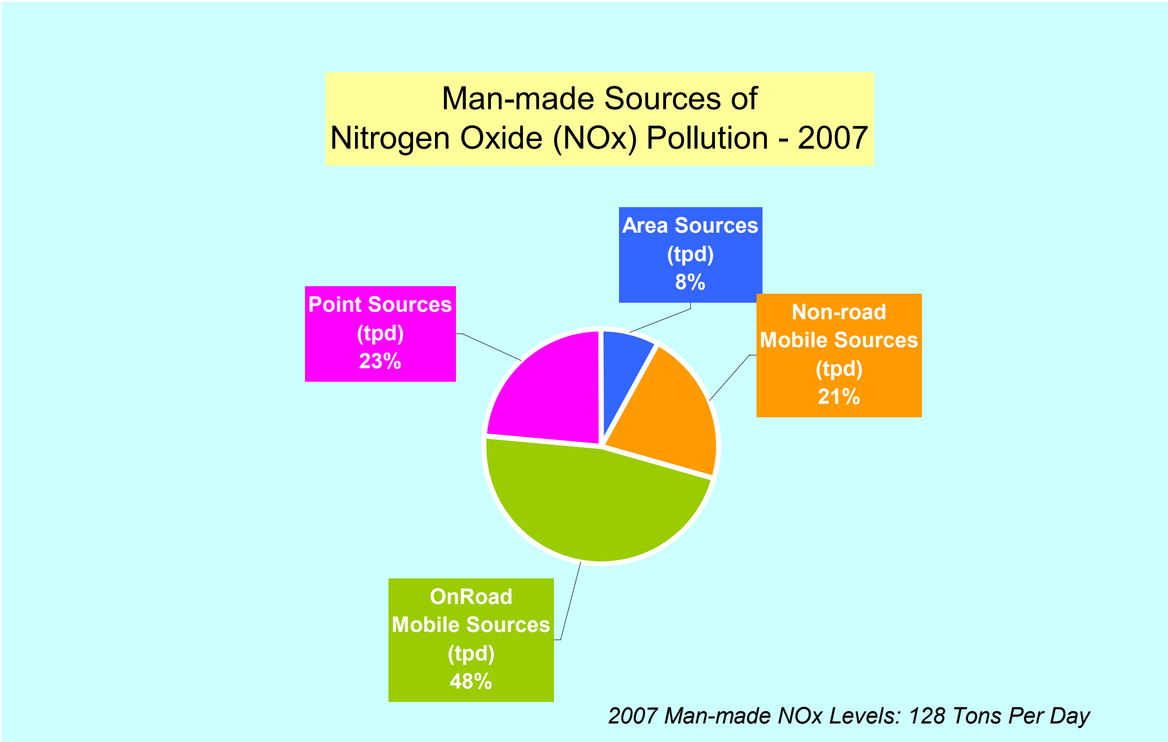


Sources of man-made VOC for the 1999 EI comprise 55% area, 30% on-road, 13% non-road and 2% point.

Table 2.7-2. Total daily (weekday) VOC emissions in 1999 from anthropogenic sources in the MSA

	Area Sources (tpd)	Non-road Mobile Sources (tpd)	OnRoad Mobile Sources (tpd)	Point Sources (tpd)	**TOTAL (tpd)**
Bastrop	4.52	0.92	2.54	0.42	**8.40**
Caldwell	15.29	0.61	1.30	0.47	**17.67**
Hays	5.47	1.53	4.85	0.34	**12.19**
Travis	50.60	15.59	32.61	2.13	**100.93**
Williamson	14.68	3.84	8.89	0.34	**27.75**
TOTAL (tpd)	**90.56**	**22.49**	**50.19**	**3.70**	**166.93**

Figure 2.7-3

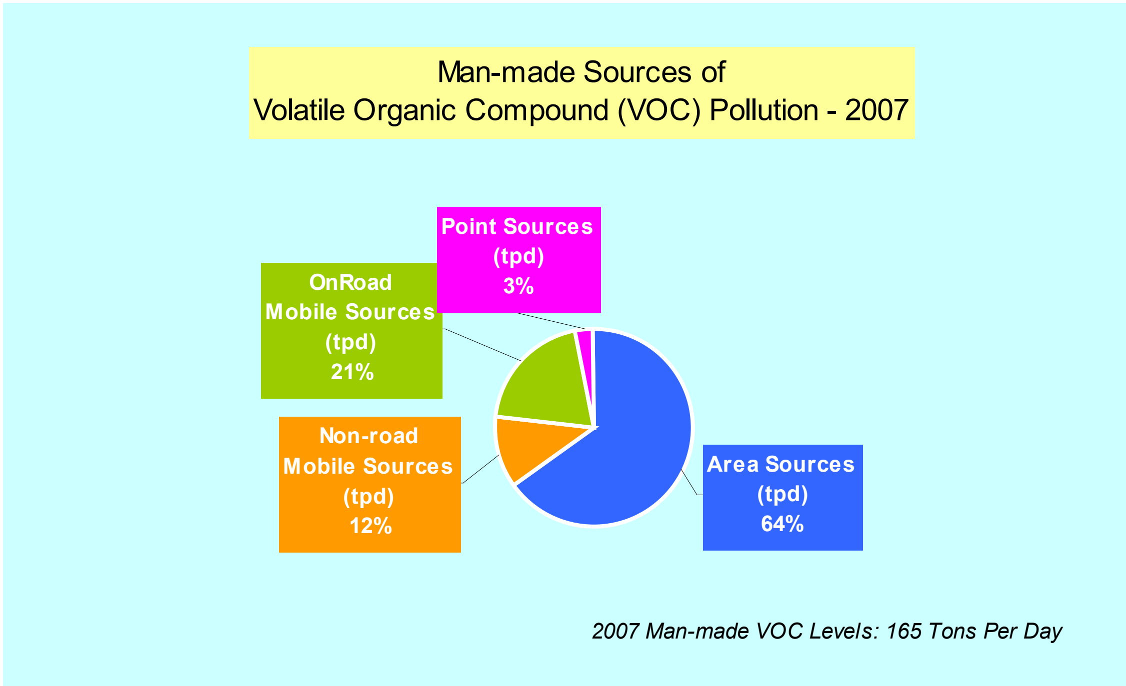


Sources of man-made NOx for the 2007 base case EI comprise 48% on-road, 21% non-road, 23% point and 8% area.

Table 2.7-3. Total daily (weekday) NOx emissions in 2007 from anthropogenic sources in MSA

	Area Sources (tpd)	Non-road Mobile Sources (tpd)	OnRoad Mobile Sources (tpd)	Point Sources (tpd)	**TOTAL (tpd)**
Bastrop	0.76	1.66	2.45	7.65	**12.52**
Caldwell	0.67	1.39	1.31	2.51	**5.88**
Hays	0.78	1.84	5.86	8.94	**17.42**
Travis	4.22	16.21	38.23	11.04	**69.70**
Williamson	3.81	6.36	12.68	0.00	**22.85**
TOTAL (tpd)	**10.24**	**27.46**	**60.53**	**30.15**	**128.38**

Figure 2.7-4



Sources of man-made VOC for the 2007 base case EI comprise 64% area, 21% on-road, 12% non-road and 3% point.

Table 2.7-4. Total daily (weekday) VOC emissions in 2007 from anthropogenic sources in the MSA

	Area Sources (tpd)	Non-road Mobile Sources (tpd)	OnRoad Mobile Sources (tpd)	Point Sources (tpd)	**TOTAL (tpd)**
Bastrop	5.53	0.99	1.50	0.56	**8.58**
Caldwell	15.75	0.68	0.73	0.07	**17.23**
Hays	7.67	1.77	2.78	1.65	**13.87**
Travis	57.04	12.70	21.95	2.18	**93.87**
Williamson	20.44	3.73	6.83	0.18	**31.17**
TOTAL (tpd)	**106.42**	**19.88**	**33.79**	**4.63**	**164.72**

CHAPTER 3: PHOTOCHEMICAL MODELING

3.1 Introduction

Photochemical grid models take data on meteorology and emissions, couple the data with mathematical descriptions of atmospheric physical and chemical processes and process the information to yield predictions of air pollutant concentrations as a function of time and location. Model predictions are calculated over a three dimensional grid that is placed over the area being modeled. Typically large grid cells (12 km to 16 km) are used for regional scale modeling and smaller grid cells (4 km) are used for urban scale modeling. The MSA uses the Comprehensive Air Quality Model with Extensions (CAMx) for its CAAP work.

With near-nonattainment area funding from the Texas legislature, the Capital Area Planning Council (CAPCO) coordinated development of three photochemical model base cases, including a 1999 South and Central Texas high ozone episode. These provide a means of projecting air quality conditions to the year 2007 and test emission reduction measure efficacy in the anticipated attainment year. The year 2007 coincides with the expected attainment dates for Dallas-Fort Worth and Houston. Because ambient ozone levels in the MSA are affected by transport, selecting a date in which emission reduction strategies are in place for other large urban areas is an important modeling consideration.

The meteorological model processes meteorological data for each day in the episode. The episode being modeled uses its own, day-specific, EI. The base case comprises the set of meteorological data and the episode's EI. The photochemical model is run and evaluated. If model performance, as evaluated by comparing model prediction to observed air pollution concentrations, is not acceptable, the meteorological modeling results and the EI are evaluated to determine if these data can be refined. Once the model performance is acceptable, precursor sensitivity modeling can be performed. For future years, the base case emissions are replaced with emissions projections for the future year. The model is rerun with the future emissions to establish the future ozone patterns and to determine adequate emission reduction strategies.

3.2 Episode Selection

The first step in episode selection is the development of a conceptual model. It describes local meteorological conditions and associated large-scale weather patterns experienced during periods of high ozone. The MSA's conceptual model is based on 1993-2002 ozone and meteorological data.

The conceptual model allowed staff to identify candidate episodes for modeling. The MSA has identified and modeled two episodes, July 7-12, 1995 and September 13-20, 1999. In response to TCEQ and EPA guidance, the CAAP is based on the September 1999 episode.

The September 13-20, 1999 modeling episode fulfills the requirements of both EPA draft guidance and the EAC Protocol. The episode is a good example of the predominant type of high ozone episode described in the conceptual model for the Austin area. The episode covers, for both Austin and San Antonio, one cycle for ozone with two initialization days and six high ozone days. The episode includes two weekend days

(September 18th and 19th) so emission reduction strategies can be evaluated with different emission characteristics.

An important consideration in selecting this episode was the high ozone concentrations observed throughout South and Central Texas. Thus, Austin, San Antonio, Corpus Christi, and Victoria, along with TCEQ, could combine resources to develop a new episode focusing specifically on conditions associated with high ozone in South and Central Texas.

3.3 1999 Meteorological Model

Meteorological models use a set of measurements taken at limited times and at a limited number of sites, along with models of physical processes, to predict the physical behavior of the atmosphere. The model develops a three dimensional simulation of wind speed, wind direction and other parameters for every hour being modeled.

Meteorological inputs to the September 1999 episode used the Fifth Generation Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model (MM5). The final MM5 application for the September 13-20,1999, modeling episode, known as Run5g, was the culmination of individual simulations and sensitivity studies performed during 2001-2003. Both Austin and San Antonio use this model for their EAC work. Details may be found in Appendix 3-1.

3.4 1999 Modeling Emissions Inventory

The Base Case modeling EI must be day-specific for each hour, of each day, being modeled. A daily profile for on-road mobile emissions estimates hourly variation, accounting for weekend/weekday differences. Specific point source emissions may vary during the day, or from day to day. The ozone season EI is a starting point for developing an episode-specific EI. Details are found in Appendix 2-1.

3.5 1999 Base Case Development

The base case model used meteorological inputs developed from the MM5 meteorological modeling and the 1999 modeling EI. Extensive sensitivity analyses established the initial and boundary conditions for the model. The base case initial and boundary conditions are consistent with those used by TCEQ for modeling in 1-hour nonattainment areas. Details on the development of the base case may be found in Appendix 3-1.

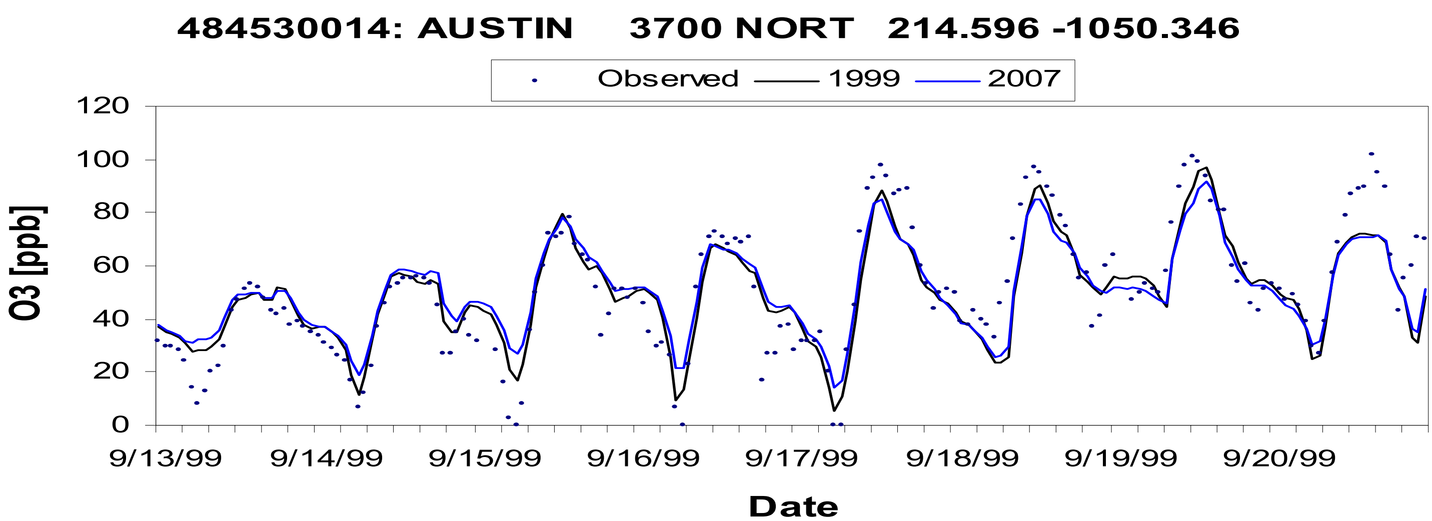
3.6 1999 Photochemical Model Base Case and Performance Evaluation

Model performance evaluation used statistical and graphical metrics in accordance with EPA guidance for both 1-hour and 8-hour attainment demonstrations. This evaluation measures the differences between model predictions and their paired observations. Details are found in Appendix 3-1.

Performance for both 1-hour and 8-hour predicted ozone concentrations used the seven monitors in the San Antonio, Austin, San Marcos, and Fayette County networks. Because the monitoring network in Central Texas is not dense, analysts evaluated performance based on data from all stations rather than on monitors grouped by cities.

Statistical evaluation of the 1-hour model performance uses the following metrics: unpaired peak accuracy, average paired peak accuracy, bias in peak timing, normalized bias and normalized error. EPA has performance criteria for the unpaired peak accuracy, normalized bias and normalized error statistics. The 1-hour modeling for the seven Central Texas monitors meets all of these criteria. Figure 3.6.1 illustrates the comparison between observed and modeled concentrations at the Audubon monitor.

Figure 3.6.1 Time series of observed concentrations compared to modeled concentrations for 1999.

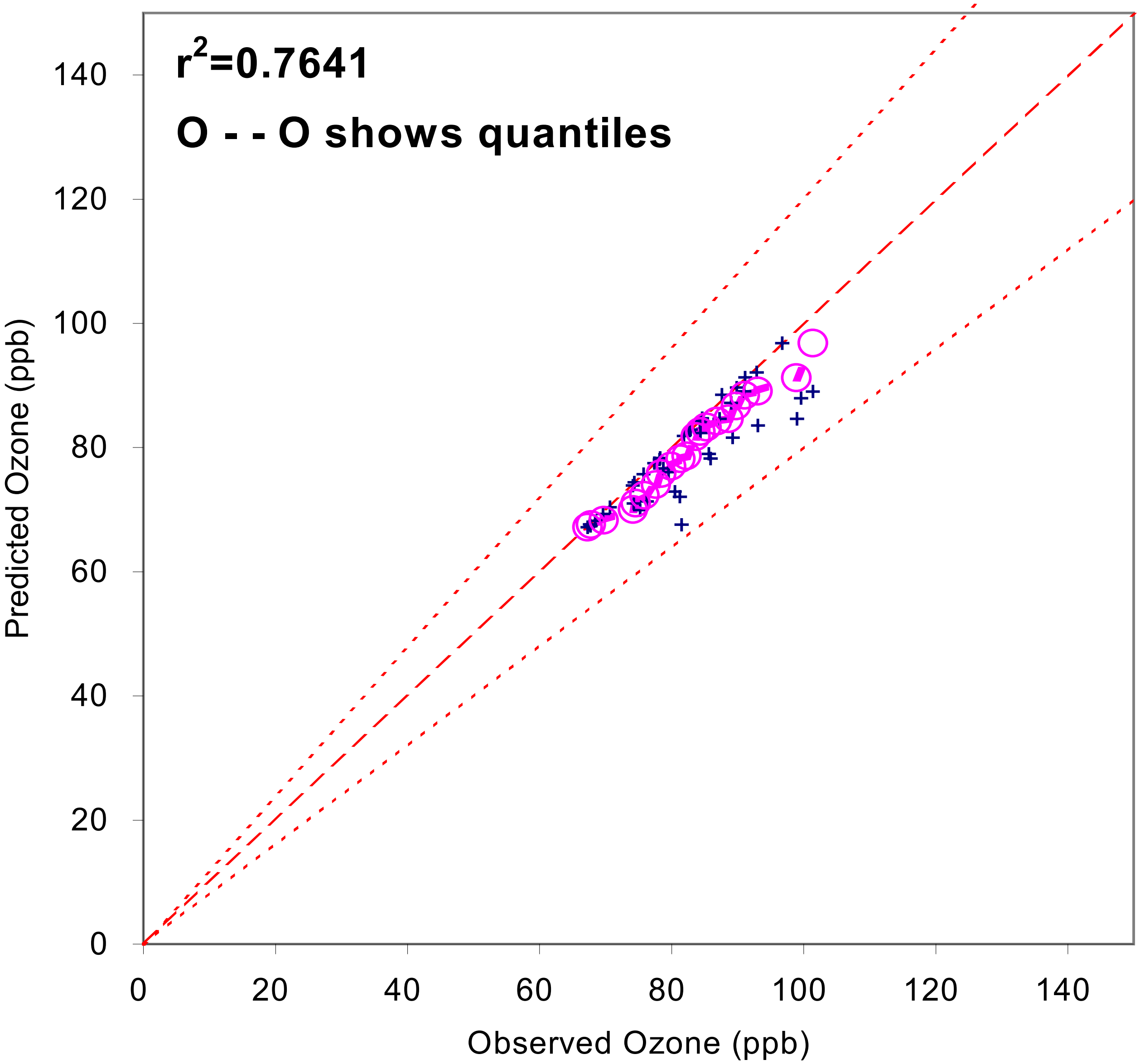


The evaluation of model performance for 8-hour averaged ozone attainment demonstrations is being applied for the first time in many areas and could be subject to future modifications. In recognition of this, analysts used the following three different methodologies in selecting predicted ozone concentrations to compare to observed value:

1. The predicted daily maximum ozone concentration within grid cells ‘near’ a monitor, as defined by U.S. EPA guidance (1999);
2. The predicted daily maximum ozone concentration within grid cells ‘near’ a monitor that is closest in magnitude to the observed daily maximum at the monitor; and
3. A bilinear interpolation of predicted daily maximum ozone concentration around the monitor location.

EPA recommends that the normalized bias and fractional bias be less than 20% of mean observed 8-hour daily maximum concentrations. Regardless of the approach used to select the predicted maximum concentration, both metrics for the Austin September 13-20 CAMx model fall well within these criteria. Figure 3.6.2 illustrates these results.

Figure 3.6.2 Statistical Model Performance Metrics for Central Texas, 8-hour



3.7 Future Case Modeling

Future Case modeling used projected 2007 emission inventories with the meteorological data and CAMx configuration developed for the successful Base Case. Inputs followed EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999) and their *Protocol for Early Action Compacts* (2003). Photochemical modeling is an iterative process. The emissions inventories used in the model are often refined to better predict emissions. The modeling for the future case has been performed with seven versions of the 2007 emissions inventory, each with minor modifications or improvements. This modeling provides results that are close to the standard of 85 ppb, but in five cases the design value has been slightly below the standard (84.37 ppb, 84.5 ppb, 84.55, 84.8 ppb and 84.91) and in two cases the design value has been slightly above the standard (85.6 ppb and 85.08 ppb). This indicates that in 2007 the area will be on the cusp of attainment or nonattainment of the 8-hour ozone standard. It is likely that the 2007 emissions inventory for the Houston/Galveston area will be modified by TCEQ in the near future, which may affect future case model values. Results of future case modeling are too close to the standard to provide meaningful conclusions about the area's likelihood of demonstrating attainment by 2007 without local emission reduction measures.

3.8 Calculation Methodology for Relative Reduction Factors and Future Design Values

The EPA methodology calls for multiplying "current" year design values by relative reduction factors (RRF) from a photochemical model in order to estimate future design values. The calculation is carried out for each monitor site that measured ozone during the current year. In addition, a screening calculation identifies grid cells with consistently high ozone and estimates scaled design values for these screening cells. The screening cells account for any areas where modeled ozone is consistently high, but not captured by the monitoring network. The attainment test passes if all the future year scaled design values are less than 85 ppb (the results are truncated to the nearest integer). Additional information on the RRF is included in Appendix 3-2.
Various sensitivity model runs were made using the 1999 base case. Sensitivity runs for the 2007 future case will be completed in February 2004. These include across-the-board precursor reductions to indicate the sensitivity to reductions of VOC, NOx and combinations of both. Also, zero-out modeling was performed using the 1999 base case. Zero-out runs using the 2007 future case will be completed in February 2004. Zero-out runs remove the anthropogenic emissions from certain source areas to evaluate transport from other areas and to establish the impact of local emissions.

The "current" year is determined by comparing two design values; one for the years that straddle the year for which the latest emission inventory was developed (1999) and the other for the year for which attainment of the standard was determined (2002). The current year is the year that has the higher design value. A current year is determined for each monitor site. The current year for the EAC CAAP is 1999 as shown in Table 3.1

Table 3.1 Current Year for Austin EAC

Monitor Site	Design Value for 1999 (a)	Design Value for 2002 (b)	Current year	Design value for current year
Audubon	89 ppb	80 ppb	1999	89 ppb
Murchison	87 ppb	84 ppb	1999	87 ppb

a. Design value for 1998, 1999 and 2000
b. Design value for 2001,2002 and 2003

3.9 Base 2007 Model Results

The final results for the base 2007 EI for Austin are shown in Table 3.2. For the EAC CAAP the current year was 1999.

Table 3.2 Model results for base 2007 modeling with the September 1999 Episode

Monitor site	1999 design value	Relative reduction factor	Estimated design value for 2007 *	Attainment of the 8-hour standard?
Audubon	89 ppb	0.948	84.37	Yes
Murchison	87 ppb	0.948	82.48	Yes

* Truncate this number to the nearest integer to compare to the standard of 85 ppb. Any design value less than 85 ppb indicates attainment of the 8-hour ozone standard.

3.10 Emission Reduction Measure Modeling Results

The modeling used various combinations of emission reduction measures or strategies. Each strategy was applied to the base 2007 EI; the resulting EI was modeled. Then the RRF for each control strategy at each monitor site was determined. It was multiplied by the appropriate current year design value to estimate the corresponding design value for 2007. The list of modeled emission reduction measures is in Table 3.3 (see Chapter 5 for a discussion of each measure), the summary of the measures is in Table 3.4 and the modeling results for each measure are shown in Table 3.5.

Table 3.3 List of Modeled Emission Reduction Measures in MSA

Emission Reduction Measure	NOx Reductions tpd	VOC Reductions tpd
I/M	2.89	3.84
Heavy Duty Vehicle Idling Restrictions	0.19	0
Commute Emission Reduction Program	0.27	0.30
Low Emission Gas Cans	0	2.60
Stage I Vapor Recovery	0	4.88
Degreasing Controls	0	6.39
Autobody Refinishing	0	0.05
Cut Back Asphalt	0	1.03
Low Reid Vapor Pressure Gas	0	2.87
TERP	2.0	0
Power Plant Reductions	7.08	0
TERMs	0.72	0.83

Table 3.4 List of Emission Reduction Measures Modeled for Each Strategy

Strategy Model Run	Emission Reduction Measure
1	I/M (three counties) only
2 **Final**	All State Assisted Measures (with TERMs) but without I/M in Hays County, without low Reid Vapor Pressure gasoline and without commute reductions.
3	TERP only (modeled at 2 tpd reduction)
4	All measures with VOC reductions and no NOx reductions
	Low Emission Gas Cans
	Stage I Vapor Recovery
	Degreasing Controls
	Autobody Refinishing
	Cut Back Asphalt
	Low Reid Vapor Pressure Gasoline
5	Point Sources Only

Table 3.5 Model Results for Emission Reduction Measures Applied to Base 2007 EI with the September 1999 Episode

Control Strategy Run	Monitor site	1999 design value	Relative reduction factor	Estimated design value for 2007 *	Attainment of the 8-hour standard?
1	Audubon	89 ppb	0.944	84.02	Yes
	Murchison	87 ppb	0.944	83.13	Yes
2 **Final**	Audubon	89 ppb	0.937	83.39	Yes
	Murchison	87 ppb	0.934	81.26	Yes
3	Audubon	89 ppb	0.946	84.19	Yes
	Murchison	87 ppb	0.947	82.39	Yes
4	Audubon	89 ppb	0.946	84.19	Yes
	Murchison	87 ppb	0.945	82.22	Yes
5	Audubon	89 ppb	0.944	84.02	Yes
	Murchison	87 ppb	0.943	82.04	Yes

* Truncate this number to the nearest integer to compare to the standard of 85 ppb. Any design value less than 85 ppb indicates attainment of the 8-hour ozone standard.

CHAPTER 4: DATA ANALYSIS

The design values for the years that straddle 1999 were used as the “current” year to estimate the design value for 2007. These design values were the highest measured in the Austin area at both monitors. More recent monitoring provides lower design values and the latest design values for the years straddling 2002 do not exceed the standard. Since the worst-case design values were used in this CAAP, it is important to put these values into perspective.

An analysis of historical trends of monitoring in the Austin area indicates that a design value of 89 ppb is the highest ever measured. Analysis of potential 8-hour ozone design values in Austin, based on historical monitoring data, indicated that the most likely 2003 design value (i.e., for the years 2002-2004) is 87 ppb. Analysis of the various metrics related to the meteorological conditions indicates that the conditions favorable to formation of high ozone occurred more often than normal during 1999 and less often than normal in 2001. The selection of the “current” year is based on the date of the most recent emissions inventory. If an emissions inventory were prepared for 2002, then the current year would be 2002, which has a maximum design value of 84 ppb.

4.1 Trends in Ozone Monitoring Data in Austin

TCEQ (previously the Texas Natural Resource Conservation Commission and prior to that the Texas Air Control Board) has monitored ozone concentrations at two sites in Austin since 1983. The site at Murchison has not moved, but the other site was moved in 1997 to the current site named Audubon. To be consistent, these analyses will be limited to the time period beginning in 1997 when ozone concentrations were measured at both the Murchison and Audubon sites.

Since the EAC addresses 8-hour ozone concentrations, these analyses will be performed for 8-hour time periods. A number of analysis metrics can be used to evaluate trends in ozone concentrations. Among these are the highest concentration, the second highest concentration, the third highest concentration and the fourth highest concentration. At each monitor the annual 8-hour ozone design value is calculated over three consecutive years. It is the average of the fourth highest daily 8-hour ozone concentration measured over each of the three consecutive years. The area-wide design value is the highest of the design values for all of the monitors in the area. The average for the design value is truncated and if that value is greater than or equal to 85 ppb, the standard is exceeded.

Figure 4.1 shows the four highest 8-hour ozone concentrations and the design values at the Audubon monitoring site from 1997 to 2003. Figure 4.2 shows those same values for the Murchison monitoring site. Figure 4.3 shows the design values for Audubon and Murchison and the area design values from 1997 to 2002.

Figure 4.1. Four Highest 8-hour Ozone Concentrations and Design Values (ppb) at the Audubon monitoring station for the 1997 through 2003 period.

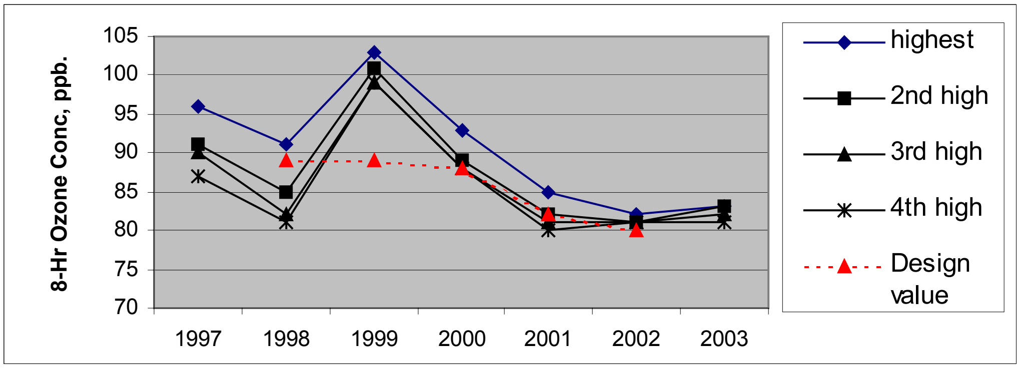


Figure 4.2. Four Highest 8-hour Ozone Concentrations and Design Values (ppb) at the Murchison monitoring station for the 1997 through 2003 period.

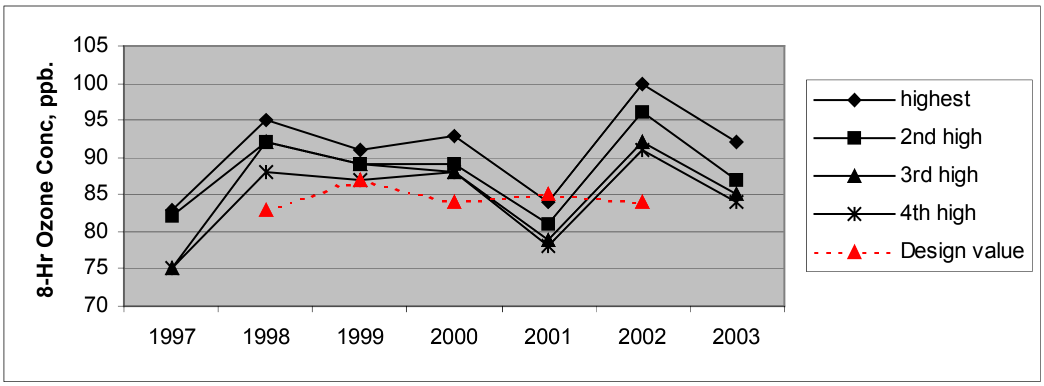
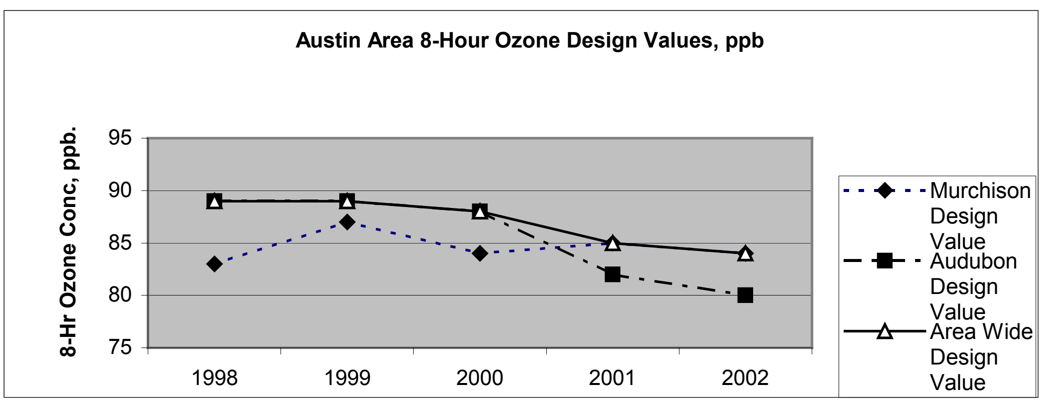


Figure 4.3. Design Values for Austin Area



4.2 Analysis of Potential 8-Hour Ozone Design Values for 2003 in Austin Based on Historical Monitoring Data

The ozone concentration measured at a monitoring site depends on a number of factors, including local emission of ozone precursors, regional transport of ozone and meteorological conditions. A conceptual model developed for the Austin area correlates periods of high ozone with the local meteorological conditions and associated large-scale weather patterns. But this conceptual model cannot be used to predict the meteorology that will be correlated with high ozone in future years, nor does it provide a forecast component to predict the frequency of meteorological conditions associated with high ozone in the past.

Ozone formation is also correlated with emissions of ozone precursors. It is sensitive to the daily temporal and spatial variation of these emissions. It is not possible to predict the future daily emissions that may cause high ozone. In general, it is appropriate to assume that the average daily emissions for the next year will be similar to those of the previous year, but it is not possible to predict future daily emissions with much precision.

Because it is difficult to predict ozone concentrations in future years based on monitored concentrations in past years, we cannot use trend analysis to predict the fourth highest concentration for 2004. However, we can assume that ozone concentrations for 2004 are likely to be similar to those measured in a previous year. In fact, we can ask the question, if 2004 were similar to each year during the 1997 through 2003 period, what would the 2003 design value be?

Historical data collected at the Audubon and Murchison monitoring stations during the 1997 through 2003 monitoring period have been used to estimate the 2003 8-hour design value for the Austin area. This analysis assumes that 2004 is equally likely to be similar to any year between the 1997 through 2003 period. At Audubon the 2003 design value is likely to be below the 85 ppb standard and between 80 ppb and 87 ppb. Using the average of the fourth highest values, the design value for 2003 would be 82 ppb. In only one case of the seven cases would the design value exceed 83 ppb. Similarly, at Murchison the 2003 design value is likely to be above the 85 ppb standard and between 83 ppb and 88 ppb. Using the average of the fourth highest values between 1997 and 2003 the design value for 2003 would be 87 ppb. Five of the seven cases would have a design value of 85 or higher. However, the reader is cautioned that this is a rather simplistic analysis guided by the available historical ozone monitoring data. In 2004, the emissions, and/or the large-scale weather patterns that determine the frequency of occurrence of daily local meteorological conditions that favor high ozone concentrations, could be quite different from any previous year.

4.3 Meteorological Conditions for the 1999 Episode

A conceptual model describes the local meteorological conditions and associated large-scale weather patterns that are associated with periods of high ozone. Once the meteorological conditions that are most frequently associated with high ozone days are identified, then representative periods can be selected and modeled with a photochemical model. A synoptic cycle is a period of a number of consecutive days for which the meteorological conditions fit into a pattern that is repeated. A set of days that are typical of high ozone and that cover a synoptic cycle is called an episode. Typically an episode has two or more days when the measured ozone is high and close in magnitude to the design value for the area. In order to minimize the impacts of the initial conditions for the model, the episode will include two or three initialization days prior to the first day when high ozone was measured. A conceptual model for the Austin area has been prepared and it indicates that the period from September 13 to 20, 1999 is a representative episode to use for photochemical modeling and includes a complete synoptic ozone cycle. This episode is representative of approximately 80 % of the days when 8-hour ozone concentrations exceed the standard.

On page eight of EPAs "Frequently Asked Questions on Implementing the DRAFT 8-Hour Ozone Modeling Guidance to Support Attainment Demonstrations for Early Action Compact (EAC)" there is a reference to EPA's "Recommended Approach for Performing Mid-course Review of SIP's To Meet the 1-Hour NAAQS For Ozone." The referenced document provides guidance on approaches that can be used to evaluate the meteorological conditions that occurred in 2001, 2002 and 2003 compared to those that occurred in the past. The following metrics that relate to 8-hour ozone measurements were recommended:

- annual number of exceedances of the standard,
- highest daily concentration for each year,
- second highest daily concentration for each year,
- fourth highest daily concentration for each year and
- design value for each three year period.

The values for each of these metrics from 1997 to 2003 are shown in Table 4.1

Table 4.1. Values for Meteorological Monitoring Metrics in the Austin Area.

	1997	1998	1999	2000	2001	2002	2003	Average 2001,2002, 2003
Number of days ≥85 ppb*	6	6	19	11	1	5	6	4
High ozone, ppb*	96	95	103	93	85	100	92	92.3
2nd High ozone, ppb*	91	92	101	89	82	96	87	88.3
4th High ozone, ppb**	87	88	99	88	80	91	84	85.0
Design value, ppb**		89	89	88	85	84		

*All monitors
** Murchison and Audubon only

The seven-year average for the annual high, second high and fourth high is about 3 ppb higher than the corresponding averages for 2001, 2002 and 2003. The average design value is 87 ppb compared to the 2002 design value of 84 ppb. It is clear from these data that the values for the above metrics for 2001, 2002 and 2003 are lower than normally observed over the period from 1997 to 2003. In 2001 the values for each of these metrics was the lowest during the period from 1997 to 2003, indicating that the meteorology or other conditions this year were not as conducive for ozone formation as for other years during the analysis period. Using a design value including data from the year 2001 may yield an estimated design value for 2007 that would be lower than normally observed in the area. To compensate for this difference in meteorology for 2001, all of these metrics indicate that the 2002 design value of 84 ppb should be increased to 87 ppb for an appropriate design value for estimating the design value for 2007.

Furthermore, these data suggest that 1999 was a year when the meteorology was conducive to ozone formation more often than in any of the other years during the analysis period. Thus, it would follow that use of a design value using the data from 1999 would yield an estimated design value for 2007 that would be much higher than normally observed in the area.

4.4 Selection of Current Year for Estimating Future Year Design Values

The emissions from 2007 and from the "current year" are modeled to develop a relative reduction factor. The RRF is the relative response of the model to the changes in the emission inventory between the current year and 2007. To estimate the design value for 2007, the RRF is multiplied by the current year's design value.

Based upon the EPA guidance and the data shown in figure 4.3, the current year is 1999 with design values at Audubon of 89 ppb and at Murchison of 87 ppb. If Austin were to prepare an emissions inventory for 2002, then the current year would be 2002 with design values at Audubon of 80 ppb and at Murchison of 84 ppb.

4.5 Transport

A zero-out modeling simulation is one in which emissions from a region of interest are eliminated (or "zeroed-out") in order to evaluate the impact of regional transport from one urban area to another. A zero-out modeling run was performed for each of the eight ozone nonattainment and near-nonattainment areas in eastern Texas. The nonattainment areas include Houston/Galveston, Beaumont/Port Arthur, and Dallas/Fort Worth. The near-nonattainment areas include Austin, Victoria, San Antonio, Corpus Christi, and Tyler/Longview/Marshall. In each zero-out run, anthropogenic emissions of VOC, NO_x and CO were eliminated from one of the eight urban sub-regions, referred to as the source area, and then the impacts were evaluated within the sub-region itself, as well as within the remaining seven analysis areas. Two additional zero-out modeling runs were performed to evaluate the impact of transport from selected point sources within the state of Texas, as well as from all sources located outside of the state of Texas. In the first of these runs, all anthropogenic point source emissions occurring outside of the eight source areas, but within the state of Texas, were zeroed-out. In the second, all anthropogenic emissions within the state of Texas were eliminated.

Peak ozone concentrations for the Austin area from the Base Case with the interim 2007 projected emission inventory ranged from 88 ppb to 98 ppb for the 8-hour average. Peak zero-out concentrations ranged from 58 ppb to 72 ppb for the 8-hour average.

Similar zero out modeling was performed with the September 13-20, 1999 episode with the 2007 emissions inventory used for the EAC. The peak 8-hour ozone values ranged from 77 ppb to 92 ppb. Peak zero-out concentrations ranged from 70 ppb to 85 ppb for the 8-hour average. Additional similar zero out modeling was performed using a much older 2007 emissions inventory. The episodes modeled were September 5-11, 1993, June 18-22, 1995 and June 30-July 4, 1996.

Table 4.2 shows the number of days each area made a significant impact (difference of greater than or equal to 2 ppb) on the Austin area for each of these episodes. This indicates that there is a significant amount of transport from these areas into the Austin area.

Table 4.2 Summary of Number of Days that Emissions from Other Areas are Transported into the Austin Area

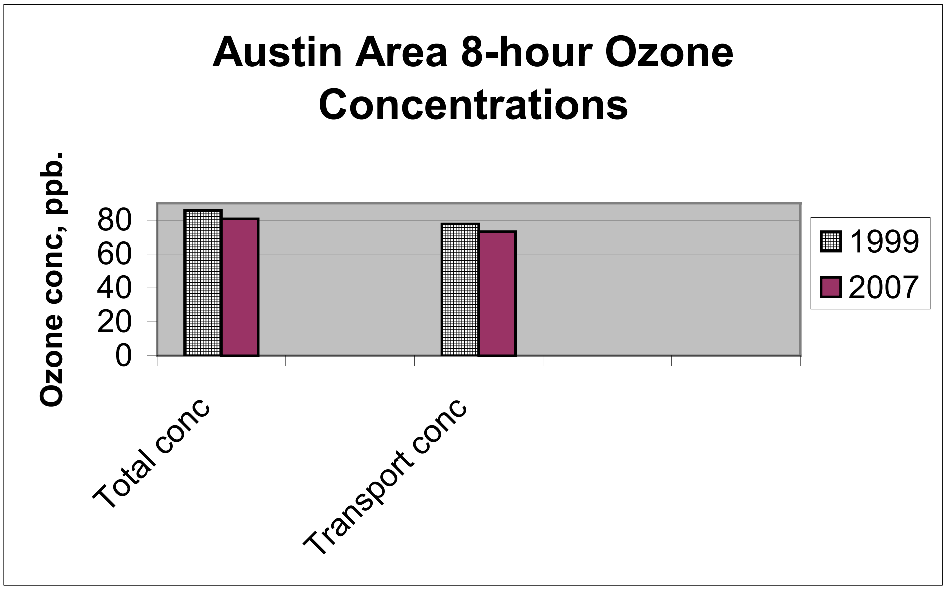
Source Area	Number of days significant impact on Austin		
	Sep 13-20, 1999	Jul 9-12, 1995	1993, 1995 and 1996
Number of days modeled	6	4	11
Houston/Galveston	5	3	10
Beaumont/Port Arthur	5	1	5
Dallas/Fort Worth	0	0	3
Tyler/Longview/Marshal	3	0	4
Victoria	2	4	5
San Antonio	3	4	6
Corpus Christi	2	2	0

Another analysis that can be performed with the zero-out modeling is to determine the maximum concentration before the zero-out, and the maximum concentration after the zero-out, of local emissions. This quantifies the difference in maximums that the local emissions make and also provides insight into the magnitude of the ozone in the area that is due to transport. A summary of these data for the September 13-20, 1999 episode is shown in Table 4.3

Table 4.3. Impact of zero-out of Austin anthropogenic emissions on the Austin Area.

Episode day	Maximum Concentration before zero of Austin Emissions, ppb	Maximum Concentration after zero of Austin Emissions, ppb
9/15/99	77	70
9/16/99	75	70
9/17/99	82	79
9/18/99	80	72
9/19/99	83	78
9/20/99	88	70

Figure 4.4 shows average result for the September 1999 episode.



CHAPTER 5: EMISSION REDUCTION STRATEGIES

5.1 Introduction

Various emission reduction techniques can effectively reduce ozone precursors. Emission reduction methods employed nationally (e.g., automotive emission reductions), statewide and regionally (emission reductions from EGUs) benefit the Austin area, but more reductions are needed to ensure clean air for the region. The EAC provides the mechanism for implementation of local emission reduction techniques.

5.2 Federal Reduction Strategies

The CAAP projects emission reductions from the following federal initiatives:

Federal Area Source Measures:

- Reformulated Architectural and Industrial Maintenance Coatings
  - 40 CFR Part 59 Subpart D *National Volatile Organic Compound Emission Standards for Architectural Coatings*
- Auto Body Refinishing
  - 40 CFR Part 59 Subpart B *National Volatile Organic Compound Emission Standards for Automobile Refinish Coatings*

Federal On-Road Measures:

- Tier 2 Vehicle Emission Standard
  - 40 CFR Parts 80, 85, and 86 *Air Pollution; Tier 2 Motor Vehicle Emission Standards and Gasoline Sulphur Control Requirements; Diesel Fuel Quality Controls*
- Heavy-duty Diesel Engine Rule
  - 40 CFR Parts 85 and 86 *Emissions Control, Air Pollution from 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Light-Duty On-Board Diagnostics Requirements*
- National Low Emission Vehicle Standards
  - 40 CFR Parts 9, 85, and 86 *Control of Air Pollution form New Motor Vehicles and New Motor Vehicle Engines: State Commitments to National Low Emission Vehicle Program*

Federal Non-Road Measures:

- Small Spark-Ignition Handheld Engines
  - 40 CFR Parts 90 and 91 *Phase 2 Emission Standards for New Nonroad Spark-Ignition Handheld Engines at or Below 19 Kilowatts and Minor Amendments to Emission Requirements Applicable to Small Spark-Ignition Engines and Marine Spark-Ignition Engines.* (FR 24268, Vol.65, No.80, April 25, 2000)
- Tier 3 heavy-duty diesel equipment
  - 40 CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines* (FR 56968, Vol.63, No.205, October 23, 1998)
- Locomotives
  - 40 CFR Parts 85, 89, and 92 *Emission Standards for Locomotives and Locomotive Engines* (FR 18978, Vol.63, No.73, April 16, 1998)
- Compression ignition standards
  - 40 CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines*
- Emissions from Non-Road Large Spark-Ignition Engines and Recreational Engines
  - CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines (Marine and Land-Based); Final Rule* (FR 68242, Vol.57, No.217, November 8, 2002)
- Recreational Marine standard
  - CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines*

Federal Point Source Measures:
- Alcoa Inc. Consent Decree

5.3 State and Regional Reduction Strategies

The CAAP projects emission reductions from the following statewide initiatives:

State Area Source Measures:

Non-Road Large Spark-Ignition Engines
- 30 TAC 114, Subchapter I, Division 3 *Non-Road Large Spark-Ignition Engines*

HB2914 - Grandfathered Pipeline Facilities
- 30 TAC 116, Chapter H, Division 2 *Small Business Stationary Source Permits, Pipeline Facilities Permits, And Existing Facility Permits*

Gas-fired Water Heaters, Small Boilers and Process Heaters
- 30 TAC 117, Chapter D, Division 1 *Water Heaters, Small Boilers, And Process Heaters*

State On-Road Source Measures:

Clean Gasoline
- 30 TAC 114, Subchapter H, Division 1 *Gasoline Volatility*

Stage 1 Vapor Recovery
- 30 TAC 115, Subchapter C, Division 2 *Filling Of Gasoline Storage Vessels (Stage I) For Motor Vehicle Fuel Dispensing Facilities*

State Non-Road Source Measures:

Texas Low Emission Diesel
- 30 TAC 114, Subchapter H, Division 2 *Low Emission Diesel*

State Point Source Measures:

Cement Kiln NOx limits
- 30 TAC 117, Subchapter B, Division 4 *Cement Kiln*

SB5 – TERP
- 30 TAC 114 Subchapter K, Division 3 *Diesel Emissions Reduction Incentive program for On-Road and Non-Road Vehicles*

SB7 - Electric Utility Deregulation
- 30 TAC 116 Subchapter I, Division *Electric Generating Facility Permits*

SB766 - VERP & MPP for Grand fathered Facilities
- 30 TAC 116 Subchapter H, Division 4 *Voluntary Emission Reduction Permits*

HB2912 - Grandfathered Permitting Requirements
- 30 TAC 116 *Control Of Air Pollution By Permits For New Construction Or Modification*

Electric Generating Facilities NOx Emission Rules for boilers & gas turbines (EASTNOx)
- 30 TAC 117, Subchapter B, Division 2 *Utility Electric Generation In East And Central Texas*

5.4 Local Strategies

5.4.1 Introduction

The June EAC milestone identified and described potential local emission reduction measures. The milestone report, and subsequent revisions, organizes the measure into two groups. The State Assisted Measures would apply to all or most jurisdictions in the A/RR MSA.[1] The Locally Implemented Measures were self-selected by the EAC signatories, with each encouraged to implement at least three in addition to continuing

[1] Per the Early Action Compact document, signed December 18, 2002, "All control measures will be incorporated by the state into the State Implementation Plan and submitted to the EPA for review and approval."

O_3 Flex commitments. Jurisdictions could choose to enhance an existing O_3 Flex measure.

5.4.2 State Assisted Measures

State Assisted Measures require state regulations or actions for implementation and/or enforcement. A chart summarizing these measures appears below, with full descriptions following the chart. They will be implemented no later than December 31, 2005, unless otherwise indicated. The semi-annual review will track and document all State Assisted Measures. In accordance with the EAC agreement, these emission reduction measures are specific, quantified, permanent and enforceable. All emission reduction estimates provided below are specific to the 2007 evaluation year. The TCEQ rules listed in this section can be found at http://www.tnrcc.state.tx.us/oprd/rules/indxpdf2.html.

Chart 5.4.2 CAC Approved State Assisted Measures

Emission Reduction Measures		**Comments**
A1	Inspection and Maintenance (I&M)	Gets the biggest reductions in on-road emissions, our major emissions source. Reduces both NOx and VOC. Also reduces toxics, some of which are known carcinogens. Well -defined state program with a high degree of certainty regarding quantified reductions, implementation and enforcement. Spreads the cost of reductions to the entire vehicle owning public, which results in a reasonable per capita cost (expected additional $20 added to safety inspection). Counties may elect t o participate in the Low Income Repair Assistance Program (LIRAP). Specific purpose waivers are also available. Cost of inspection equipment reimbursed through fees.
A2	Idling Restrictions on Heavy-Duty Diesels (14,000 lbs or more)	Reduces on-road NOx emissions, as well as PM and toxic emissions, some of which are known carcinogens. Results in fuel savings. Addresses citizens concerns re extended idling in residential areas. Most preferred measure in CAF Public Opinion Survey. Would be enforced by local law enforcement, if TCEQ grants the authority to do so.
A3	Commute Emission Reduction Program	Reduces on-road NOx and VOC emissions. Designed to allow employers choice and flexibility in meeting requirements. May help reduce peak hour weekday congestion and encourage business practices that improve air quality.
A4	Low Emission Gas Cans	Reduces area source VOC emissions. TCEQ is working on a state rule that would require all gas cans sold or for sale, in all or part of the state, (including the MSA) to be low emission cans.
A5	Stage I Vapor Recovery Requirement Change	Reduces area source VOC emissions. Would lower the exemption in the current TCEQ rule from under 125,000 gallons a month to under 25,000 gallons a month. Local information indicates that many stations already have the equipment in place.
A6	Degreasing Controls	Reduces area source VOC emissions. Would revise TCEQ rule that applies to selected nonattainment and other counties to apply in the MSA.
A7	Autobody Refinishing Controls	Reduces area source VOC emissions. Would revise TCEQ rule that applies to selected nonattainment and other counties to apply in the MSA.

A8	Cut Back Asphalt	Reduces area source VOC emissions. Would revise TCEQ rule that applies to selected nonattainment and other counties to apply in the MSA. TCEQ rule includes an exemption for patching
A9	Low Reid Vapor Gas	Reduces on-road VOC emissions. Flint Hills, the region's primary fuel supplier has expressed concerns with this measure in light of recent fuel improvements that they have made. We continue to work with Flint Hills to define a mutually acceptable measure.
A10	BACT and Point Source Emissions Balancing	Will manage future point source growth. Maintains current BACT requirements and adds emissions balancing (offset) requirements. Modified defined as per TCEQ New Source Review (NSR) rules.
A11	Petroleum Dry Cleaning	Mitigates growth in petroleum dry cleaning emissions. Would revise TCEQ rule that applies to selected nonattainment and other counties to apply in the MSA.
A12	Texas Emission Reduction Program (TERP)	A state Emission Reduction Incentive Grants Program which reduces on and off road NOx. Requires local participation through grant applications and project implementation. TCEQ has suggested that a 2 ton per day NOx reduction would be a reasonable commitment for this measure.
A13	Power Plant Reductions	Reduces local power plant NOx emissions below state and federal mandated levels. Austin Energy, LCRA and UT have indicated a willingness to proceed with these reductions.

The CAC approved these recommendations by vote on January 14, 2004.

5.4.2.A1 Inspection and Maintenance (I/M) Program

Program Summary/Explanation

NOTE: [This I/M program was designed for use in the MSA's three urbanized counties (Hays, Travis and Williamson), with implementation contingent upon approval from the commissioners' court of each county and from the city council of the largest city in each county. The commissioners' courts in Hays, Travis and Williamson Counties approved; the city councils in Austin and Round Rock approved. The City of San Marcos voted (four to two, with one council member absent) to delete I/M from the draft list of recommended measures. The CAC requested that the City of San Marcos commit to alternative measures for on-road emissions reductions. In a letter dated March 9, 2004, Mayor Habingreither indicated San Marcos would implement an alternative plan involving propane fuel and propane-fueled vehicles. These measures would replace the reductions lost to Hays County because of the decision by the San Marcos City Council. The plan will be revised when the alternative measures are finalized. The following summary describes the amended, two-county program for Travis and Williamson Counties.]

The I/M program requires all subject gasoline vehicles 2 to 24 years old registered and primarily operated in the I/M program counties (Travis and Williamson) to undergo an annual emissions inspection test in conjunction with the annual safety inspection. Emissions inspection tests are conducted at all safety inspection stations. The entire vehicle safety and emissions inspection should be completed in about 20 minutes from the time the vehicle is driven into the inspection bay. If a vehicle fails the emissions inspection test, the items of failure will be indicated on the *Vehicle Inspection Report*. The vehicle should be repaired and returned to the same inspection station with 15 days for a free re-test. A passing emission inspection test (or test waiver) is required in order to renew vehicle registration or to receive a safety inspection sticker.

The program does not apply to motorcycles or slow moving vehicles, as defined by Section 547.001, Transportation Code. Test on resale is required for all vehicles from non-I/M program counties that are sold and registered in the I/M program counties. Per state statute, vehicles belonging to students at public universities, but registered in non-I/M program counties, must participate to receive campus parking privileges.

The emissions test fee (set by TCEQ) is expected to be no more than $20 in Hays, Travis and Williamson Counties. The safety inspection fee is $12.50, so the combined inspection cost is not expected to exceed $32.50. Testing equipment costs (estimated at $15,000 per station) are recouped through fee. The equipment includes the Two-Speed Idle (TSI), the On-Board Diagnostic (OBD) analyzer testing system, gas cap tester and 2-D Bar Code scanner.

The OBDII testing program will be used to test 1996 model year and newer vehicles. All 1996 and newer vehicles less than 14,000 pounds (passenger cars, pickup trucks, sport utility vehicles) are equipped with OBD systems. The OBD system monitors emission performance components to ensure that the vehicle runs as cleanly as possible. The system also assists repair technicians in diagnosing and fixing emission-related problems. If a problem is detected, the OBD system illuminates a "Check Engine" or "Service Engine Soon" warning lamp on the vehicle instrument panel to alert the driver. The system will store information about the detected malfunction so that a repair technician can accurately find and fix the problem

Model year 1996 and newer vehicles are required to meet EPA specifications for collection and transfer of emissions control data during each driving cycle. The Diagnostic Link Connector (DLC) cable on the emissions test analyzer is hooked up to the DLC located in the vehicle. When the vehicle's OBD system has checked the emissions control systems and detected a problem with the vehicle, this information is stored in the vehicle's on-board computer. The OBD test transmits this data to the analyzer and the vehicle will fail the inspection. The inspection report will indicate which emissions control systems were checked and display the description of the fault codes retrieved from the vehicle.

The Two-Speed Idle testing program will be used to test 1995 model year and older vehicles. The TSI test uses a tailpipe probe exhaust gas analyzer to measure VOC and CO while the vehicle is idling at a low and a high rate.

The I/M program includes a high emitter program to identify vehicles that are significantly exceeding federal vehicle emission standards. On-road remote sensing equipment will be used to identify high-emitting vehicles in the three I/M program counties or those commuting from contiguous counties. The van-installed on-road testing equipment is strategically placed to capture auto emissions from single-lane traffic in an acceleration mode. Vehicles identified as high emitters must be tested using the age-appropriate OBDII or TSI test within 30 days of notification and be repaired, if necessary. A passing test result (or test waiver) will be needed to renew vehicle registration.

The following waivers and extensions will be available to all qualifying vehicle owners through the Texas Department of Public Safety (DPS):

- Individual Vehicle Waiver– In order to address unusual cases where a vehicle cannot meet emissions standards, an *Individual Vehicle Waiver* may be issued to a vehicle owner whose vehicle has failed its initial emissions inspection and re-inspection, and in which at least $600 in emissions related repairs have been performed by a registered repair facility.

· Low Mileage Waiver – A *Low Mileage Waiver* may be issued to a vehicle owner whose vehicle has failed both its initial emissions inspection and the re-inspection, and in which at least $100 in emissions related repairs have been performed. The vehicle should have been driven less than 5,000 miles in the previous inspection cycle and anticipate being driven fewer than 5,000 miles before the next required safety inspection.

· Parts Availability Time Extension – A *Parts Availability Extension* may be issued for 30, 60 or 90 days to a vehicle owner whose vehicle fails the initial emission inspection and needs time to locate necessary vehicle emissions control parts.

Low Income Time Extension- A *Low Income Time Extension* may be issued to a vehicle owner whose vehicle has failed its initial inspection and re-inspection, and the applicant's adjusted gross income is at or below the federal poverty level.

Counties that implement a vehicle emissions inspection program may elect to implement the Low Income Repair Assistance, Retrofit, and Accelerated Vehicle Retirement Program (LIRAP). Vehicle owners whose vehicles fail the emissions inspection and who meet eligibility requirements may receive assistance through this program. The assistance can pay for emissions related repairs or be used toward a replacement vehicle if they choose to retire the vehicle. The assistance program is funded through a portion of the emissions inspection fee. The program is administered through a grant contract between TCEQ and each participating county. Only 5% of the grant contract funds may be used for the administrative costs of the program. Assistance is limited to no more than $600 for repairs or $1,000 toward replacement of the vehicle.

In order to be eligible for LIRAP, the vehicle owner's total family income must be less than or equal to twice the amount of the Federal Poverty Guidelines for designated family units. (At this writing, $24,240 for a family of two and $36,800 for a family of four). A vehicle is eligible for repair assistance if it failed the emissions inspection within 30 days of application, is currently registered, and has been registered in the program area for the two years preceding application, and it passes the safety inspection portion of the test. Repairs must be performed at a DPS-recognized repair facility. Vehicle retirement eligibility requirements are the same as for vehicle repairs, except the vehicle must have passed a safety inspection within 15 months of the application.

The I/M program will be applied in Travis and Williamson Counties.
NOTE: Periodic program evaluations will determine if any revisions or modifications are needed. If the I/M Program, as implemented, does not achieve the desired effects or is determined to be unnecessary, any participating jurisdiction can petition TCEQ to terminate the program.

<u>Implementation Considerations</u>
To implement this measure, the I/M Program counties exercise the flexibility offered to EAC areas in Senate Bill 1159 and request that TCEQ adopt a rule including the MSA's I/M Program in the state program.

<u>Program Participants</u>
Program participants are owners of 2 to 24 year old gasoline vehicles <8,500 lbs. Gross vehicle weight, safety inspection station owners and operators, vehicle repair facilities, TCEQ, DPS and counties that choose to administer (or contract with another entity to administer) a LIRAP program.

<u>Expected Reductions</u>
The I/M program is expected to reduce NOx emissions by 2.89 tons per day and VOC emissions by 3.84 tons per day.

<u>Additional Benefits</u>
The I/M program will also reduce toxic emissions, some of which are known carcinogens. It will encourage proper vehicle maintenance, which may result in fuel savings for some vehicle owners.

5.4.2.A2 Idling Restrictions on Heavy-Duty Diesel Engines

<u>Program Summary/Explanation</u>
This measure restricts engine idling of vehicles with a gross vehicle weight rating of more than 14,000 pounds to five consecutive minutes.

Exemptions are allowed for vehicles with a gross vehicle weight rating of 14,000 pounds or less; that are forced to remain motionless because of traffic conditions over which the operator has no control; are being used as an emergency or law enforcement vehicle; when the engine operation is providing power for a mechanical operation other than propulsion; when engine operation is providing power for multiple passenger heating or air conditioning; when the engine is being operated for maintenance or diagnostic purposes, or when the engine is being operated solely to defrost a windshield.

Alternative methods of providing power to the vehicle are currently available. Truck stop electrification allows the vehicle operator to access electricity as a power source. Small generators, which emit less and are commercially available, can be used as auxiliary power sources.

<u>Area of Application</u>
This measure will apply throughout the MSA.

<u>Implementation Considerations</u>
To implement this measure, the MSA requests TCEQ adopt the measure through rulemaking applicable in the MSA and authorize MSA county and municipality law enforcement agencies, or other county and municipality entities, to enforce the measure.

<u>Program Participants</u>
Owners and operators of heavy duty diesel vehicles, MSA county and municipality law enforcement agencies or designees

<u>Expected Reductions</u>
NOx reductions of 0.19 tpd

Additional Benefits
The measure will reduce both NOx and particulate matter (PM) emissions. It also reduces exposure to toxic compounds associated with diesel fuel use. In addition, the measure will result in fuel savings.

5.4.2.A3 Commute Emission Reduction Program

Program Summary/Explanation

The Commute Emission Reduction Program requires every existing or future employer, public or private sector, with 200 or more employees per location to submit a detailed plan to TCEQ or local designee that demonstrates how the employer will reduce the equivalent of their NOx and VOC commute related emissions by 10% within three years. Employers will set interim goals to ensure they reach the 10% goal within the time frame. Employers may choose to reduce commute or any other business related emissions that occur at the location with 200 or more employees as long as the aggregate emissions reductions are equivalent to 10% of their commute related emissions for both NOx and VOC.

The plan will include details on how the commute related emissions were calculated, how and when the 10% total emissions reductions (in any combination of VOC and/or NOx) will be achieved, as well as how the reductions will be maintained over time. Alternative plans that detail how the employer will achieve and maintain a verifiable employee commuter average vehicle occupancy (AVO) of 1.2 will be accepted. Verifiable participation in the CLEAN AIR Force's Clean Air Partners Program at a 10% reduction level will also be accepted.

Commute related emissions may be calculated for locations with 200 or more employees using a baseline of the annual average number of employees at that location in 2003, 2004 or the expected annual average number of employees for a new employer location and assuming all employees drove to work alone. For Clean Air Partners, the emissions baseline for new participants is either the year they joined or a baseline that is defined by the Partners program.

The annual average number of employees multiplied by the average round trip commute (22.6 miles) equals the number of employee miles traveled. Employee miles traveled multiplied by the MSA's commute MOBILE6 emission factors for VOC and NOx equals the VOC and NOx commute emissions. The MOBILE6 emission factors may be for the analysis year, 2007 or any other year deemed appropriate by the TCEQ. The MSA average round trip commute mileage may be used or an employer may choose to use employee specific round trip commute mileage. A calculation guidance packet, including emission factors will be developed and made available to employers.

All employers with 200 or more employees at a single location will register with TCEQ or local designee by December 31, 2004 or within 60 days of beginning operations for new locations. All plans must be submitted to TCEQ or local designee by March 31, 2005 or within 120 days of beginning operations for new locations. TCEQ or local designee will approve all plans, or inform the employer of any plan deficiencies by July 31, 2005 or within 4 months of plan submittal for new locations. In the event that plan deficiencies occur, employers will have 60 days from the date of notification of such deficiencies to revise and resubmit their plans. TCEQ or local designee will approve or reject the revised plan within 30 days from the date of re-submittal. Plans must be implemented no later than December 31, 2005 or within 1 year from the date of registration for new locations.

Employers will report on the plan's implementation and results semi-annually in conjunction with the MSA's EAC semi-annual report. Reporting periods are May 1 through October 31 and November 1 through April 30. Copies of the Commute Emission Reduction Program report are due to TCEQ or local designee and CAPCO by November 30th and May 31st respectively. In the event that the semi-annual reports indicate that the planned emission reductions are not being achieved and maintained, TCEQ or local designee may request that the employer revise their plan accordingly.

In the event TCEQ designates program responsibility to a local entity, the TCEQ and EPA will make every reasonable effort to provide adequate funding for program administration. Both the Clean Air Partners Program and the CAMPO Commute Solutions Program provide free tools and information that may be useful in complying with this measure. The Commute Solutions Program provides employee transportation coordinator training and Commute Solutions Fairs for alternatives to drive-alone commutes, while Clean Air Partners provides tools, expertise and experiences of member employers. Information on the Commute Solutions and Clean Air Partners programs can be found at www.commutesolutions.com and www.cleanairpartnerstx.org .

Area of Application
This measure will apply throughout the MSA.

Implementation Considerations
To implement this measure the MSA requests that TCEQ adopt a rule applying this measure in the MSA. TCEQ or their local designee will be responsible for implementation and enforcement of the program.

Program Participants
All employers with 200 or more employees per location, TCEQ (or its designated local agent), Clean Air Partners Program, CAMPO Commute Solutions Program, CAPCO

Expected Reductions
Emission reductions from this measure will not be included in final modeling.

Additional Benefits
Some workday rush hour congestion may be reduced if employers select and implement commute emission reduction measures. The measure will also encourage business practices that improve air quality.

5.4.2.A4 Low Emission Gas Cans

Program Summary/Explanation
The TCEQ is drafting a statewide rule to lower the emission of VOCs from portable fuel containers that spill, leak, and/or allow permeation. A Portable Fuel Container Rule will reduce both the frequency and quantity of fuel that is spilled or that leaks from portable

fuel containers. The rule mirrors California Air Resources Board regulations and will add provisions to 30 TAC Chapter 115 (Control of Air Pollution from Volatile Organic Compounds), Subchapter G (Consumer-Related Sources). It will apply to all portable fuel containers and spouts manufactured for sale or sold in Texas. The rules will set standards for design requirements to prevent overfills of receiving tanks and spills during transit. The rules will prohibit separate vent holes.

Area of Application
This measure will apply statewide

Implementation Considerations
The MSA does not need to initiate action for implementation if the TCEQ proceeds with rulemaking.

Program Participants
Consumers and sellers of portable fuel containers in Texas

Implementation Date
No later than December 31, 2005

Expected Reductions
Implementation of these rules solely in the A/RR MSA reduces regional VOC emissions by 2.6 tpd. Given transport patterns, statewide implementation of the rule should bring additional reductions.

Additional Benefits
Because the improved gas cans decrease spills, they are safer for consumers and can reduce water pollution.

5.4.2.A5 Stage 1 Vapor Recovery Requirement Change

Program Summary/Explanation
This measure would require additional gas stations and fuel dispensing facilities in the MSA to comply with TCEQ Stage 1 Vapor Recovery rules (Chapter 115, Subchapter C, Division 2, §§115.221 - 115.227, 115.229) by lowering the exemption threshold defined in §115.227(3) from 125,000 gallons a month to 25,000 gallons a month in the MSA counties. According to the TCEQ Petroleum Storage Tank database, over 60% of existing tanks in the area are already Stage 1 equipped, so implementation costs should be reduced substantially.

Area of Application
This measure will apply throughout the MSA

Implementation Considerations
To implement this measure, the MSA requests that TCEQ revise the rule to include the above-mentioned change to the existing Stage 1 Vapor Recovery rule. The MSA encourages TCEQ to expand implementation of this measure to the eastern half of the state.

Program Participants
Program participants are gas stations and fuel dispensing facilities in the MSA.

Expected Reductions
Expected emission reductions in the MSA are 4.88 tons per day VOC.

Additional Benefits
Stage 1 Vapor Recovery reduces emissions of toxics, some known to be carcinogens.

5.4.2.A6 Degreasing Controls

Program Summary/Explanation
This measure regulates cold solvent degreasing operations by revising TCEQ rules (Chapter 115, Subchapter E, Division 1, §§115.412 (1), 115.413, 115.415 - 115.417, 115.419) to apply to the MSA counties. Degreasing uses a solvent to remove grease, oil, or dirt from the surface of a part prior to surface coating or welding.

Area of Application
This measure will apply throughout the MSA.

Implementation Considerations
To implement this measure, the MSA requests that TCEQ's existing rule be revised to apply in the MSA.

Program Participants
Program participants are facility owners and operators that conduct degreasing operations in the MSA.

Expected Reductions
The expected emission reductions from this measure are 6.38 tons per day VOC.

Additional Benefits
Cost saving due to less rapid evaporation of solvents.

5.4.2.A7 Autobody Refinishing Controls

Program Summary/Explanation
This measure regulates autobody refinishing by revising TCEQ rules (Chapter 115, Subchapter E, Division 2, §§115.420 - 115.427, 115.429) so that the requirements of §115.421(a)(8)(B) and §115.422(1) and (2) apply in the MSA counties. These requirements set limits on the VOC content in paint and address spray gun cleaner and transfer efficiency.

Area of Application
This measure will apply throughout the MSA.

Implementation Considerations
To implement this measure, the MSA requests that TCEQ's existing rule be revised to apply in the MSA.

Program Participants
The program participants are autobody refinishing facility owners and operators in the MSA.

Expected Reductions
The expected emission reductions from this measure are 0.05 tons per day VOC.

Additional Benefits
No additional benefits are noted at this time.

5.4.2.A8 Cut Back Asphalt

Program Summary/Explanation
This measure would restrict the use of cut-back asphalt in the MSA through a TCEQ rule revision (Chapter 115, Subchapter F, Division 1, §§115.510, 115.512, 115.513, 115.515 - 115.517, 115.519) to include the MSA counties in the requirements of these sections.

The use of conventional cutback asphalt containing VOC solvents for the paving of roadways, driveways, or parking lots is restricted to no more than 7.0% of the total annual volume averaged over a two-year period of asphalt used by or specified by any state, municipal, or county agency who uses or specifies the type of asphalt application.

When asphalt emulsion is used or produced, the maximum VOC content shall not exceed 12% by weight or the following limitations, whichever is more stringent:

A. 0.5% by weight for seal coats;
B. 3.0% by weight for chip seals when dusty or dirty aggregate is used;
C. 8.0% by weight for mixing with open graded aggregate with less than 1.0% by weight of dust or clay-like materials adhering to the coarse aggregate fraction (1/4 inch in diameter or greater); and
D. 12% by weight for mixing with dense graded aggregate when used to produce a mix designed to have 10% or less voids when fully compacted.

Exemptions:

1. asphalt concrete made with cutback asphalt, used for patching, which is stored in a long-life stockpile (longer than one-month storage); and
2. cutback asphalt used solely as a penetrating prime coat.

Area of Application
This measure will apply throughout the MSA.

Implementation Considerations
To implement this measure, the MSA requests that TCEQ's existing rule be revised to apply in the MSA.

Program Participants
Users and suppliers of cut-back asphalt in the MSA are program participants.

Expected reductions
The expected emission reductions from this measure are 1.03 tons per day VOC.

Additional Benefits
This measure results in water quality benefits.

5.4.2.A9 Low Reid Vapor Gas

(Note: This measure will not be included in the final modeling.)
Program Summary/Explanation
This measure lowers the gasoline Reid vapor pressure requirement in TCEQ rules (Chapter 114 Subchapter H, Division 1, §§114.301, 114.304 - 114.307, 114.309) from 7.8 to 7.0 in all counties in the MSA from May 1 to October 31 and retains all other requirements of these sections, unless they are contradictory to the 7.0 Reid vapor requirement.

Area of Application
This measure will apply throughout the MSA.

Implementation Considerations
To implement this measure, the MSA requests that TCEQ's existing rule be revised as stated in the program summary/explanation. The MSA encourages TCEQ to expand implementation of this measure to the eastern half of the state.

Program Participants
Gasoline producers, importers, suppliers, dispensers and users within the MSA

Expected Reductions
The expected emission reductions are 2.87 tons per day VOC.

Additional Benefits
No additional benefits noted at this time.

5.4.2.A10 BACT and Point Source Emissions Balancing

Program Summary/Explanation
Maintain Best Available Control Technology (BACT) and add emissions balancing 1:1 offsets for all new or modified point sources that will emit 100 tons per year or more of NOx. Emissions balancing offsets for VOC will be considered when, during the course of the continuing planning process, a review of the emissions inventory indicates a doubling of actual VOC emissions from the base year of 1999 (as indicated by TCEQ annual point source emissions inventory program).

Area of Application
This measure will apply throughout the MSA.

Implementation Considerations
To implement this measure, the MSA requests TCEQ adopt the measure through rulemaking applicable in the MSA.

Program Participants
Owners or operators of any new or modified (as defined by TCEQ rule) point sources in the MSA

Implementation Date
Spring 2005

Expected Reductions
N/A (see additional benefits)

Additional Benefits
Measure would be a core piece of the region's plan to manage to emissions growth.

5.4.2.A11 Petroleum Dry Cleaning

Program Summary/Explanation
This measure extends the TCEQ rules regulating petroleum dry cleaning (Chapter 115, Subchapter F, Division 4, §§115.552, 115.553, 115.555 - 115.557, 115.559) to include the MSA counties.

Area of Application
This measure will apply throughout the MSA.

Implementation Considerations
To implement this measure, the MSA requests that TCEQ's existing rule be revised to apply in the MSA.

Program Participants
Program participants are owners and operators of petroleum dry cleaning facilities in the MSA.

Expected Reductions
The expected emission reductions from this measure range from 0 to 1.0 tons per day VOC, depending on the amount of actual and expected petroleum dry cleaning occurring in the MSA. Emission reductions from this measure are not currently included in the CAAP. The measure is included to mitigate possible future growth in dry cleaning emissions.

Additional Benefits
No additional benefits noted at this time.

5.4.2.A12 Texas Emission Reduction Program (TERP)

<u>Program Summary/Explanation</u>
The 77th Texas Legislature established the Texas Emissions Reduction Plan (TERP) in 2001, through enactment of Senate Bill 5. The program was not fully funded, however, until the 78th Legislature enacted HB 1365 in 2003. TCEQ expects to have about $115-120 million in revenue in FY 2004, of which approximately $104 million will be available for the Emissions Reduction Incentive Grants Program (see below). Those figures are expected to increase in each of the subsequent fiscal years through FY2008, averaging a total of $150 million each year.

The primary purpose of the TERP is to replace, through voluntary incentive programs, the reductions in emissions of NOx that would have been achieved through mandatory measures that the Legislature directed the TCEQ to remove from the SIP for the Dallas/Fort Worth (DFW) and Houston/Galveston (HGA) ozone nonattainment areas. TERP funding is also expected to be available to help achieve reductions in counties located in the state's other two nonattainment areas and in designated near-nonattainment areas, where air quality is approaching nonattainment levels.

The TERP includes the following financial incentive and assistance programs intended to address the goals of the plan:

<u>The Emissions Reduction Incentive Grants Program</u> is administered by the TCEQ. The program provides grants to eligible projects in "affected counties," as delineated in HB 1365, to offset the incremental cost associated with activities to reduce emissions of NOx from high-emitting mobile diesel sources.

The types of projects that may be eligible for these grants include:

- ✓ On-Road Heavy-Duty Vehicles (8,500 lb or more)
    - Purchase or lease
    - Replacement
    - Re-power
    - Retrofit or add-on of emission-reduction technology
- ✓ Non-Road Equipment
    - Purchase or lease
    - Replacement
    - Re-power
    - Retrofit or add-on of emission-reduction technology
- ✓ Marine Vessels
    - Purchase or lease
    - Replacement
    - Re-power
    - Retrofit or add-on of emission-reduction technology
- ✓ Locomotives
    - Purchase or lease
    - Replacement
    - Re-power
    - Retrofit or add-on of emission-reduction technology
- ✓ Stationary Equipment
    - Purchase or lease
    - Replacement
    - Re-power
    - Retrofit or add-on of emission-reduction technology infrastructure

  - Oil and Gas Compressors
- ✓ On-Site Electrification and Idle Reduction Infrastructure
- ✓ Refueling Infrastructure (for qualifying fuel)
- ✓ On-Vehicle Electrification and Idle Reduction Infrastructure
- ✓ Use of Qualifying Fuel
- ✓ Demonstration of New Technology

The Heavy-Duty Motor Vehicle Purchase or Lease Incentive Program is a statewide program also administered by the TCEQ. Under this program, the TCEQ may reimburse a purchaser or lessee of a new on-road heavy-duty (over 10,000 lb) vehicle for incremental costs of purchasing or leasing the vehicle in lieu of a higher-emitting diesel-powered vehicle. The vehicle being purchased or leased must be EPA-certified to meet certain designated lower emissions standards for NOx. This program has yet to be implemented and available funds have been allocated to the Emissions Reduction Incentive Grants Program.

The Light-Duty Motor Vehicle Purchase or Lease Incentive Program is similar to the Heavy-Duty Program, and provides incentives statewide for the purchase or lease of light-duty (less than 10,000 lb) motor vehicles that are certified by the EPA to meet a lower emissions standard for NOx. The incentive program will be administered by the Texas Comptroller of Public Accounts but is currently unfunded.

Area of Application
HB 1365 designated all five counties in the A/RR MSA as "affected counties" and therefore eligible for participation.

Implementation Considerations
N/a

Program Participants
This voluntary program is available to all public and private fleet operators that operate qualifying equipment in any of the five counties. For new purchases, not less than 75 percent of the annual usage of the vehicle projected for the 5 years following the purchase must be projected to take place in one or more of the eligible counties. Leases must be for at least one year, and 75 percent of the annual usage over the lease period must be projected to take place in one or more of the eligible counties. Annual usage will be measured by either miles of operation or by fuel consumption.

Implementation Date
Immediately. Subsequent to the passage of HB 1365 in June 2003, TCEQ issued an initial Request for Applications under the original SB 5 rules in August 2003, and a second RFA under the new HB 1365 rules on December 31, 2003.

Expected Reductions
Because TERP was initially designed to address deficiencies in the HGA and DFW ozone nonattainment areas, our region assumes a majority of TERP funding will be necessary to address those continuing concerns. Nevertheless, the signatories to the A/RR MSA EAC intend to pursue TERP grants and to work with other public and private

sector entities operating in the region to pursue grants that will result in total NOx reductions of at least 2 tons per day.

Additional Benefits
Changes in fleet operations required by TERP retrofits, re-powers, replacements, etc. usually contribute to a reduction in other harmful toxics. They typically increase fuel efficiencies and lower fuel costs.

5.4.2.A13 Power Plant Reductions

Program Summary
Reduce NOx emissions from local power plants below state and federal mandates as follows:
Austin Energy –AE has committed to:

- Lower the cap on the total SB-7 NOx emissions from the original 1750 tons to 1500 tons per year. This will be accomplished by AE permanently retiring 241 SB-7 allowances per year.
- Voluntarily offset the emissions from all other AE-owned non-SB-7 units by reducing emissions from the Holly and Decker units. This effectively includes these units into the 1500-ton emission cap. This cap would be in effect at least through the year 2012.
- As new units are brought online, they will be included in this effective cap and their emissions will be offset by additional emission reductions from the Holly and Decker facilities.
- AE will achieve this cap through a combination of installing NOx reduction technologies at the Holly and Decker facilities as well as the retirement of their older generating units. AE has committed to permanently shut down Holly Units 1 and 2 by 31 December 2004 and Holly Units 3 and 4 by 31 December 2007.
- In order to comply with this effective cap, in addition to the emission rate reductions produced at the Holly and Decker facilities, additional emission reductions will be produced by the increased utilization of renewable energy resources as well as increased use of energy efficiency measures.

Lower Colorado River Authority

LCRA plans to contribute to the A/RR MSA Early Action Compact by taking the following voluntary actions:

- Reduce the NOx allowance allocation (as provided under SB7) to the Sim Gideon Power Plant, located in Bastrop County, by 300 tons. By reducing the Sim Gideon NOx allowance allocation from 1,344 tons per year to 1,044 tons per year, LCRA will offset the maximum expected NOx emissions from the Lost Pines 1 Power Plant, as previously committed to, plus an additional 100 tons. This action will be formalized in an enforceable regulatory mechanism, such as an agreed order or permit alteration, to be effective by December 31, 2005.
- Commit to offset NOx emissions associated with any new fossil fuel facility sited in the five-county EAC region with equivalent NOx reductions in the same five counties.

In addition, LCRA and Austin Energy, as partners in the Fayette Power Project (FPP), located in Fayette County agree to:

- Accelerate the FPP Flexible Air Permit final NOx plant-wide emission cap from an effective date of 2012 to December 31, 2006. The early replacement of the interim cap of 10,494 tons with the final cap of 9,522 tons will reduce the allowable plant-wide NOx emissions by 972 tons.

Although these facilities have not been identified as significant contributors to high ozone levels in the Austin Area, LCRA is taking the above voluntary actions in support of the Austin/Round Rock Early Action Compact and to further demonstrate our commitment to air quality protection.

The University of Texas at Austin - UT will reduce the allowable annual NOx emissions from its grandfathered units by 75%.

- Under a Voluntary Emission Reduction Permit with the TCEQ, the University will limit NOx emissions from grandfathered units to 341 tons per year; the historical potential NOx emissions from these units are 1,388 tons per year.
- The University will meet these reduced emissions levels by limiting operating hours on certain equipment and by installing 10-year BACT controls on other equipment. Controls are proposed for Boiler #7 in 2004 and Boiler #3 in 2005.
- The University will continue to operate its permitted unit (Gas turbine/boiler #8) as usual; this unit has average NOx emissions of 394 tons per year.

<u>Area of Application</u>
For Austin Energy and UT, commitments cover all units within the five counties. Additionally, Austin Energy's and LCRA's Fayette Power Project (Sam Seymour) in Fayette County is covered. The Lost Pines 1 facility, operated by LCRA's subsidiary Gentex, will be governed by the existing TCEQ permit.

<u>Implementation Considerations</u>
The power plant reductions will be implemented by the specified entities through agreed orders or permits.

<u>Program Participants</u>
Austin Energy, LCRA, Gentex, UT

<u>Implementation Date</u>
Austin Energy – April 1, 2005
LCRA – Sim Gideon Dec.31, 2005 FFP Dec. 31, 2006

<u>Expected Reductions</u>
Austin Energy – 627 tpy from 1999 actual emissions; 250 tpy from 2007 allowables
LCRA – 300 tpy from 2007 allowables at Sim Gideon
LCRA and Austin Energy (Fayette Power Project) – 9,600 tpy from 1999 actual emissions; 972 tpy from 2007 allowables
Estimated daily NOx reductions in the MSA are 7.08 tpd.

<u>Additional Benefits</u>
Austin Energy and LCRA – commitment to offset all new NOx emissions in the five counties

5.4.3 Locally Implemented Emission Reduction Measures

Locally Implemented EAC measures build on those in the O_3 Flex Agreement. Appendix 5-1 (comprising the ERG February 17, 2004 Report *Technical Support Documentation: Emission Control Strategy Evaluation for the Austin/Round Rock MSA EAC Clean Air Action Plan* and the CAPCO *Austin/Round Rock MSA Emission Reduction Strategy Technical Report*); more detailed descriptions, and commitments from participating agencies, appear in Appendix 5-2. Chart 5.1 lists each signatory's commitments. Signatories interpret and implement these measures according to their needs and abilities. With the exception of the Transportation Emission Reduction Measures (TERMs), the CAAP neither quantifies these reductions nor includes them in its modeling.

In addition to the self-selected measures, the region started Ultra Low Sulfur Gasoline in May 2004. It is used throughout the MSA.

Chart 5.1 – Locally Implemented EAC and O3 Flex Emission Reduction Measures

Emission Reduction Measure	City of Austin	Travis County	City of Round Rock	Williamson County	City of San Marcos	Hays County	City of Bastrop	City of Elgin	Bastrop County	City of Lockhart	City of Luling	Caldwell County
Texas Emission Reduction Program (TERP)	E	E		E	E	E						
Texas Low Emission Diesel (TxLED) for Fleets	E	E		E								
Transportation Emission Reduction Measures (TERMs)	O, E+	O, E+	O, E+	O, E+	O, E+		E	E				
Access Management							E	E		E		
Alternative Commute Infrastructure Requirements	E						E	E				
Drive-Through Facilities on Ozone Action Days	E									E		
Expedited permitting for mixed use, transit oriented or in-fill development							E	E				
Airport Clean Air Plan, includes:	O											
• Use of electric or alternative fuels for airport GSE	O, E											
• ABIA Airside Incentives for GSE use reduction	O, E											
• Integrate alternative fuels into City's aviation fleet	O, E											
• Operate alternative fueled ABIA surface parking lot shuttle buses	O, E											

Emission Reduction Measure	**City of Austin**	**Travis County**	**City of Round Rock**	**Williamson County**	**City of San Marcos**	**Hays County**	**City of Bastrop**	**City of Elgin**	**Bastrop County**	**City of Lockhart**	**City of Luling**	**Caldwell County**
• Use existing ABIA alternative fuel infrastructure for off-site parking shuttle buses	O, E											
Low VOC Striping Material	O, E	O	O	O	E	O	E	E		O, E		
Landfill Controls												
Open Burning Restrictions			E		E		E	E				
Tree Planting	O, E	O	O	O, E+	O, E	E	E	E		O, E		
Extend energy efficiency requirements beyond SB5 and SB7	E											
Shift the electric load profile	E											
Environmental dispatch of power plants	E											
Clean Fuel Incentives												
Low Emission Vehicles	O, E	O	O	O						O, E		O
Adopt-a-School-Bus Program										E		
Police Department Ticketing										E		
EPA Smart Way Transport Program												
Business Evaluation of Fleet Useage, Including Operations and Right Sizing	E	E		E	E							
Parking Incentives for Alt Fuel or SULEV vehicles												
Commute Solutions Programs, may include	O, E									E		
• Compressed Work Week	O, E	O	O						O		O	
• Flexible Work Schedule	O, E	O	O									
• Carpool or Alternative Transportation Incentives	O, E											

Emission Reduction Measure	**City of Austin**	**Travis County**	**City of Round Rock**	**Williamson County**	**City of San Marcos**	**Hays County**	**City of Bastrop**	**City of Elgin**	**Bastrop County**	**City of Lockhart**	**City of Luling**	**Caldwell County**
• Employer Subsidized Transit	O, E											
• Teleworking (full time)	O, E											
• Teleworking (part time)	O, E		O									
Direct Deposit	O, E	O	O	O	O, E	O, E+	E		O	E		O
e-Government and/or Available Locations	O, E	O	E	O, E+	O, E	O, E+						
Voluntary use of APUs for locomotives operating in Central Texas												
Fueling of Vehicles in the Evening	O, E	O	O	O	E	O, E+			O,E	O, E	O	O
Urban Heat Island/Cool Cities Program	E											
Resource Conservation	O, E+	O	O	O	O, E	O, E+					O	
Increase investments by Central Texas electric utility providers in energy demand management programs	E											
Alter production processes and fuel choices												
Contract provisions addressing construction related emissions on high ozone days	E											
Ensure emission reductions in SEPs, BEPs and similar agreements							E	E		E		
Ozone Action Day Education Program, includes:	O, E	O	O	O	O, E	O, E+	O, E	O, E	O	O, E	O	O
Employee Education Program	O	O	O	O	O	O	O	O	O	O	O	O
Public Education Program	O	O	O	O	O	O	O	O	O	O	O	O
Ozone Action Day Notification Program	O	O	O	O	O	O	O	O	O	O	O	O

Emission Reduction Measure	City of Austin	Travis County	City of Round Rock	Williamson County	City of San Marcos	Hays County	City of Bastrop	City of Elgin	Bastrop County	City of Lockhart	City of Luling	Caldwell County
Ozone Action Day Response Program	O, E	E	O	E	E	E			E			O
Alternative Fuel Vehicles	O	O	O									
Right Sizing	O	O	O									
5-minute Limit on Diesel Idling	O		O	O						O	O	O
Cleaner Diesel	O	O	O	O		O	O	O	O			
Vehicle Maintenance	O	O	O	O	O	O			O			O
Vapor Recovery on Pumps			O									O
Low VOC Asphalt		O	O	O								
Low-Emission Gas Cans	O		O	O		O	O	O		O	O	
Transit-Oriented Development	O											
Shaded Parking	O	O										
Landscaping voluntary start at noon on high ozone days (education program)										E		

O = O_3 Flex commitment
E = EAC commitment
E+ = increased EAC commitment from original O_3 Flex commitment
O, E = jurisdiction confirmed O_3 Flex commitment when selecting Locally Implemented EAC measures

The geographic area of the Locally Implemented commitments is the area covered by the jurisdiction making the commitment.
O_3 Flex measures have generally already been implemented, although the TERMs include phased implementation dates through 2007.
EAC measures will generally be implemented no later than December 31, 2005, although the TERMs include phased implementation dates through 2007. TERP projects may also have phased implementation dates. Many Locally Implemented EAC measures may be implemented by ozone season 2004.

Estimated emission reductions from Locally Implemented measures are at least 1 tpd NOx and 1 tpd VOC. The CAAP includes modeled reductions from the TERMs only.

5.4.4 Transportation Emission Reduction Measures (TERMs)

TERMs are transportation projects designed to reduce vehicle use, improve traffic flow or reduce congested conditions. A transportation project that adds single-occupancy vehicle (SOV) roadway capacity is not considered a TERM. General categories of TERMs include intersection improvements, traffic signal synchronization improvements, bicycle and pedestrian facilities, high-occupancy vehicle lanes, major traffic flow improvements, park and ride lots, intelligent transportation system (ITS) and transit projects.

TERMs are similar to transportation control measures (TCMs), except that TCMs apply to nonattainment areas. TCMs are included in the SIP and subject to transportation conformity requirements. The A/RR MSA O_3 Flex and EAC CAAP TERMs are not subject to nonattainment SIP or transportation conformity requirements.

Various jurisdictions and implementing agencies committed to numerous TERMs in the MSA's O_3 Flex Agreement. Additional TERM commitments have been made for the EAC CAAP. A total of 467 TERM projects have been, or will be, implemented. The listed O_3 Flex and EAC CAAP TERMs have various implementation dates. All TERMS will reduce emissions in 2007, while some will contribute to continued attainment past 2007. A project-specific list of O_3 Flex, EAC CAAP and continued attainment TERMs is found in Appendix 5-3. The list provides locations, project limits, implementation dates, and emission reductions for all TERMs. A summary table of the O_3 Flex and EAC CAAP TERMs, and the expected emission reductions, is below.

TERMs by Project Type	**2007 VOC Reductions (lbs/day)**	**2007 NOx Reductions (lbs/day)**
Intersection Improvements	448.82	374.95
Signal Improvements	797.30	705.14
Bicycle/Pedestrian Facilities	69.88	62.54
Grade Separations	5.94	5.28
Park and Ride Lots	98.26	87.99
Traffic Flow Improvements	159.43	145.98
ITS	41.32	41.32
Transit	35.10	14.51
Total (lbs/day)	**1656.05**	**1437.71**
Total (tons/day)	**0.83**	**0.72**

Area of Application
The TERMs are in various locations in the MSA. See Appendix 5-3 for specific locations.

Program Participants
Participants in the TERMs program are local jurisdictions and implementing agencies in the MSA and CAMPO.

Expected Reductions
The expected 2007 emission reductions are 0.83 tons per day VOC and 0.72 tons per day NOx.

Additional Benefits

TERMs help reduce roadway congestion and provide opportunities for alternatives to single occupant vehicle travel. They encourage people to travel (and exercise) by biking and walking.

5.4.5 Participating Organizations

Both the O_3 Flex Agreement and the EAC have benefited from the ongoing participation of various agencies and organizations. Their descriptions or contributions are found in the Appendices as noted. Participants include:

- Capital Metropolitan Transit Authority (Appendix 5-4)
- Clean Air Partners (Appendix 5-5)
- Clean Cities (Appendix 5-6)
- TxDOT (Austin District)
- TxDOT (State)
- TCEQ

5.4.6 Additional Considerations

Additional programs (not included in the modeling) that area organizations have initiated, used periodically or are considering, include:

- Electric lawnmower exchange program (residential) – The program offers incentives to the trade-in of gas-powered lawnmowers for electric lawnmower models at participating retail stores. The program was operated in 1997, 2002 and 2003 with quantifiable reductions of VOC and carbon monoxide emissions.

- Adopt-a- School-Bus – Implemented under the auspices of the CLEAN AIR Force.

In 2003, the CLEAN AIR Force of Central Texas brought the Adopt-A-School Bus Program to the Central Texas region. This program is an EPA initiative to partner with communities, businesses, educational leaders, and heath care professionals to reduce children's exposure to diesel exhaust and to improve air quality in our communities. The program operates as a private/public nonprofit grant program—making funds available to local school districts to replace and retrofit their aging, diesel bus fleets with new cleaner technology buses and fuels. This program will also support anti-idling guidelines in school districts. The Adopt-A-School Bus Program grant opportunity is open to all school districts in the five county region of Travis, Hays, Williamson, Caldwell and Bastrop. A projected replacement of 200 school buses over the course of three years could realize a reduction of approximately 80 tons/year of NOx.

Another component of the Adopt-A-School Bus Program is a supplemental environmental project in which funds will be used to retrofit or replace aging school buses in Milam, Lee and Bastrop Counties. With these two programs combined, both PM and NOx emissions from older school buses will be reduced in our region.

- Tree Planting Guide – This initiative involves specifying low VOC emitting trees in local lists of regionally appropriate plantings.

A collection of initiatives compiled for further study appears in Appendix 5-7.

CHAPTER 6: MAINTENANCE FOR GROWTH AND THE CONTINUING PLANNING PROCESS

Staff has evaluated the anticipated future growth of the region to ensure that the area will remain in attainment of the 8-hour standard for the time period 2007 through 2012 and 2015. This evaluation included analysis of population growth and its effect on on-road mobile emissions and area sources, and new and planned new point sources. This chapter is a summary of the analysis.

Area Sources

The emissions associated with area sources are directly related to population and economic activity. These two data sources are typically used to estimate area source emissions.

The population of the region has been growing for the past 60 years and is expected to continue to grow through 2012.

Table 6.1 Population Growth (CAPCO Regional Forecast 2000 to 2030, REMI, 2003)

	Population (thousands)				
County	**1999**	**2002**	**2005**	**2007**	**2012**
Bastrop	55.68	62.78	74.41	76.77	96.49
Caldwell	31.49	34.71	37.31	40.09	46.52
Hays	93.62	109.48	128.14	144.51	184.50
Travis	788.50	851.59	931.17	985.47	1095.30
Williamson	236.61	289.85	328.62	358.66	428.30
TOTAL	1205.90	1348.41	1499.66	1605.50	1851.11

As the population increases, so will the economic activity in the region. Though the economy of the region has slowed in recent years, the overall trend from 1999 through 2012 continues to show an increase.

Table 6.2 Total manufacturing employment forecast (CAPCO Regional Forecast, REMI, 2003)

	Employment as Manufacturing Total (thousands)				
County	**1999**	**2002**	**2005**	**2007**	**2012**
Bastrop	0.93	0.96	1.02	1.06	1.12
Caldwell	0.43	0.41	0.43	0.44	0.46
Hays	3.86	3.61	3.89	4.11	4.61
Travis	68.90	65.13	64.39	66.08	68.53
Williamson	9.10	9.09	9.36	9.68	10.11
TOTAL	83.23	79.21	79.10	81.36	84.83

With this increase in population and economic growth in the region, emissions from area sources are expected to increase only 14.2% from 1999 to 2012.

Table 6.3 Area Source Emission Trends Break Down (Tons per Day), CAPCO

Area Sources Emission Trend			
	1999	**2007**	**2012**
BASTROP			
NOx	0.60	0.76	0.82
VOC	4.52	5.53	6.16
CALDWELL			
NOx	0.54	0.67	0.68
VOC	15.29	15.75	17.17
HAYS			
NOx	0.58	0.79	0.85
VOC	5.47	7.67	8.21
TRAVIS			
NOx	3.21	4.05	4.28
VOC	50.60	57.04	57.58
WILLIAMSON			
NOx	3.00	3.84	3.86
VOC	14.68	20.44	21.25
MSA			
NOx	7.93	10.12	10.50
VOC	90.56	106.42	110.37

For more details, please see the report, *Emissions Inventory Comparison and Trend Analysis for the Austin-Round Rock MSA: 1999, 2002, 2005, 2007, & 2012* in Appendix 6-1.

On-Road Mobile Sources

The Protocol calls for an evaluation of the current long-range transportation plan. By definition, the long-range plan covers the geographical area of the MPO, which for the Austin Metropolitan area includes only Hays, Travis and Williamson Counties. The MSA and the region covered by this CAAP also include Bastrop and Caldwell Counties. Therefore, the analysis of the region's on-road emissions will be of VMT from three different sources, CAMPO, TxDOT, and TTI. Please refer to Appendix 6-2 a & b for details.

<u>VMT Screen</u>: Because on-road mobile emissions account for a significant amount of the region's ozone forming emissions, the region has focused much of its attention on growth in that area. It was, therefore, reasonable to perform a test to determine if the future planned transportation system will contribute increasing or decreasing amounts of NOx and VOC. One test that uses readily available data is a review of the relative change in VMT, also referred to as a VMT "screen". Staff has chosen to use the VMT screen that EPA originally developed for its proposed transitional ozone classification.

The VMT screen tests if any expected increase in VMT in a future year will be offset by technology and control measures. That is, that the expected associated emissions in a future year will not exceed the associated emissions of the base year.

The current CAMPO long-range transportation plan is based on VMT for the years 1997, 2007, 2015 and 2025. TxDOT supplied the1999 VMT. The "VMT Screen" for years 2007 and 2015 of the plan, *Mobility 2025* (Appendix 6-3), gave the following results.

Table 6.4 Emission Reductions in VMT from 1999 to 2015, with and without I/M

	NOx		VOC	
	Three-County		Three-County	
	CAMPO LRP		CAMPO LRP	
Year	No Controls	With I&M	No Controls	With I&M
1999	29,002,000		29,002,000	
2007	19,815,722	18,801,663	20,413,830	17,869,330
2015	9,162,901	7,316,813	15,036,818	11,943,306

VMT in the three-county region is expected to increase 40% from 1999 to 2007 and 90% from 2007 to 2015. The associated NOx will decrease by so much during those years that it will be as though there were a 31.7% decrease in VMT from 1999 to 2007 and a 68.4% decrease from 1999 to 2015. Additional, though less substantial, decreases will be realized from the region's implementation of an I/M program in Travis, Williamson and Hays Counties in 2005 (35.2% and 74.8%). Also, VOC will be reduced by 29.6% from 1999 until 2007 and 48.2% from 1999 to 2015. Reductions of VOC will also be greater with the I/M program (38.4% and 58.8%). The expected increases in population and the planned expansion of the roadway system will contribute to an increase in VMT, but will not cause on-road emissions to exceed 1999 levels.

Because Bastrop and Caldwell Counties are outside the CAMPO boundaries, and because they will not participate in the I/M program, a separate VMT screen was conducted for the aggregate 5-county region. The results are similar to those realized for the CAMPO area.

Table 6.5 Emission Reductions in VMT from 1999 to 2015

	NOx	VOC
	Five-County MSA	Five-County MSA
	TTI VMT	TTI VMT
Year	No Control Measures	No Control Measures
1999	32,506,000	32,506,000
2007	27,677,756	22,332,084
2015	9,796,164	15,907,780

VMT is expected to increase in the five-county region by 36% from 1999 to 2007 and 79.3% from 1999 to 2015. Without I/M in the five-county region, NOx from VMT is expected to decline by 33.3% from 1999 to 2007 and 69.9% from 1999 to 2015. The VOC will also decline (31.3% and 51.1%). Again, the expected increases in population and the planned roadway system that will contribute to an increase in VMT will not contribute to emissions exceeding the amount of 1999 on-road emissions.

One conclusion from this analysis is that the currently planned roadway system will not exacerbate the production of ozone in the MSA through 2015. The details of all calculations are included in Appendix 6-2b.

Emissions Comparisons: Another way to evaluate VMT and associated emissions is to compare the estimated emissions for future years to the base year emissions. Multiplying the emission factor by the VMT results in an estimate of the daily emissions associated with on-road travel. This evaluation shows a decrease in both NOx and VOC emissions, despite an increase in VMT.

Emission factors for each year were calculated by CAMPO staff using MOBILE6 and included appropriate local data where available. Emissions factors are typically expressed in grams/mile. Multiplying the emissions factor times the VMT results in the grams of emissions, either NOx or VOC. Because the emissions inventory is expressed in tons per day, the resultant grams of on-road emissions were converted to tons by dividing the number of grams by 454 grams/lb and then by 2000 lbs/ton. Please refer to Appendix 6-2 a & b for more details.

Table 6.6 Emission Reductions from 1999 to 2015

TTI, Five-County, No Controls								
NOx					**VOC**			
Year	**VMT (miles)**	**EF (g/mi)**	**VMT X EF (tons)**		**Year**	**VMT (miles)**	**EF (g/mi)**	**VMT X EF (tons)**
1999	32,506,000	2.433	87		1999	32,506,000	1.425	51
2007	44,508,000	1.185	58		2007	44,508,000	0.715	35
2015	58,274,000	0.409	26		2015	58,274,000	0.389	25

Both evaluation techniques, the VMT screen and comparison of emissions, show large enough decreases in on-road emissions to more than offset the anticipated growth in VMT through 2015. These decreases in emissions will be even greater once the I/M program is implemented.

Point Sources

TCEQ provided emission data for point sources in the CAPCO region for the 1999 EI. In the 1999 EI, the point source was sub-categorized into major point source and minor point source. CAPCO developed the following point source information for 1999 and 2007.

Table 6.4 Point Source Emissions from EGU, A/ RR MSA and Surrounding Area

EGUs Point Source Emissions (tpd) A/RR MSA and Surrounding Area					
		1999		**2007**	
County	**Facility Name**	**NOx**	**VOC**	**NOx**	**VOC**
Bastrop	Sim Gideon Electric Power Plant	7.10	0.33	3.94	0.11
Bastrop	Lost Pines 1 Power Plant	n/a	n/a	1.50	0.23
Bastrop	Bastrop Clean Energy Center	n/a	n/a	2.21	0.12
Fayette	Fayette Power Project	60.82	0.55	28.12	0.78
Hays	Hays Energy Facility	n/a	n/a	3.70	0.96
Milam	Sandow Steam Electric	24.20	0.33	13.19	0.32
Travis	Decker Lake Power Plant	8.15	0.44	3.80	0.12
Travis	Holly Street Power Plant	2.88	0.12	2.98	0.01
Travis	Sand Hills	n/a	n/a	1.03	0.20
Travis	Hal C Weaver Power Plant	1.99	0.03	1.86	0.05
Total		**105.14**	**1.80**	**62.32**	**2.91**
Total MSA		**20.12**	**0.92**	**21.01**	**1.81**

A uniform change for 2002 and 2005 was assumed and 2012 is expected to stay unchanged based on feedback from power plant stakeholders.

Table 6.5 Point Source Emissions from NEGU

NEGUs Point Source Emissions (tpd) A/RR MSA and Sourranding Area					
		1999		2007	
County	**Facility Name**	**NOx**	**VOC**	**NOx**	**VOC**
Caldwell	Durol Western Manufacturing, Inc.	0.00	0.01	0.00	0.00
Caldwell	Luling Gas Plant	0.89	0.26	0.29	0.04
Caldwell	Maxwell Facility	0.00	0.15	0.00	0.06
Caldwell	Prairie Lea Compressor Station	2.66	0.04	2.23	0.03
Caldwell	Teppco Crude Oil LLC, Luling Station	0.00	0.01	n/a	n/a
Comal	APG Lime Corp	1.15	0.00	1.15	0.00
Comal	Sunbelt Cemebt of Texas LP	7.61	0.12	3.79	0.13
Comal	TXI Operations LP	3.34	0.14	3.43	0.15
Hays	Parkview Metal Products, Inc.	0.00	0.10	0.00	0.03
Hays	Southern Post Co. Commercial Metal	0.00	0.06	0.00	0.01
Hays	Southwest Solvents and Chemicals	0.00	0.00	0.00	0.00
Hays	Texas LeHigh Cement	7.20	0.18	5.24	0.55
Milam	Aluminum Company of America	54.26	4.25	4.64	0.38
Travis	RIN3M Austin Center	0.15	0.03	0.15	0.03
Travis	Advanced Micro Devices, Inc.	0.00	0.00	0.23	0.17
Travis	Austin White Lime Co.	0.89	0.00	0.94	0.02
Travis	IBM Corporation	0.09	0.04	0.01	0.04
Travis	Lithoprint Co., Inc.	0.00	0.05	n/a	n/a
Travis	Motorola-Ed Bluestein	0.46	0.17	0.01	0.04
Travis	Motorola Integrated Circuit Division	0.09	0.08	0.02	0.02
Travis	Multilayer TEK, L.P.	0.00	0.18	0.01	0.21
Travis	Raytheon Systems, Co.	0.02	0.02	0.01	0.00
Travis	Twomey Welch Aerocorp, Inc.	0.00	0.00	0.00	0.00
Williamson	Aquatic Industries, Inc.	0.00	0.11	0.00	0.04
Total		**78.82**	**6.02**	**22.14**	**1.95**
Total MSA		**12.46**	**1.50**	**9.13**	**1.28**

Backup documentation for the above may be found in Appendix 6-4.

THE CONTINUING PLANNING PROCESS

CAPCO and CAMPO staff will analyze air quality and related data and perform necessary modeling updates annually. In addition to the data sources used for the above analyses, staff may add information from The Central Texas Sustainability Indicators Project (CTSIP). The CTSIP is a nonprofit organization that tracks 40 key indicators (e.g., water pollution, air quality, density of new development) that show the economic, environmental and social health of our

MSA. The results of all these analyses will be reported in the June semi-annual reports beginning in June 2005.

Using similar methods as for the above maintenance for growth analysis, staff will evaluate:
1. future transportation patterns;
2. all relevant actual new point sources; and
3. impacts from potential new source growth.

Future Transportation Patterns: As part of the *Mobility 2030* plan development process CAMPO staff will perform the VMT screen for years 2007 and 2017. The screen will test to be sure that any expected increase in VMT over the planning horizons will be offset by technology and control measures, that is, that the expected associated emissions will not exceed the associated emissions of the base year (1999).

As part of this analysis, the emission factors will be reviewed and updated as necessary. Review of the emission factors includes checking and updating the fleet mix.

This test will also be performed prior to adoption of any CAMPO long-range transportation plan update or amendment that significantly increases VMT.

New Point Sources and Potential New Point Sources: In addition to the VMT screen and review of area sources, staff will include a list and impact analysis of the relevant new and potential new point sources. Staff will obtain data on these relevant new and potential new point sources from TCEQ.

The annual analysis will determine the adequacy of the selected control measures. After review by the appropriate elected officials, these measures will be adjusted if necessary.

CHAPTER 7: TRACKING AND REPORTING

All signatories and implementing agencies will review EAC activities twice yearly. The semi-annual review will track and document, at a minimum, control strategy implementation and results, monitoring data and future plans. CAPCO, or its designee, will file reports with TCEQ and EPA by June 30 and December 31 of each reporting year. Reporting periods will be May 1 to October 31, and November 1 to April 30, to allow for adequate public notice and comment. CAPCO has primary responsibility for report generation.

CAPCO will provide appropriately detailed technical analysis for all semi-annual review reporting. The metrics detailed in Appendix 7-1 provide an example, but their use is subject to staffing and funding constraints.

Austin/Round Rock MSA Emissions Reduction Strategies

Clean Air Action Plan
Technical Report

Prepared by
The Capital Area Planning Council (CAPCO)
on behalf of
The Austin-Round Rock MSA Clean Air Coalition
Austin, Texas, March 2004

Executive Summary

This report supports the requirement outlined in the Austin-Round Rock Metropolitan Statistical Area (A/RR MSA) Early Action Compact (EAC), December 18, 2002 Memorandum of Agreement Section II A.1 Milestones, *Local Emission Reduction Strategies Selected,* January 31, 2004 for the Clean Air Action Plan. It summarizes the control measures that will be in effect for the attainment demonstration.

Federal Regulations currently or expected to be in place are covered in Section Two. Existing or proposed State Regulations are covered in Section Three. These measures are described in a summary format and are addressed further in the Maintenance for Growth report.

Section Four covers the local measures that either, (A) require state regulations or actions for implementation and enforcement or, (B) are recommended for local regulation, agreement, or voluntary arrangement and implementation. A discussion including who is affected by the measure, what the control strategy and implementation plan is, the methodology used to calculate the emission reduction, and cost estimates for each control measure is included for the Table A measures. The amount of NOx reduced by the requested state regulations is estimated to be about 12.73 tpd and the VOC reduction about 23.64 tpd. The Table B measures are summarized and will have to be developed further by the local adopting authority. Jurisdictions may select from Table B the measures that will complete their "fair share" obligation to emission reductions. Estimation on the amount of emissions reductions from the locally instituted measures will depend on how they are implemented by each jurisdiction.

The total NOx and VOC reductions are 10.6% and 14.8% respectively of the 2007 anthropogenic emissions for the A/RR MSA. The largest NOx reductions are coming from the Power Plants at 7.08 tpd. The largest VOC reductions come from the Degreasing Controls and Stage 1 Vapor Recovery Requirement Change at 6.38 and 4.88 tpd respectively. The Inspection and Maintenance program in Travis and Williamson County is the next greatest reduction category

providing 2.89tpd NOx reduction and 3.84tpd VOC reduction. Table ES-1 provides the summary of local reduction measures explained in this document.

		COUNTY					
Emission Reduction Measure	Pollutant	Bastrop	Caldwell	Hays	Travis	Williamson	Total
*Inspection and Maintenance (I&M)	NOx	n/a	n/a	0.30	2.16	0.73	**3.19**
	VOC	n/a	n/a	0.35	2.80	1.04	**4.19**
Idling Restrictions on Heavy Diesel	NOx	0.01	0.00	0.01	0.13	0.03	**0.19**
	VOC	n/a	n/a	n/a	n/a	n/a	**0.00**
Commute Emission Reduction Program	NOx	0.02	0.01	0.05	0.34	0.11	**0.54**
	VOC	0.03	0.01	0.05	0.39	0.12	**0.60**
Stage I Vapor Recovery Requirement Change	NOx	n/a	n/a	n/a	n/a	n/a	**0.00**
	VOC	0.16	0.19	0.63	2.83	1.08	**4.88**
Low Emission Gas Cans	NOx	n/a	n/a	n/a	n/a	n/a	**0.00**
	VOC	0.09	0.05	0.19	1.74	0.52	**2.60**
Architectural/Industrial Coatings Controls	NOx	n/a	n/a	n/a	n/a	n/a	**0.00**
	VOC	0.03	0.01	0.03	0.66	0.18	**0.91**
Degreasing Controls	NOx	n/a	n/a	n/a	n/a	n/a	**0.00**
	VOC	0.07	0.04	0.26	5.47	0.54	**6.38**
Autobody Refinishing Controls	NOx	n/a	n/a	n/a	n/a	n/a	**0.00**
	VOC	0.00	0.00	0.00	0.03	0.01	**0.05**
Cutback Asphalt	NOx	n/a	n/a	n/a	n/a	n/a	**0.00**
	VOC	0.07	0.05	0.06	0.61	0.24	**1.03**
Low Reid Vapor Pressure Gas	NOx	n/a	n/a	n/a	n/a	n/a	**0.00**
	VOC	0.11	0.05	0.17	1.74	0.81	**2.87**
TERP	NOx	0.10	0.04	0.19	1.19	0.48	**2.00**
	VOC	n/a	n/a	n/a	n/a	n/a	**0.00**
Power Plant Reductions	NOx	2.94	0.00	0.00	4.14	0.00	**7.08**
	VOC	n/a	n/a	n/a	n/a	n/a	**0.00**
TERMS	NOx	0.03	0.02	0.07	0.45	0.15	**0.72**
	VOC	0.04	0.02	0.07	0.54	0.17	**0.83**
GRAND TOTAL (REDUCTIONS) [TPD]	**NOx**	**3.11**	**0.07**	**0.61**	**8.43**	**1.50**	**13.72**
	VOC	**0.59**	**0.42**	**1.81**	**16.80**	**4.72**	**24.34**
Total Anthropogenic Emissions [TPD]	**NOx**	**12.52**	**5.88**	**17.42**	**69.70**	**22.85**	**128.38**
	VOC	**8.58**	**17.23**	**13.87**	**93.87**	**31.17**	**164.72**
Percent Reduction [%]	**NOx**	**24.8%**	**1.2%**	**3.5%**	**12.1%**	**6.6%**	**10.7%**
	VOC	**6.9%**	**2.4%**	**13.1%**	**17.9%**	**15.1%**	**14.8%**
* Note that total I/M reductions without Hays County are estimated to be 2.89tpd of NOx and 3.84tpd of VOC							

Table 1-1. A/RR MSA Local Measures Emission Reductions Summary

The emission distributions over the counties in the MSA are depicted in Figure ES-1 for VOC reductions and Figure ES-2 for NOx reductions. Travis County will be providing most of the reductions in both VOC and NOx at 70% and 61% respectively. Williamson County will provide a 19% reduction in VOC and Bastrop County a 23% reduction in NOx.

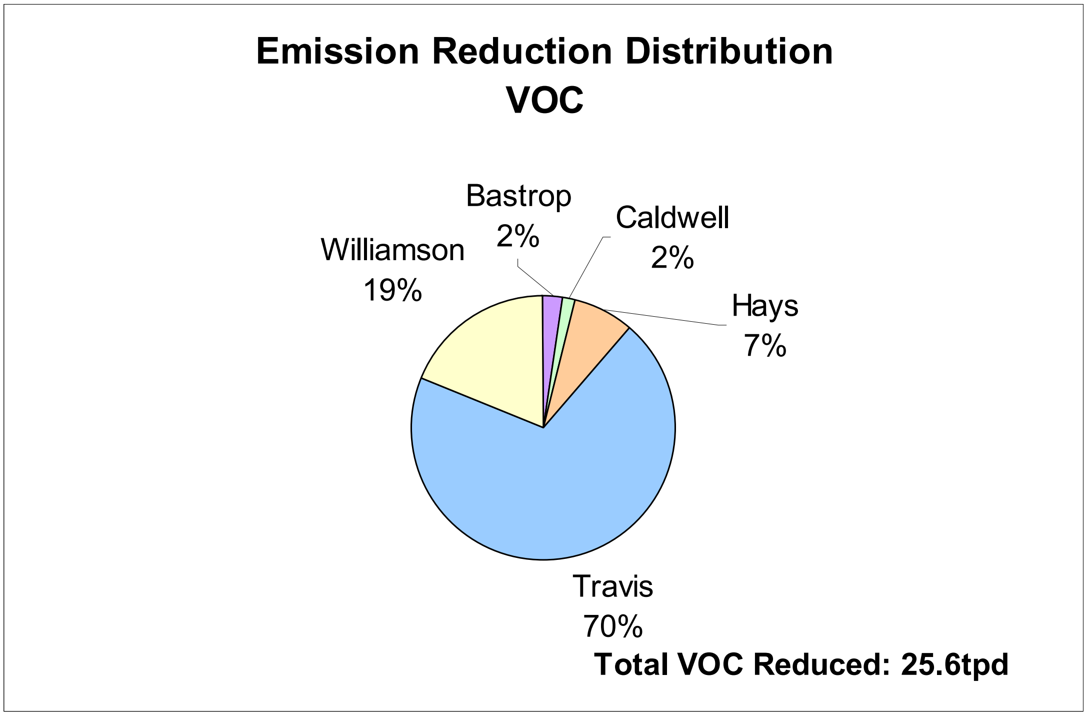


Figure 1-1. A/RR MSA VOC Emission Reduction Distribution. This assumes I/M or equivalent reduction program in Hays County

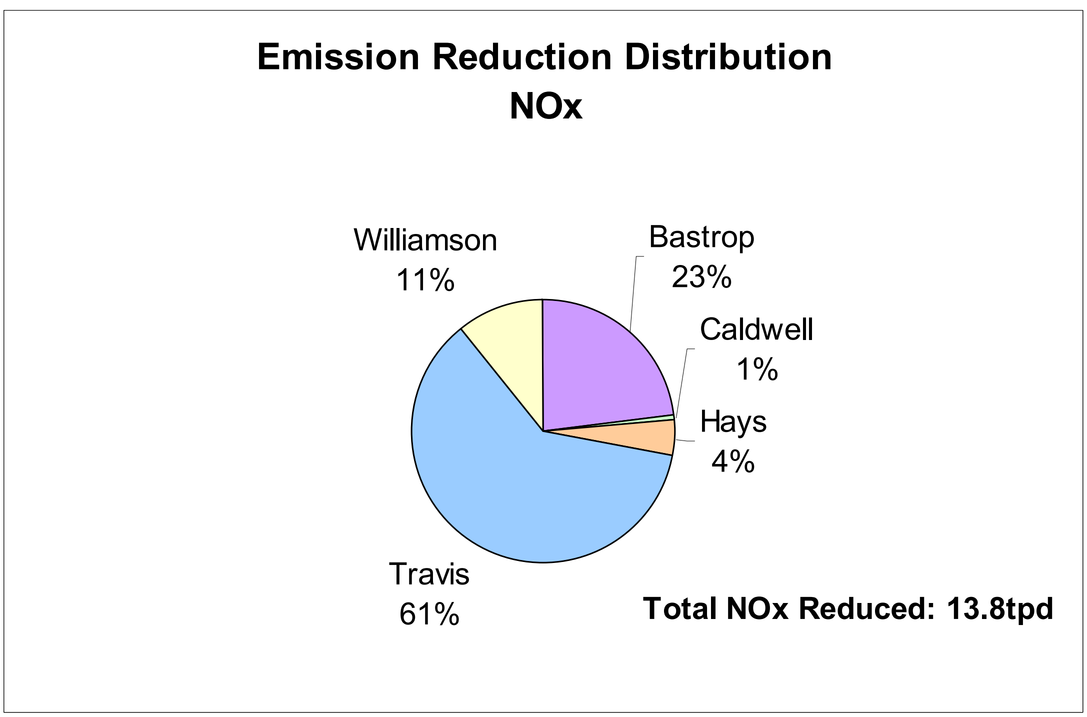


Figure 1-2. A/RR MSA NOx Emission Reduction Distribution. This assumes I/M or equivalent reduction program in Hays County

TABLE OF CONTENTS

Executive summary ... i
TABLE OF CONTENTS ... iv
1 Introduction ... 1-1
2 Federal Reduction Strategies ... 2-1
Non-Road Measures ... 2-1
2.1 REFORMULATED SURFACE COATINGS ... 2-3
2.2 AUTO BODY REFINSHING ... 2-4
2.3 TIER 2 MOTOR VEHICLE EMISSION REGULATIONS ... 2-5
2.4 NATIONAL LOW EMISSION VEHICLE STANDARD ... 2-6
2.5 HEAVY-DUTY DIESEL ENGINE RULE ... 2-7
2.6 STANDARDS FOR SMALL SPARK-IGNITION HANDHELD ENGINES ... 2-8
2.7 COMPRESSION IGNITION STANDARDS FOR VEHICLES AND EQUIPMENT. 2-8
2.8 EMISSIONS STANDARDS FOR LARGE SPARK IGNITION ENGINES ... 2-9
2.9 EMISSIONS STANDARDS FOR SPARK IGNITION MARINE ENGINES ... 2-9
2.10 EMISSIONS CONTROLS FOR LOCOMOTIVES ... 2-10
2.11 ALCOA CONSENT DECREE ... 2-12
3 State and Regional Reduction Strategies ... 3-1
Sec. ... 3-1
Category ... 3-1
Reductions in 2007 (tpd) ... 3-1
Area Source: ... 3-1
On-road Source: ... 3-1
Non-road Source: ... 3-1
Point Source: ... 3-1
3.1 DEGREASING UNITS ... 3-1
3.2 GRANDFATHERED PIPELINES ... 3-2
3.3 STAGE 1 VAPOR RECOVERY ... 3-2
3.4 STATE LOW EMISSION DIESEL PROGRAM ... 3-3
3.5 ELECTRIC GENERATING UTILITY NOX REDUCTIONS ... 3-4
3.6 VOLUNTARY EMISSIONS REDUCTION PERMIT (VERP) ... 3-4
3.7 HB 2912 Grandfathered Requirements ... 3-5
3.8 CEMENT KILN NOx LIMITS ... 3-5
4 Local Strategies ... 4-1
4.1 LOCAL STRATEGIES INTRODUCTION ... 4-1
4.2 TABLE A EMISSION REDUCTION MEASURES ... 4-1
4.2.1 Inspection and Maintenance (A1) ... 4-2
4.2.2 Idling Restrictions on Heavy-Duty Diesel Engines (A2) ... 4-11
4.2.3 Commute Emission Reduction Program (A3) ... 4-14
4.2.4 Low Emission Gas Cans (A4) ... 4-18
4.2.5 Stage 1 Vapor Recovery Requirement Change (A5) ... 4-23
4.2.6 Degreasing Controls (A6) ... 4-27
4.2.7 Autobody Refinishing Controls (A7) ... 4-29
4.2.8 Cut Back Asphalt (A8) ... 4-35

4.2.9 Low Reid Vapor Gas (A9) 4-36
4.2.10 BACT and Offsets for New or Modified Point Sources (A10) 4-40
4.2.11 Petroleum Dry Cleaning (A11) 4-40
4.2.12 Texas Emission Reduction Program (TERP) (A12) 4-42
4.2.13 Power Plant Reductions (A13) 4-47
4.3 TRANSPORTATION EMISSION REDUCTION MEASURES (TERMS) 4-50
4.4 TABLE B EMISSION REDUCTION MEASURES 4-52
4.4.1 Texas Emission Reduction Program (TERP) 4-57
4.4.2 Texas Low Emission Diesel (TxLED) for Fleets 4-57
4.4.3 Transportation Emission Reduction Measures (TERMs) 4-57
4.4.4 Access Management 4-58
4.4.5 Alternative Commute Infrastructure Requirements 4-58
4.4.6 Drive-Through Facilities on Ozone Action Days 4-58
4.4.7 Expedited permitting for mixed use, transit oriented or in-fill development. 4-59
4.4.8 Use of electric or alternative fuels for airport GSE 4-59
4.4.9 ABIA Airside incentives for GSE use reduction 4-59
4.4.10 Integrate alternative fuels into City's aviation fleet 4-60
4.4.11 Operate alternative fueled surface parking lot shuttle buses 4-60
4.4.12 Use existing ABIA alternative fuel infrastructure for off-site parking shuttle buses 4-60
4.4.13 Low VOC Striping Material 4-60
4.4.14 Landfill Controls 4-61
4.4.15 Open Burning Restrictions 4-61
4.4.16 Tree Planting 4-62
4.4.17 Extend energy efficiency requirements beyond SB5 and SB7. 4-62
4.4.18 Shift the electric load profile 4-62
4.4.19 Environmental dispatch of power plants 4-62
4.4.20 Clean Fuel Incentives 4-63
4.4.21 Low Emission Vehicles 4-63
4.4.22 Adopt-a-School-Bus Program 4-63
4.4.23 Police Department Ticketing 4-63
4.4.24 EPA Smart Way Transport Program 4-64
4.4.25 Business Evaluation of Fleet Usage, Including Operations and Right Sizing 4-64
4.4.26 Parking Incentives for Alt Fuel or Low Emission vehicles 4-64
4.4.27 Commute Solutions Programs 4-65
4.4.28 Direct Deposit 4-65
4.4.29 e-Government and/or Available Locations 4-65
4.4.30 Voluntary use of APUs for locomotives operating in Central Texas 4-65
4.4.31 Fueling of Vehicles in Evening 4-65
4.4.32 Urban Heat Island/Cool Cities Program 4-66
4.4.33 Resource Conservation 4-66
4.4.34 Increase investments by Central Texas electric utility providers in energy demand management programs 4-66
4.4.35 Alter production processes and fuel choices 4-67

4.4.36 Contract provisions addressing construction related emissions on high ozone days 4-67
4.4.37 Ensure emission reduction in SEPs, BEPS and similar agreements 4-68
4.4.38 Ozone Action Day Education Program 4-68
4.4.39 Ozone Action Day Notification Program 4-68
4.4.40 Ozone Action Day Response Program 4-68
4.4.41 Alternative Fuel Vehicles 4-68
4.4.42 Right Sizing 4-69
4.4.43 5-minute Limit on Diesel Idling 4-69
4.4.44 Cleaner Diesel 4-70
4.4.45 Vehicle Maintenance 4-70
4.4.46 Vapor Recovery on Pumps 4-70
4.4.47 Low VOC Asphalt 4-71
4.4.48 Low Emission Gas Cans 4-71
4.4.49 Transit-Oriented Development 4-71
4.4.50 Shaded Parking 4-72
4.4.51 Landscaping voluntary start at noon on high ozone days (education program) 4-72

LIST OF FIGURES

Figure 1. A/RR MSA VOC Emission Reduction Distribution iii
Figure 2. A/RR MSA NOx Emission Reduction Distribution.. iii

LIST OF TABLES

Table 1-1. A/RR MSA Local Measures Emission Reductions Summary ii
Table 2-1 EPA-ISSUED RULES Estimated NO_x Reductions 2-1
Table 2-2. Federal Non-road NOx reductions 2-2
Table 2-3. Federal Non-road VOC reductions.. 2-3
Table 2-4. Architectural Coatings VOC Emission Reduction 2-4
Table 2-5. Auto Body Refinishing VOC Emission Reduction 2-4
Table 2-6. Federal Tier 2 NOx Reduction 2-5
Table 2-7. Federal Tier 2 VOC Reduction.. 2-5
Table 2-8. Federal NLEV NOx Reduction 2-6
Table 2-9. Federal NLEV VOC Reduction.. 2-7
Table 2-10. Federal H-D Diesel NOx Reductions 2-7
Table 2-11. Federal H-D Diesel VOC Reductions 2-8
Table 2-12. Locomotive Rule NOx Emission Reduction 2-11
Table 2-13. Annual NOx Reductions from Anticipated Locomotive Standards 2-11
Table 3-1. Summary of TCEQ-Issued Rules for Reduction Strategies 3-1
Table 3-2. NOx reductions from degreasing rule 3-2
Table 3-3. Stage 1 VOC emission reduction 3-3
Table 3-4. Utility (EGU) NOx Reductions.. 3-4
Table 3-5. Cement Kiln NOx Reduction 3-6
Table 4-1. I&M NOx Emission Reduction.. 4-7
Table 4-2. I&M VOC Emission Reduction 4-7
Table 4-3. Run and Idle Time Derivation * From TTI 4-13
Table 4-4. Estimation of Heavy-Duty Fleet Size ^ From TTI 4-13
Table 4-5. Idling Restrictions NOx Emission Reduction 4-14
Table 4-6. Commute Program NOx Emission Reduction 4-17
Table 4-7. Commute Program VOC Emission Reduction.. 4-17
Table 4-8. 2007 State Emission Reductions 4-21
Table 4-9. Low Emission Gas Can VOC emission reduction 4-22
Table 4-10. Gasoline station throughput.. 4-24
Table 4-11. Stage I Rule penetration for gas stations 4-24
Table 4-12. Expected emission reduction from Stage I Vapor recovery control...................... 4-24
Table 4-13. Stage I controls VOC reductions by County 4-25
Table 4-14. Number of Retail Gasoline Tanks and Stage I Units by County (2003)................ 4-25
Table 4-15. Number of Tanks Without Stage I Capability, by Throughput 4-26
Table 4-16. Annual Costs by Throughput.. 4-26
Table 4-17. Cost-Effectiveness by Rule Cut-Off Level ($/Ton VOC) 4-26
Table 4-18. Cold Cleaning Degreasing VOC Emission Reduction.. 4-28
Table 4-19. Comparison of VOC Limits of the Federal Rule and SCAQMD.......................... 4-30

Table 4-20. Comparison of Characteristics of Paint Spray Equipment for Automotive Refinishers 4-33
Table 4-21. Autobody Refinishing VOC Emission Reduction 4-34
Table 4-22. Comparison of Control Options, Source: U.S. EPA, 2002. 4-34
Table 4-23. Asphalt Paving VOC Emission Reduction 4-36
Table 4-24. Low Reid Vapor Pressure VOC Emission Reduction 4-38
Table 4-25. RVP Cost Calculations 4-39
Table 4-26. TERP NOx emission reduction 4-46
Table 4-27. Point Source NOx emission reduction 4-49
Table 4-28. Point Source NOx emission reduction by County 4-49
Table 4-29. TERM Projects 4-51
Table 4-30. TERM VOC reduction 4-51
Table 4-31. TERM NOx reduction 4-52

1 Introduction

The Texas Commission on Environmental Quality (TCEQ) and the Environmental Protection Agency (EPA) are working with communities to achieve clean air as soon as possible by entering into Early Action Compacts (EAC) to reduce ground-level ozone pollution. The EAC provides the mechanism for local emission reduction measures to be considered and recommended for inclusion in the State Implementation Plan. This document provides the description for each of the local control measures under consideration. This final selection of measures is based on review and approved by local stakeholders and officials and on technical demonstration showing attainment of the 8-hour ozone standard by December 31, 2007.

Various emission reduction techniques can effectively reduce ozone precursors. Emission reduction methods employed nationally (e.g., automotive emission reductions), statewide and regionally (emission reductions from EGUs) benefit the Austin area, but more reductions are needed to ensure clean air for the region. Ozone precursors include Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC) from vehicles, electric utilities and other industrial, commercial and residential sources that burn fuels.

Modeling was performed to indicate the amount of reductions needed in the area. The model shows that up to 80% of ozone monitored locally has been transported from outside the area. An important characteristic of NOx emissions is that they can be transported long distances and cause problems far from the original emissions source. Emission reductions in other nonattainment areas will not only beneficially impact the Austin area but will also provide possible solutions for local emissions sources. TCEQ is encouraged to evaluate new major sources for impact on ozone background levels and extend local strategies to a larger, regional area.

The Austin-Round Rock MSA includes the following counties, Bastrop (population 63 thousand), Caldwell (35 thousand), Hays (109 thousand), Travis (851 thousand), and Williamson (290 thousand). The development of the emission reduction strategies for this area has proved to be an extremely challenging effort, due to the impact of emissions transport from outside of the area, the small number of local point sources, and the monitored ozone varying so closely above and below the standard. We developed a technical advisory committee and created working groups of Area Source, Point Source, On-Road, and Non-Road categories. We worked with stakeholders to consider control measures that can reasonably be implemented in each area. Other factors that were considered were the geographic area to which the control measure could be applied, the implementation dates, and resource constraints of the area.

Emission reductions were calculated by applying, where applicable, rule penetration (RP), rule effectiveness and control efficiency factors. Rule penetration represents the percentage of the source category under consideration that is affected by a certain rule. Rule effectiveness (RE) is a measure of the expected degree of actual compliance with the controls specified by a rule. Control efficiency represents expected emission reductions due to process change or control implementation from the source that complies with a specific rule.

2 Federal Reduction Strategies

The Clean Air Action Plan (CAAP) projects emission reductions from the following federal initiatives. A discussion on these rules is presented in the following sections.

Table 2-1 EPA-ISSUED RULES Estimated NO_x Reductions			
Sec.	**Category**	**Reductions in 2007 (tpd)**	
	Area Source measures:	VOC	NOx
2.1	• Architectural and Industrial Maintenance Coatings	1.44	n/a
2.2	• Auto Body Refinishing	0.52	n/a
	On-Road measures:		
2.3	• Tier 2 Vehicle Emission Standards	5.71	16.79
2.4	• National Low Emission Vehicle Program	1.70	3.01
2.5	• Heavy-Duty Diesel Engine Rule	0.34	11.78
	Non-Road measures:		
2.7	• Small Spark-Ignition Handheld Engines		
2.8	• Emissions from Compression-Ignition Engines		
2.9	• Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines	9.27	3.48
210	• Recreational Marine Standards		
2.11	• Locomotives	n/a	2.28
	Point Source Measures:		
2.12	• ALCOA Consent Decree	n/a	54
	Total	18.98	91.34

Non-Road Measures

"Nonroad" is a term that covers a diverse collection of engines, equipment, vehicles, and vessels. Sometimes referred to as "off-road" or "off highway," the nonroad category includes outdoor power equipment, recreational vehicles, farm and construction machinery, lawn and garden equipment, marine vessels, locomotives, and many other applications.

The NONROAD model was run to evaluate the reductions of federal regulations relating to certain non-road equipment operating in the A/RR MSA. The method was to (1) run the State of Texas for a typical ozone season weekday in 2007 and then (2) turn off all federal regulations being implemented after the year 1999. This provided a percentage of reductions for hydrocarbons (VOC) and oxides of nitrogen (NOx) which was then applied to the local inventory as shown in Table 2-2 and Table 2-3 respectively.

Due to the nature of the NONROAD model, it was not directly possible to estimate the impact of any specific EPA regulation, such as “Phase II Small Handheld Equipment.” This is because the model uses engine technology families as opposed to specific rules (e.g., M2, TIER2 GANO4) and because with the more recent regulations, manufacturers are allowed to introduce cleaner engines on a schedule depending on horsepower, milestone year, and corporate averaging credits. Therefore, the emissions reductions in sections 2.6 through 2.9 are shown as a total of 9.27 tpd VOC and 3.48 tpd NOx in Table 2-1. However, it is easy to grasp the general trends in categories such as residential lawn and garden equipment or recreational marine engines, which are dominated by single-scope rules.[1]

Equipment	Base 2007 NOx (tpd)	Federally Controlled NOx (tpd)	Net Reduction NOx (tpd)	Reduction
Agricultural	2.37	2.20	0.17	7.2%
Commercial	1.66	1.49	0.17	10.0%
Construction	12.73	10.60	2.13	16.7%
Industrial	5.40	5.00	0.40	7.4%
Commercial Lawn & Garden	2.78	2.25	0.53	19.1%
Residential Lawn & Garden	0.28	0.21	0.07	25.7%
Recreational Vehicles	0.08	0.07	0.01	12.5%
Total	25.33	21.85	3.48	13.7%

Table 2-2. Federal Non-road NOx reductions

[1] ERG memo *Percentage Reductions Using the NONROAD Model*, February 27, 2004

Equipment	Base 2007 NOx (tpd)	Federally Controlled NOx (tpd)	Net Reduction NOx (tpd)	Reduction
Agricultural	0.30	0.28	0.02	7.6%
Commercial	2.41	1.61	0.80	33.2%
Construction	2.10	1.52	0.58	27.8%
Industrial	1.41	1.20	0.21	14.9%
Commercial Lawn & Garden	13.96	7.46	6.50	46.5%
Residential Lawn & Garden	2.77	1.76	1.01	36.4%
Pleasure Craft	0.52	0.41	0.11	21.6%
Recreational Vehicles	2.79	2.75	0.04	1.3%
Total	26.26	16.99	9.27	35.3%

Table 2-3. Federal Non-road VOC reductions

2.1 REFORMULATED SURFACE COATINGS

Rule 40 CFR 59, *National Volatile Organic Compound Emission Standards for Architectural Coatings*, restricts the VOC content of architectural, industrial maintenance, special industrial, and highway markings surface coatings. This measure affects makers of architectural, industrial maintenance, special industrial, and highway markings surface coatings. Compliance is required by September 13, 1999, or March 10, 2000. According to the most recent EPA guidance the final rule is expected to yield a 20% reduction in VOC emissions from Architectural and Industrial Maintenance (AIM) coating sources. This estimate includes a control efficiency of 20%, rule penetration and effectiveness of 100%.

Reductions for AIM coatings are achievable through product reformulations, product substitution, and consumer education. Reformulations include altering the components of the coating to achieve a lower VOC content, replacing VOC solvents with water or alternative non-VOC solvents, and increasing the solids content of the coating thereby reducing the volume applied. Product substitution is accomplished by replacing higher-VOC coatings with currently available lower-VOC coatings. Consumer education will provide information on the relative cost of lower-VOC coatings and encourage careful, efficient use of such products. Specific VOC content limits included in the regulatory negotiations are not yet published. Table 2-4 provides an estimate on the reductions this rule will provide the A-RR MSA.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
AREA SOURCES: Architectural Coatings SCC: 2401008000, 2401001000, 2401001001, 2401001005, 2401001006, 2401001010, 2401001011, 2401001015, 2401001020	National Volatile Organic Compound Emission Standards for Architectural Coatings	Austin-Round Rock MSA (5 Counties)	7.18	5.74	1.44	20.0%

Table 2-4. Architectural Coatings VOC Emission Reduction

2.2 AUTO BODY REFINSHING

In 40 CFR Part 59, Subpart B, *National Volatile Organic Compound Emission Standards for Automobile Refinish Coatings,* the EPA set forth policy on the creditable reductions to be assumed from the national rule for auto body refinishing. The provisions of the rule apply to automobile refinish coatings and coating components that are manufactured on or after January 11, 1999 for sale or distribution in the United States. These reductions, presented in Table 2-5, represent a 37% reduction from current emissions with an assumption of 100% rule efficiency (presuming the coating application instructions were being followed) and penetration.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
AREA SOURCES: Autobody Shops SCCs: 2401070000, 2401001025 & 2401005000	National Volatile Organic Compound Emission Standards for Auto Body Refinishing	Austin-Round Rock MSA (5 Counties)	0.90	0.57	0.33	37.0%

Table 2-5. Auto Body Refinishing VOC Emission Reduction

2.3 TIER 2 MOTOR VEHICLE EMISSION REGULATIONS

The U.S. EPA promulgated a rule on February 10, 2000 (40 CFR Parts 80, 85 and 86, *Air Pollution; Tier 2 Motor Vehicle Emission Standards and Gasoline Sulphur Control Requirements; Diesel Fuel Quality Controls*) requiring more stringent tailpipe emissions standards for all passenger vehicles, including sport utility vehicles (SUVs), minivans, vans and pick-up trucks. These regulations also require lower levels of sulfur in gasoline, which will ensure the effectiveness of low emission-control technologies in vehicles and reduce harmful air pollution.

The new tailpipe and sulfur standards require passenger vehicles to be 77 to 95 percent cleaner than those built before the rule was promulgated and will reduce the sulfur content of gasoline by up to 90 percent. The new tailpipe standards are set at an average standard of 0.07 grams per mile for NOx for all classes of passenger vehicles beginning in 2004. This includes all light-duty trucks, as well as the largest SUVs. Vehicles weighing less than 6000 pounds will be phased-in to this standard between 2004 and 2007.

These reductions are presented in Table 2-6 for NOx and Table 2-7 for VOC. They are estimated to be a 35.7% reduction or a net 16.79 tpd of NOx and 15.3% or a net 5.71 tpd for VOC in the A/RR MSA.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
LDGVs + LDGT	NLEV II (Tier 2)	Austin-Round Rock MSA (5 Counties)	47.01	30.23	16.79	35.7%

Table 2-6. Federal Tier 2 NOx Reduction

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
LDGVs + LDGT	NLEV II (Tier 2)	Austin-Round Rock MSA (5 Counties)	37.23	31.52	5.71	15.3%

Table 2-7. Federal Tier 2 VOC Reduction

The significant environmental benefits of this program would come at an approximate cost to consumers of less than $100 for cars and $200 for light duty trucks. EPA estimates the program will cost industry about $5.3 billion. In contrast, health and environmental benefits are estimated to be $25.2 billion.

2.4 NATIONAL LOW EMISSION VEHICLE STANDARD

Under the National Low Emission Vehicle (NLEV) program (40 CFR Parts 9, 85, and 86, *Control of Air Pollution From New Motor Vehicles and New Motor Vehicle Engines: State Commitments to National Low Emission Vehicle Program*), auto manufacturers have agreed to comply with tailpipe standards that are more stringent than EPA can mandate prior to model year (MY) 2004. These federally implemented programs affect light-duty vehicles and trucks.

Once manufacturers committed to the program, the standards became enforceable in the same manner that other federal motor vehicle emissions control requirements are enforceable. The program went into effect throughout the Ozone Transport Region (OTR) in model year 1999 and will be nationwide in model year 2001. The National Low Emission Vehicle Program requires more stringent exhaust emission standards than the Federal Motor Vehicle Control Program Tier I (or Phase I) exhaust standards.

These reductions are presented in Table 2-8 for NOx and Table 2-9 for VOC. They are estimated to be a 9.1% reduction or a net 3.01 tpd of NOx and 5.1% or a net 1.7 tpd for VOC in the A/RR MSA.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
LDGVs + LDGT	NLEV I	Austin-Round Rock MSA (5 Counties)	33.24	30.23	3.01	9.1%

Table 2-8. Federal NLEV NOx Reduction

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
LDGVs + LDGT	NLEV I	Austin-Round Rock MSA (5 Counties)	33.23	31.52	1.70	5.1%

Table 2-9. Federal NLEV VOC Reduction

2.5 HEAVY-DUTY DIESEL ENGINE RULE

Under the Heavy-Duty Diesel Engine Rule (40 CFR Parts 85 and 86, *Emissions Control, Air Pollution From 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Light-Duty On-Board Diagnostics Requirements, Revision; Final Rule Friday, October 6, 2000*), truck manufacturers must comply with tailpipe standards that are more stringent by 2004 for all diesel vehicles over 8,500 pounds. These federally implemented programs affect heavy-duty diesel engines used in trucks. The standards are enforceable in the same manner that other federal motor vehicle emissions control requirements are enforceable. The new standards require diesel trucks to be more than 40 percent cleaner than today's models.

The second phase of the program will require cleaner diesel fuels and even cleaner engines, and will reduce air pollution from trucks and buses by another 90 percent. EPA expects to issue the final rule, to take effect in 2006-2007, for the second phase of the program by the end of 2003.

These reductions are presented in Table 2-10 for NOx and Table 2-11 for VOC. They are estimated to be a 41% reduction or a net 11.78 tpd of NOx and 30% or a net .34 tpd for VOC in the A/RR MSA. This includes fleet turnover, which will continue to reduce emissions over time.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
HDDV	2004 HDDV standards	Austin-Round Rock MSA (5 Counties)	40.50	28.73	11.78	41.0%

Table 2-10. Federal H-D Diesel NOx Reductions

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
HDDV	2004 HDDV standards	Austin-Round Rock MSA (5 Counties)	1.48	1.14	0.34	30.0%

Table 2-11. Federal H-D Diesel VOC Reductions

2.6 STANDARDS FOR SMALL SPARK-IGNITION HANDHELD ENGINES

The rules for small spark-ignition handheld engines are codified in 40 CFR Part 90 *Control of Emission from Nonroad Spark-Ignition Engines at or Below 19 Kilowatts.* In July 1995, EPA finalized the first federal regulations affecting small nonroad SI engines at or below 19 kilowatts (kW), or 25 horsepower. The regulations, commonly known as "Phase 1," took effect for most new handheld and nonhandheld engines beginning in model year 1997 and expected to result in a 32 percent reduction in HC emissions from these engines. For the nonhandheld categories, Class I engines are used primarily in walk behind lawnmowers and Class II engines are used primarily in lawn and garden tractors. For the handheld categories, Class III and IV engines are used primarily in residential equipment such as string trimmers, leaf blowers and chainsaws. Class V engines are used primarily in commercial equipment such as chainsaws.

The Phase 2 handheld engine standards will result in a 70 percent reduction in HC+NOx emissions from these engines beyond the 32 percent reduction from the Phase 1 standards. The Phase 2 standard began with the 2002 model year. This reduction in HC+NOx emissions will be accompanied by an overall reduction in fuel consumption.

2.7 COMPRESSION IGNITION STANDARDS FOR VEHICLES AND EQUIPMENT

This rule is addressed in 63 Federal Register 56968 (October 23, 1998) and codified in 40 CFR Part 89 *Control Of Emissions From New And In-use Nonroad Compression-ignition Engines*. Non-road diesel engines, also referred to as non-road compression-ignition engines, dominate the large non-road engine market. Examples of non-road equipment that use diesel engines include: agricultural equipment such as tractors, balers, and combines; construction equipment such as backhoes, graders, and bulldozers; general industrial equipment such as concrete/industrial saws, crushing equipment, and scrubber/sweepers; some lawn and garden equipment such as garden tractors, rear engine mowers, and chipper/grinders; material handling equipment such as heavy forklifts; and utility equipment such as generators, compressors, and pumps.

On October 23, 1998, EPA adopted more stringent emission standards for NOx, VOC's and particulate matter (PM) for now non-road, compression-ignition engines, to be phased in over several years beginning in model year 1999.

2.8 EMISSIONS STANDARDS FOR LARGE SPARK IGNITION ENGINES

This rule is covered in 40 CFR, Subchapter U, Part 1048 *Control of Emissions from New, Large Non-road Spark-ignition Engines.* It controls VOC and NOx emissions from several groups of previously unregulated nonroad engines, including large industrial spark-ignition engines, recreational vehicles, and diesel marine engines. This applies to manufacturers or importers of new, spark-ignition, nonroad engines, including anyone who manufactures, installs, owns, operates, or rebuilds any of the engines.

The new EPA requirements vary depending upon the type of engine or vehicle, taking into account environmental impacts, usage rates, the need for high performance models, costs and other factors. The emission standards apply to all new engines sold in the United States and any imported engines manufactured after these standards begin. Controls on the category of large industrial spark-ignition engines are first required in 2004. Controls on the other engine categories are required beginning in years after 2005.

2.9 EMISSIONS STANDARDS FOR SPARK IGNITION MARINE ENGINES

Provided in a program update titled *Reducing Air Pollution from Non-Road Engines (EPA420-F-03-011, April 2003)* are plans for controlling exhaust VOC emissions from new spark-ignition (SI) gasoline marine engines, including outboard engines, personal watercraft engines, and jet boat engines. Of nonroad sources studied by EPA, gasoline marine engines were found to be one of the largest contributors of hydrocarbon (HC) emissions (30% of the nationwide nonroad total).

EPA is imposing emission standards for 2 – stroke technology, outboard and personal watercraft engines. This will involve increasingly stringent HC control over the course of a nine-year phase-in period beginning in model year 1998. By the end of the phase-in, each manufacturer must meet an HC and NOx emission standard that represents a 75% reduction in HC compared to unregulated levels. These standards do not apply to any currently owned engines or boats.

2.10 EMISSIONS CONTROLS FOR LOCOMOTIVES

Federal Register Vol. 63, No 73 (April 16, 1998), *40 CFR Parts 85, 89, and 92, Emission Standards for Locomotives and Locomotive Engines,* sets NOx standards for locomotive engines remanufactured and manufactured after 2001. This program includes all locomotives originally manufactured from 2002 through 2004. It also applies to the remanufacture of all engines built since 1973. Regulation of the remanufacturing process is critical because locomotives are generally remanufactured 5 to 10 times during their total service lives, which are typically 40 years or more.

Three separate sets of emissions standards have been adopted, with the applicability of the standards dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) applies to locomotives and locomotive engines originally manufactured from 1973 through 2001, any time they are manufactured or remanufactured. The second set of standards (Tier 1) apply to locomotives and locomotive engines originally manufactured from 2002 through 2004. These locomotives will be required to meet the Tier 1 standards at the time of manufacture and at each subsequent remanufacture. The final set of standards (Tier 2) apply to locomotives and locomotive engines originally manufactured in 2005 and later. Electric locomotives, historic steam-powered locomotives and locomotives manufactured before 1973 do not significantly contribute to the emissions problem and, therefore, are not included in the regulation. Table 2-12 provides an estimate on the reductions this rule will provide the A-RR MSA.). A rule penetration and effectiveness of 100% and control efficiency of 43.2% is assumed.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
NONROAD MOBILE SOURCES: Locomotives SCC: 2285002000	Federal Rule	Austin-Round Rock MSA (5 Counties)	5.28	3.00	2.28	43.2%

Table 2-12. Locomotive Rule NOx Emission Reduction

The following table provides the estimated annual NOx emission reductions for years 1999 through 2010. Because it takes forty or more years for the locomotive fleet to turn over, NOx emissions will continue to decline well beyond 2010.

Calendar Year	NOx
1999	0.0%
2000	-7.9%
2001	-15.9%
2002	-23.9%
2003	-32.0%
2004	-40.2%
2005	-41.8%
2006	-42.5%
2007	-43.2%
2008	-43.9%
2009	-44.6%
2010	-45.3%

Table 2-13. Annual NOx Reductions from Anticipated Locomotive Standards

These numbers are based on a draft of the proposed locomotive standards. States are permitted to take credit for them in their SIP submittals.

2.11 ALCOA CONSENT DECREE

On April 9, 2003, the Justice Department, and the Environmental Protection Agency announced a major Clean Air Act settlement with Alcoa Inc. that resolved violations of the Clean Air Act's New Source Review (NSR) and Prevention of Significant Deterioration (PSD) requirements. Under the settlement, Alcoa has committed to install pollution controls that will result in major reductions of harmful air pollutants annually and will fund several beneficial environmental projects. Within twelve (12) months of the issuance of the Permit Amendment (September 2003), Alcoa shall select one of the three pollution reduction options set forth below for the Existing Sandow Units, and shall notify the TCEQ in writing as to which option Alcoa has selected for these Units:

a. the continued utilization of the Existing Sandow Units, and the installation of pollution control equipment at these Units in compliance with Paragraphs 51 through 59 of the Consent Decree ("Option A");
b. the installation of Replacement Sandow Units for the Existing Sandow Units, with the installation and operation of pollution controls as required by the State Permitting Process, in compliance with Paragraphs 60 through 67 of the Consent Decree ("Option B"); or
c. the shutdown of the Existing Sandow Units, in compliance with Paragraph 68 of the Consent Decree ("Option C").

Estimated reductions for these options are 90% of NOx or about 54 tpd. The company's Rockdale facility, located northeast of Austin, Texas, is the nation's largest emitter of sulfur dioxide (SO_2) and nitrogen oxides (NOx) from the non-utility source category, according to EPA's 1999 National Emissions Inventory that was released in October 2001. These emissions were generated for the three coal-fired electric generating industrial boilers that support the smelter operations at Rockdale and are addressed in the agreement.

3 State and Regional Reduction Strategies

Sec.	Category	Reductions in 2007 (tpd)	
	Area Source:	VOC	NOx
3.1	Degreasing Units	1.96	n/a
3.2	HB 2914 Grand fathered Pipelines	TBD	TBD
	On-road Source:		
3.3	Stage 1 Vapor Recovery	3.72	n/a
	Non-road Source:		
3.4	Low Emission Diesel	TBD	TBD
	Point Source:		
3.5	SB 7 EGU NOx Reductions	n/a	10.09
3.6	SB 766 Voluntary Emissions Reduction Permit	TBD	TBD
3.7	HB 2912 Grandfathered Requirements	TBD	TBD
3.8	Cement Kiln NOx Limits	n/a	2.16
	Total (not including TBD)	9.4	12.25

Table 3-1. Summary of TCEQ-Issued Rules for Reduction Strategies

State and regional reduction strategies are from state implemented rules that apply to the A/RR MSA. Rules that apply but were listed in the emission reduction strategies are Gasoline Volatility (30 TAC §114.302), Non-Road Large Spark-Ignition Engines (30 TAC 114, Subchapter 1, Division 3), and Gas-fired water heaters, small boilers, and process heaters (30 TAC 117, Subchapter D, Division 1). There is no category or direct method to calculate the rule application.

3.1 DEGREASING UNITS

Under 30 TAC 106.454 *Degreasing Units*, anyone obtaining a state air permit for a degreasing unit is required to meet with §115.412 and §115.415 as of November 1st, 2001. These rules cover operating procedures, solvent use and storage, ventilation, and record keeping. Given the projected population growth, this existing rule affects our future inventory by 10.1%. (Table 3-2). The assumptions used in the calculation were 100% rule effectiveness, 50% rule penetration and 85% control efficiency.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
AREA SOURCES: Degreasing (All Degreasing Categories)	VOC degreasing controls on new sources (permit rules)	Austin-Round Rock MSA (5 Counties)	16.32	9.38	6.94	42.5%

Table 3-2. NOx reductions from degreasing rule

3.2 GRANDFATHERED PIPELINES

The new ruling of the grandfather permitting portion of HB 2914 will be added to 30 TAC Chapter 116, Subchapters H & I. The implementation will address reciprocating internal combustion engines connected to a pipeline. It requires 50% reduction in NOx and up to 50% reduction in VOC in East Texas. It also requires up to 20% reduction in NOx and VOC in West Texas. It allows averaging of reduction between engines connected to a pipeline. The Oasis Pipeline in Caldwell County is effected by this rule.

3.3 STAGE 1 VAPOR RECOVERY

30 TAC 115, Subchapter C, Division 2 *Filling of Gasoline Storage Vessels (Stage 1) for Motor Vehicle Fuel Dispensing Facilities,* was adopted on June 30, 1999. These rules apply to the BPA, El Paso, HGA, and DFW ozone nonattainment areas and in 95 counties, including the A/RR MSA, in the eastern and central parts of Texas. These rules regulate the filling of gasoline storage tanks at gasoline stations by tank-trucks. To comply with Stage I requirements, a vapor balance system is typically used to capture the vapors from the gasoline storage tanks that would otherwise be displaced to the atmosphere as these tanks are filled with gasoline. The captured vapors are routed to the gasoline tank-truck, and are processed by a vapor control system when the tank-truck is subsequently refilled at a gasoline terminal or gasoline bulk plant. The rules reduce VOC emissions that are precursors to ground-level ozone formation, resulting in ground-level ozone reductions.

The effectiveness of Stage I vapor recovery rules depend on the captured vapors being: (1) effectively contained within the gasoline tank-truck during transit; and (2) controlled when the transport vessel is refilled at a gasoline terminal or gasoline bulk plant. Otherwise, the emissions captured at the gasoline station will simply be emitted at a location other than the gasoline station, resulting in no reduction in VOC emissions despite the Stage I requirements. It is estimated that the A/RR MSA will see a 27% reduction from the 2007 baseline emissions due to this rule (Table 3-3).). A rule penetration of 37.5%, rule effectiveness of 80% and control efficiency of 90% was assumed.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
AREA SOURCES: Stage I Refueling SCC: 2501060053	Stage I VRS on 125k Gas Stations	Austin-Round Rock MSA (5 Counties)	13.79	10.07	3.72	27.0%

Table 3-3. Stage 1 VOC emission reduction

3.4 STATE LOW EMISSION DIESEL PROGRAM

This strategy implements a state LED fuel program (30 TAC 114.313 *designated alternative limit*) requiring fuel producers and importers, beginning April, 2005 to ensure that all diesel fuel used in 110 East Texas counties, including the A/RR MSA, for both on-road and non-road use does not exceed 500 ppm sulfur, contains less than 10.0% by volume of aromatic hydrocarbons, and has a minimum cetane number of 48. Alternative diesel fuel formulations that achieve equivalent emission reductions may also be used. The state LED fuel program also requires that, beginning June 1, 2006, the sulfur content be reduced to 15 ppm sulfur in both on-road and non-road diesel fuel in 110 East Texas counties. The fuel required by the state LED fuel program will have a lower aromatic hydrocarbon content and a higher cetane number in each gallon of diesel than required by current federal regulations for on-road diesel. Due to a provision in the rule allowing refiners to receive credit for alternate emission reductions, some benefits of NOx reductions may not be realized during the final two years of this plan.

3.5 ELECTRIC GENERATING UTILITY NOX REDUCTIONS

Senate Bill 7, enacted by the 76th Legislature, restructured electric utility service in Texas. Owners of grandfathered facilities that generate electric energy for compensation were required to apply for an electric generating facility (EGF) permit from the commission by September 1, 2000. The legislation provided that initial issuance of these permits allow for notice and comment hearing proceedings, not contested-case evidentiary hearings. The legislation does not allow for amendments to EGF permits. Renewal of these permits requires notice, comment, and opportunity for a contested case hearing. Table 3-4 shows the expected NOx reductions due to this measure.). A rule penetration and effectiveness of 100% and control efficiency of 50% is assumed.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
Point Sources (EGUs): ID#: BC0015L, BC0082T, BC0083R, HK0108C, TH0004D, TH0006W, TH0104V,	Senate Bill 7 NOx reduction	Austin-Round Rock MSA (5 Counties)	31.11	21.02	10.09	32.4%

Table 3-4. Utility (EGU) NOx Reductions

3.6 VOLUNTARY EMISSIONS REDUCTION PERMIT (VERP)

The *Voluntary Emission Reduction Permit* (VERP) program is found under 30 TAC 116 Subchapter H, Division 4. In 1999, the 76th Texas State Legislature used the CARE Committee's recommendation as the basis for Senate Bill 766 (SB 766), which directed the TCEQ to develop rules containing incentives for the voluntary permitting of grandfathered facilities. The TCEQ adopted rules to implement the VERP program on December 16, 1999. The owners and operators of a number of grandfathered facilities took advantage of the incentives offered by the VERP program and submitted VERP applications for their grandfathered facilities. Additionally, the owners and operators of other grandfathered facilities submitted permit-by-rule registrations and other new source review permit applications to permit their grandfathered facilities. The deadline to apply for a VERP was August 31, 2001.

3.7 HB 2912 Grandfathered Requirements

The mandatory permitting requirements of HB 2912 are the culmination of legislative efforts, beginning in 1997, to permit or otherwise authorize all grandfathered facilities. House Bill 2912 created four new types of permits for grandfathered facilities: existing facility permits, small business stationary source permits, EGF permits, and pipeline facilities permits. House Bill 2912 also mandated the dates by which grandfathered facilities must apply for a permit and have controls operational or submit a shutdown notice. Grandfathered facilities that are addressed by an application for a VERP are not required to comply with the provisions of HB 2912 for grandfathered facilities. However, grandfathered facilities that withdraw their VERP applications and elect to submit a permit application for an authorization under HB 2912 will forfeit those incentives, including eligibility for amnesty from enforcement. This rule will be under 30 TAC 116 Subchapter H *Permits for Grandfathered Facilities,* Divisions 2 and 3.

3.8 CEMENT KILN NOx LIMITS

30 TAC 117 Subchapter B, Division 4 *Cement Kilns,* applies to each portland cement kiln in Bexar, Comal, Ellis, Hays, and McLennan Counties except as specified in §117.265 and §117.283 (relating to Emission Specifications; and Source Cap). It establishes emission limits on the basis of pounds of NOx per ton of clinker produced for cement kilns placed into service before December 31, 1999. These limits are based on the NOx emissions averaged over each 30 consecutive day period, and vary depending on the type of cement kiln. For each preheater-precalciner or precalciner kiln in Hays County, 2.8 lbs/ton of clinker produced is specified in Role 117.283. It is expected a 27% reduction in NOx will be seen where this rule is applicable.

The reduction from Texas Lehigh Cement, as incorporated in TCEQ permit no. 3611D, will go from 7.2 tpd of NOx to 5.04 tpd for a total of 2.16 tpd reduction or 30%. This is given in Table 3-5. The 2007 emission was adjusted using a growth factor to the final value 5.24 tpd. All non-EGU were grown using growth factors from the EGAS model (by TCEQ). A rule penetration and effectiveness of 100% and control efficiency of 30% is assumed.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	Net Reduction (tpd)	Percent Reduction (%)
Point Sources (TX LEHIGH C.): HK0108C	NOx reduction	Austin-Round Rock MSA (5 Counties)	7.20	5.04	2.16	30.0%

Table 3-5. Cement Kiln NOx Reduction

4 Local Strategies

4.1 LOCAL STRATEGIES INTRODUCTION

The June 2003 EAC milestone identified and described potential local emission reduction strategies. The milestone report, and subsequent revisions, organizes the measures into two tables. The measures in Table A apply to all or most jurisdictions in the A/RR MSA. They will require state regulation. The Table B measures are self-selected by the jurisdictions with each choosing at least three for implementation. These are in addition to continuing O3 Flex commitments. Jurisdictions may choose to enhance an existing O3 Flex measure. Included in this section is a Transportation Emission Reduction Measure (TERM) that will be implemented by various local jurisdictions through an agreement with the Capital Area Metropolitan Planning Organization (CAMPO).

4.2 TABLE A EMISSION REDUCTION MEASURES

Emission Reduction Measures (State Regulations)		NOx Reductions (tpd)	VOC Reductions (tpd)
A1	Inspection and Maintenance (I&M)	3.19	4.19
A2	Idling Restrictions on Heavy Diesel	0.19	0.00
A3	Commute Emission Reduction Program	0.27	0.30
A4	Stage I Vapor Recovery Requirement Change	0.00	4.88
A5	Low Emission Gas Cans	0.00	1.97
A6	Degreasing Controls	0.00	6.38
A7	Autobody Refinishing Controls	0.00	0.05
A8	Cutback Asphalt	0.00	1.03
A9	Low Reid Vapor Pressure Gas	0.00	2.87
A10	BACT and Offsets for New or Modified Point Sources	TBD	TBD
A11	Petroleum Dry Cleaning	0.00	1.06
A12	Texas Emission Reduction Program (TERP)	2.00	0.00
A13	Power Plant Reductions	7.08	0.00
	Total (Does not include TBD)	**12.73**	**23.64**

Table A. Recommended Measures requiring State Regulations of Actions.
Note: The I&M program assumes participation from Hays County. Without Hays Co participation reductions are 2.89tpd and 3.84tpd of NOx and VOC respectively.

This section describes each of the control measures appearing in Table A. Each control measure is described and emission reduction calculations are presented in the remainder of this chapter. Actual implementation dates and regulation names were supplied by the state. Actual emission reductions may vary slightly from the estimates appearing in this chapter since these estimates are based on EPA guidance, and not necessarily actual data from the in-situ emission control measures. CAPCO contracted with ERG, Inc. to provide technical support in quantifying emissions and evaluating regulatory and other implementation issues.

Table A measures require state regulations or actions for implementation and enforcement. They will be implemented no later than December 31, 2005. (Power plant reductions and TERP will begin phasing-in no later than December 31, 2005.) The semi-annual review reports will track and document Table A measures.

4.2.1 Inspection and Maintenance (A1)

SOURCE TYPE AFFECTED

Program participants are owners of 2 to 24 year old gasoline vehicles, safety inspection station owners and operators, vehicle repair facilities, TCEQ, DPS and counties that choose to administer (or contract with another entity to administer) a LIRAP program.

The program does not apply to motorcycles or slow moving vehicles, as defined by Section 547.001, Transportation Code. Test on resale is required for all vehicles from non-I/M program counties that are sold and registered in the I/M program counties. Per state statute, vehicles belonging to students at public universities, but registered in non-I/M program counties, must participate to receive campus-parking privileges.

CONTROL STRATEGY

The I/M program requires all subject gasoline vehicles 2 to 24 years old registered and primarily operated in the I/M program counties (Hays, Travis and Williamson) to undergo an annual emissions inspection test in conjunction with the annual safety inspection. Emissions inspection tests are conducted at all safety inspection stations.

The entire vehicle safety and emissions inspection should be completed in about 20 minutes from the time the vehicle is driven into the inspection bay. If a vehicle fails the emissions inspection test, the items of failure will be indicated on the *Vehicle Inspection Report*. The vehicle should be repaired and returned to the same inspection station with 15 days for a free re-test. A passing emission inspection test (or test waiver) is required in order to renew vehicle registration or to receive a safety inspection sticker.

IMPLEMENTATION

The I/M program was evaluated to be applied in Travis, Hays and Williamson Counties. As of the plan submittal date (3/31/04) the City of San Marcos had voted not to participate in the I/M program, thus eliminating Hays County form program applicability. The I/M Program counties exercise the flexibility offered to EAC areas in Senate Bill 1159 and request that TCEQ adopt a rule including the MSA's I/M Program in the state program. Periodic program evaluations will determine if any revisions or modifications are needed. The plan must be implemented no later than December 31, 2005.

The OBDII testing program will be used to test 1996 model year and newer vehicles. All 1996 and newer vehicles less than 14,000 pounds (passenger cars, pickup trucks, sport utility vehicles) are equipped with OBD systems. The OBD system monitors emission performance components to ensure that the vehicle runs as cleanly as possible. The system also assists repair technicians in diagnosing and fixing emission-related problems. If a problem is detected, the OBD system illuminates a "Check Engine" or "Service Engine Soon" warning lamp on the vehicle instrument panel to alert the driver. The system will store information about the detected malfunction so that a repair technician can accurately find and fix the problem.

Model year 1996 and newer vehicles are required to meet EPA specifications for collection and transfer of emissions control data during each driving cycle. The Diagnostic Link Connector (DLC) cable on the emissions test analyzer is hooked up to the DLC located in the vehicle. When the vehicle's OBD system has checked the emissions control systems and detected a problem with the vehicle, this information is stored in the vehicle's on-board computer. The OBD test transmits this data to the analyzer and the vehicle will fail the inspection. The inspection report will indicate which emissions control systems were checked and display the description of the fault codes retrieved from the vehicle.

The Two-Speed Idle testing program will be used to test 1995 model year and older vehicles. The TSI test uses a tailpipe probe exhaust gas analyzer to measure VOC and CO while the vehicle is idling at a low and a high rate.

The I/M program includes a high emitter program to identify vehicles that are significantly exceeding federal vehicle emission standards. On-road remote sensing equipment will be used to identify high-emitting vehicles in the three I/M program counties or those commuting from contiguous counties. The van-installed on-road testing equipment is strategically placed to capture auto emissions from single-lane traffic in an acceleration mode. Vehicles identified as high emitters must be tested using the age-appropriate OBDII or TSI test within 30 days of notification and be repaired, if necessary. A passing test result (or test waiver) will be needed to renew vehicle registration.

The following waivers and extensions will be available to all qualifying vehicle owners through the Texas Department of Public Safety (DPS):

> Individual Vehicle Waiver– In order to address unusual cases where a vehicle cannot meet emissions standards, an *Individual Vehicle Waiver* may be issued to a vehicle owner whose vehicle has failed its initial emissions inspection and re-inspection, and in which at least $600 in emissions related repairs have been performed by a registered repair facility.
>
> Low Mileage Waiver – A *Low Mileage Waiver* may be issued to a vehicle owner whose vehicle has failed both its initial emissions inspection and the re-inspection, and in which at least $100 in emissions related repairs have been

performed. The vehicle should have been driven less than 5,000 miles in the previous inspection cycle and anticipate being driven fewer than 5,000 miles before the next required safety inspection.

Parts Availability Time Extension – A *Parts Availability Extension* may be issued for 30, 60 or 90 days to a vehicle owner whose vehicle fails the initial emission inspection and needs time to locate necessary vehicle emissions control parts.

Low Income Time Extension- A *Low Income Time Extension* may be issued to a vehicle owner whose vehicle has failed its initial inspection and re-inspection, and the applicant's adjusted gross income is at or below the federal poverty level.

Counties that implement a vehicle emissions inspection program may elect to implement the Low Income Repair Assistance, Retrofit, and Accelerated Vehicle Retirement Program (LIRAP). Vehicle owners whose vehicles fail the emissions inspection and who meet eligibility requirements may receive assistance through this program. The assistance can pay for emissions related repairs or be used toward a replacement vehicle if they choose to retire the vehicle. Note that in case of the vehicle replacement additional emission reductions may be expected when newer vehicles are purchased but are not quantified. The assistance program is funded through a portion of the emissions inspection fee. The program is administered through a grant contract between TCEQ and each participating county. Only 5% of the grant contract funds may be used for the administrative costs of the program. Assistance is limited to no more than $600 for repairs or $1,000 toward replacement of the vehicle.

In order to be eligible for LIRAP, the vehicle owner's total family income must be less than or equal to twice the amount of the Federal Poverty Guidelines for designated family units. (At this writing, $24,240 for a family of two and $36,800 for a family of four). A vehicle is eligible for repair assistance if it failed the emissions inspection within 30 days of application, is currently registered, and has been registered in the program area for the two years preceding application, and it passes the safety inspection portion of the test.

Repairs must be performed at a DPS-recognized repair facility. Vehicle retirement eligibility requirements are the same as for vehicle repairs, except the vehicle must have passed a safety inspection within 15 months of the application.

ESTIMATED EMISSION REDUCTION

MOBILE6.2 was used to estimate NOx and VOC emission rates for vehicles operating in each of the 3 counties, for a typical ozone season weekday in 2007. Emission rates were then combined with VMT values to estimate emissions in tons per day, for the uncontrolled base case, the standard state program, and the alternative control options listed above.

ERG obtained link-level activity data for Travis, Williamson, and Hays Counties from the Texas Transportation Institute (TTI). These link files included hourly speed and VMT estimates by vehicle type, for each link in the area, for the September 2007 modeling episode. MOBILE6 input file data were obtained from CAMPO. The CAMPO data included county level registration distributions and diesel sales fractions (from 2002 TxDOT data), and ambient temperatures and humidity levels obtained from the TCEQ. The MOBILE6.2 hourly emission factor outputs were combined by roadway and vehicle type with the link-level activity data to estimate total 24-hour mass emissions for the region. Different control scenarios were specified corresponding to each of the cases listed above. The MOBILE6.2 input files and VMT link files are available from ERG.

The I/M program is expected to reduce NOx emissions by 3.19 tons per day and VOC emissions by 4.19 tons per day (Table 4-1 and Table 4-2). The I/M program will also reduce toxic emissions, some of which are known carcinogens. It will encourage proper vehicle maintenance, which may result in fuel savings for some vehicle owners.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	**Net NOx Reduction (tpd)**	**Percent Reduction (%)**
ONROAD MOBILE: All Light Duty vehicles & Heavy Duty Gasoline Vehicles (LDV, HDGV)	Inspection and Maintenance (I&M)	Hays, Travis Williamson	31.12	27.93	3.19	10.3%

Table 4-1. I&M NOx Emission Reduction

Note: The I&M program assumes participation from Hays County. Without Hays Co participation reductions are 2.89tpd of NOx.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
ONROAD MOBILE: All Light Duty vehicles & Heavy Duty Gasoline Vehicles (LDV, HDGV)	Inspection and Maintenance (I&M)	Hays, Travis Williamson	30.33	26.14	4.19	13.8%

Table 4-2. I&M VOC Emission Reduction

Note: The I&M program assumes participation from Hays County. Without Hays Co participation reductions are 3.84tpd of VOC.

ESTIMATED COST

ERG developed bottom-up estimates for test fees using their in-house I/M fee calculator. The fee calculator develops a cash flow to calculate the fee required to assure a fair return on capital and operations costs over a 10-year program operations period. The calculator is dynamic, accounting for growth in the overall fleet, as well as changing proportions of OBD and ASM/TSI populations. (E.G., OBD populations increase with time, while pre-OBD fleets decrease, allowing for partial liquidation of under-utilized ASM/TSI equipment over time.) The key parameters used in the different testing scenarios are listed below. Note that all estimates are incremental to the time and effort associated with safety tests. Ultimately, the test fees are determined by TCEQ.

Baseline cost assumptions:

- 3,120 hrs of operation/station per year
- Inspector $/hr -- $12 (OBD/TSI), $12 (ASM), all @ 30% loading
- Test time -- 20 minutes for ASM, 15 minutes for TSI, 10 minutes for OBD
- Bay space lease cost -- $32/sf/yr (only applied when test lane is in use -- assumes alternate revenue generating activities will occur in that area when not testing)

- Wholesale capital cost -- $31,000 ASM, $12,000 TSI, $8,000 OBD (Combined OBD/TSI system -- $14,000)
- ASM installation -- $4,000 (in-ground)
- Annual interest rate for equipment financing -- 12.5%
- Warranty -- $2,700 per yr ASM, $2,000 TSI
- Utilities -- $1,200 / yr ASM, $100 TSI
- Span gases -- $384 / yr ASM, $250 TSI
- Zero gases -- $0.45 per TEST ASM and TSI
- Computer link -- $1.00 per test
- Program Administration and Enforcement -- $2.50 per vehicle ($2.00 to DPS High Emitter Program, $0.50 for TCEQ audits/enforcement)
- Discount Rate -- 6%
- Inflation Rate -- 4%
- Equipment depreciation -- 10%
- Real wage rate increase -- 2%
- Corporate Income Tax rate -- 34%

Using these input parameters ERG estimated the following test fees, assuming 1 free retest is allowed after repairs. Any costs associated with Low Income Repair Assistance Program (LIRAP) subsidies are not included in these estimates.

- OBD Only -- $11.97[2]
- TSI Only -- $14.52
- ASM Only -- $25.91
- OBD + TSI -- $16.69

Note that these independent estimates are quite close to the official state fees of $27.00 for ASM, and $14.00 for TSI (in El Paso), but substantially different than the $21.00 fee for OBD (without LIRAP).

Repairs

Repair costs for the different type of test failures were based on results from a number of I/M programs across the country. ERG took a rough mid-point value from the available data to estimate costs for each test type. For OBD, the state of Wisconsin reported repair costs at $227 per OBD failure for 2003, while the TCEQ reported an average of $397. Both Oregon and California reported approximately $300 per OBD repair, which was

[2] OBD fees also account for TSI testing of the ~2.5% of 1996 and older vehicles that cannot be tested using OBD equipment, due to instrument non-communication and/or a not-ready sensor status -- these vehicles receive a TSI test instead.

used in the ERG estimates. Repair costs for loaded transient test failures (including IM240, IM147, and ASM) ranged from ~$200 in Arizona to $440 in Texas. TSI repairs were based on 2003 California data. Average repair costs by test type are summarized below.

- OBD -- $300
- TSI -- $135
- ASM -- $300

ERG assumed repairs would only have a one-year lifetime, so these figures correspond directly to annual program costs.[3]

Inconvenience Costs

ERG estimated the amount of extra time needed to comply with program requirements, considering travel time to and from the test facility, likely wait times before the test, actual test time, and time required to obtain needed repairs and subsequent retests. While test time is available from several I/M programs, estimates for the other categories are not available and had to be estimated by ERG staff.[4]

ERG assumed that OBD and TSI stations would be relatively numerous and easily accessed by Austin area motorists. For example, in order to meet anticipated demand and to keep wait times down during peak periods (lunch and after work), ERG's I/M fee calculator estimates that 125 stations offering OBD and TSI testing will be needed in the three county area in 2007. Therefore ERG assumed 20 minutes of additional travel time to and from these stations. The expected high number of stations should also keep wait times low, assumed to be five minutes on average for TSI and OBD.

[3] Although repair lifetime is unknown, this assumption is consistent with the state requirement for annual testing.

[4] Wait times are often also tracked by I/M station operators, but these times are highly dependent on the number of stations, specific locations, and other local factors, and therefore could not be used with confidence for the yet to be designed Austin program.

Given the higher cost of entry associated with ASM testing, ERG assumed fewer stations would be available to serve the pre-OBD population than under TSI. Accordingly, ERG assumed 30 minutes of travel time and 10 minutes of wait time on average for ASM testing.

ERG used data from TCEQ's I/M database to estimate average test times for the three options -- 20 minutes for ASM, 15 minutes for TSI, 10 and minutes for OBD.

The time required for repair is likely to vary according to test type. Since many TSI failures simply require air/fuel adjustments and related tune-ups, which are relatively quick, ERG assumed an average of 2 hours for these repairs. However, vehicles failing OBD or ASM for high-NOx emissions may often require new catalysts or other complex repairs. Therefore ERG assumed 3 hours on average for OBD and ASM repairs.

ERG calculated the total motorist time required for program compliance for each of these options using the above assumptions, as well as estimates of total vehicle tests (from local registration records) and failure rates obtained from TCEQ. Given the uncertainty in the value of this time, ERG did not monetize inconvenience costs.[5]

The emissions test fee (set by TCEQ) is expected to be no more than $20 in Travis and Williamson Counties. The safety inspection fee is $12.50, so the combined inspection cost is not expected to exceed $32.50. Testing equipment costs (estimated at $15,000 per station) are recouped through fee. The equipment includes the Two-Speed Idle (TSI), the On-Board Diagnostic (OBD) analyzer testing system, gas cap tester and 2-D Bar Code scanner.

REFERENCES

U.S. Environmental Protection Agency, "Inspection/ Maintenance Program Requirements," Final Rule, 57 *Federal Register* 52950 (November 5, 1992).

[5] A very conservative calculation could use the existing minimum wage rate for the opportunity cost of leisure time ($5.15/hr). Under these assumptions program cost effectiveness values increase by a modest amount -- ~$3,000 to $5,000 per ton of NOx + VOC.

U.S. Environmental Protection Agency, "I/M Costs, Benefits, and Impacts Analysis," Draft, February 1992.
ERG, Inc., *Technical Support Documentation: Emission Control Strategy Evaluation for the Austin/San Marcos (A/SM) MSA EAC Clean Air Action Plan (CAAP)*, January 26, 2004

4.2.2 Idling Restrictions on Heavy-Duty Diesel Engines (A2)

SOURCE TYPE AFFECTED

Owners and operators of heavy-duty diesel vehicles, MSA county and municipality law enforcement agencies or designees are affected by this measure.

CONTROL STRATEGY

This measure restricts engine idling of vehicles with a gross vehicle weight rating of more than 14,000 pounds to five consecutive minutes. Exemptions are allowed for vehicles with a gross vehicle weight rating of 14,000 pounds or less; that are forced to remain motionless because of traffic conditions over which the operator has no control; are being used as an emergency or law enforcement vehicle; when the engine operation is providing power for a mechanical operation other than propulsion; when engine operation is providing power for multiple passenger heating or air conditioning while occupied by passengers; when the engine is being operated for maintenance or diagnostic purposes, or when the engine is being operated solely to defrost a windshield.

Alternative methods of providing power to the vehicle are currently available. Truck stop electrification allows the vehicle operator to access electricity as a power source. Small generators, which emit less and are commercially available, can be used as auxiliary power sources.

IMPLEMENTATION

This measure will apply throughout the MSA. To implement this measure, the MSA requests TCEQ adopt the measure through rulemaking applicable in the MSA and authorize MSA county and municipality law enforcement agencies, or other county and municipality entities, to enforce the measure. The plan must be implemented no later than December 31, 2005. In the event TCEQ designates program responsibility to a local entity, the TCEQ and EPA will make every reasonable effort to provide adequate funding for program administration.

ESTIMATED EMISSION REDUCTION

ERG used a methodology previously developed for the TNRCC (now TCEQ) to estimate NOx emission reductions from such a rule in the Houston area.[6]

Following this methodology, to calculate fleet idle emissions for Heavy-duty diesel vehicles (HDDV) and heavy-duty gasoline vehicles (HDGV) in the five-county Austin area it was necessary to first obtain the number of vehicles in each county, as well as to estimate the average vehicle idle time for each county. Average vehicle idle time was estimated by using a SAS program that read in mileage accumulation rates (MAR), by age, from the MOBILE6.2 default values. For both HDDV and HDGV vehicles, an average MAR was calculated using data from each of the eight applicable MOBILE6.2 vehicle types. The program also read in registration distribution data for each county from TxDOT records, and weighted the distribution using county VMT data obtained from TTI.

For each county, average MARs were ratioed by the registration data and summed to obtain an annual mileage accumulation rate by vehicle age, which in turned was used to calculate average VMT per day. Using the average VMT per day and the average speed (also read in from the TTI data), the average run time per vehicle was deduced. The average idle time was assumed to be 25% of the average run time for diesels, and 23% for gas vehicles, based on heavy-duty engine certification cycles (see ERG Memo to TNRCC). Finally the number of vehicles in each county was obtained by dividing the total fleet VMT (obtained from TTI data) by the average VMT per day calculated above.

---

[6] ERG Memo to Hazel Barbour, Texas Natural Resource Conservation Commission Re: Determination of NOx Benefits from Proposed Idle Shut-Off Rule, February 2001. Estimates were included in the latest HGA SIP revision.

Idle emission factors (g/mi) were then obtained from MOBILE6.2 output.[7] An average idle speed of 3.1 mph (per model defaults) was used to convert the idle emission factor to g/hr. This value, along with the number of vehicles in each county and their appropriate average idle time were used to calculate fleet idle emissions. Note that two idle events per day were assumed for the purposes of the calculation. The output from the intermediate and final calculation steps are summarized in the tables below.

Vehicle Type	County Group	Avg Vehicle Speed* (mph)	Avg VMT/day	Avg Run Time (minutes)	Avg Idle Time (minutes)
HDDV	Bastrop	39.6	129.4	196.06	49.02
	Caldwell	41.1	130.1	189.93	47.48
	Hays	44.2	131.9	179.05	44.76
	Travis	35.9	131.6	219.94	54.99
	Williamson	43.7	131.1	180.00	45.00
HDGV	Bastrop	39.6	54.06	81.91	18.84
	Caldwell	41.1	54.06	78.92	18.15
	Hays	44.2	54.06	73.38	16.88
	Travis	35.9	54.06	90.35	20.78
	Williamson	43.7	54.06	74.22	17.07

Table 4-3. Run and Idle Time Derivation * From TTI

Vehicle Type	County Group	Total Fleet VMT^ (mi/day)	Avg VMT/day	VMT Fraction*	Number of Vehicles
HDDV	Bastrop	133,043	129.4	1.000	1,028
	Caldwell	69,365	130.1	1.000	533
	Hays	311,744	131.9	0.431	1,019
	Travis	2,171,524	131.6	0.820	13,531
	Williamson	678,264	131.1	0.733	3,792
HDGV	Bastrop	33,727	54.06	1.000	624
	Caldwell	16,773	54.06	1.000	310
	Hays	65,220	54.06	0.520	627
	Travis	464,313	54.06	0.851	7,309
	Williamson	151,015	54.06	0.788	2,201

Table 4-4. Estimation of Heavy-Duty Fleet Size ^ From TTI

Note: VMT fraction reduced to account for IH 35 pass-through traffic (no idle time anticipated – extended Class 8 idle events excluded from analysis)

[7] Unlike MOBILE5b, MOBILE6 does not provide explicit idle emission factors in grams per hour. EPA guidance suggests using the emission rate for the lowest speed bin available, and converting to g/hr.

An assumed rule penetration of 100% and effectiveness of 80% (per TCEQ) were used to calculate the reductions shown in Table 4-5.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	**Net NOx Reduction (tpd)**	**Percent Reduction (%)**
ONROAD MOBILE: Heavy Duty Diesel & Gas Trucks (HDV)	Idling Restrictions	Austin-Round Rock MSA (5 Counties)	31.82	31.63	0.19	0.6%

Table 4-5. Idling Restrictions NOx Emission Reduction

ESTIMATED COST

At this time we do not have a cost estimate. However, the measure will result in fuel savings.

REFERENCES

ERG, Inc., *Technical Support documentation: Emission Control Strategy Evaluation for the Austin/San Marcos (A/SM) MSA EAC Clean Air Action Plan (CAAP),* February 17, 2004

4.2.3 Commute Emission Reduction Program (A3)

SOURCE TYPE AFFECTED

All employers with 200 or more employees per location throughout the MSA, TCEQ (or its designated local agent), Clean Air Partners Program, CAMPO Commute Solutions Program, CAPCO.

CONTROL STRATEGY

The Commute Emission Reduction Program requires every existing or future employer with 200 or more employees per location to submit a detailed plan to TCEQ or local designee that demonstrates how the employer will reduce the equivalent of their NOx and VOC commute related emissions by 10%. The 10% reduction requirement may be met by reducing emissions at least 3% per year until the 10% reduction is achieved.

Employers may choose to reduce commute or any other business related emissions that occur at the location with 200 or more employees as long as the aggregate emissions reductions are equivalent to 10% of their commute related emissions for NOx or VOC.

IMPLEMENTATION

To implement this measure the MSA requests that TCEQ adopt a rule applying this measure in the MSA. TCEQ or their local designee will be responsible for implementation and enforcement of the program. The plan must be implemented no later than December 31, 2005.

Commute related emissions may be calculated using a baseline of the annual average number of employees at that location in 2003, 2004 or the expected annual average number of employees for a new employer location and assuming all employees drove to work alone. The annual average number of employees multiplied by the average round trip commute (22.6 miles) equals the number of employee miles traveled. Employee miles traveled multiplied by the MSA's commute MOBILE6 emission factors for VOC and NOx equals the VOC and NOx commute emissions. The MOBILE6 emission factors may be for the analysis year, 2007 or any other year deemed appropriate by the TCEQ. The MSA average round trip commute mileage may be used or an employer may choose to use employee specific round trip commute mileage. A calculation guidance packet, including emission factors will be developed and made available to employers.

The plan will include details on how the commute related emissions were calculated, how and when the 10% of total VOC and NOx reductions will be achieved, as well as how the reductions will be maintained over time. Alternative plans that detail either how the employer will achieve and maintain a verifiable employee commuter average vehicle occupancy (AVO) of 1.2 or achieve and maintain verifiable participation in the Clean Air Partners Program at a 10% reduction level will also be accepted.

All employers with 200 or more employees at a single location will register with TCEQ or local designee by December 31, 2004 or within 60 days of beginning operations for new locations. All plans must be submitted to TCEQ or local designee by March 31, 2005 or within 120 days of beginning operations for new locations. TCEQ or local designee will approve all plans, or inform the employer of any plan deficiencies by July 31, 2005 or within 4 months of plan submittal for new locations. In the event that plan deficiencies occur, employers will have 60 days from the date of notification of such deficiencies to revise and resubmit their plans. TCEQ or local designee will approve or reject the revised plan within 30 days from the date of re-submittal.

Employers will report on the plan's implementation and results semi-annually in conjunction with the MSA's EAC semi-annual report. Reporting periods are May 1 through October 31 and November 1 through April 30. Copies of the Commute Emission Reduction Program report are due to TCEQ or local designee and CAPCO by November 30^{th} and May 31^{st} respectively. In the event that the semi-annual reports indicate that the planned emission reductions are not being achieved and maintained, TCEQ or local designee may request that the employer revise their plan accordingly.

In the event TCEQ designates program responsibility to a local entity, the TCEQ and EPA will make every reasonable effort to provide adequate funding for program administration. Both the Clean Air Partners Program and the CAMPO Commute Solutions Program provide free tools and information that may be useful in complying with this measure. The Commute Solutions Program provides employee transportation coordinator training and Commute Solutions Fairs for alternatives to drive-alone commutes, while Clean Air Partners provides tools, expertise and experiences of member employers.

ESTIMATED EMISSION REDUCTION

Expected reductions from this measure are 0.27 tons per day NOx and 0.30 tons per day VOC (Table 4-6 and Table 4-7). An assumed rule penetration of 100% and effectiveness of 80% were used to calculate the reduction. Some workday rush hour congestion may be reduced if employers select and implement commute emission reduction measures. The measure will also encourage business practices that improve air quality.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	**Net NOx Reduction (tpd)**	**Percent Reduction (%)**
ONROAD MOBILE: Light Duty Vehicles (LDV)	Commute Emission Reduction Program	Austin-Round Rock MSA (5 Counties)	30.29	30.02	0.27	0.9%

Table 4-6. Commute Program NOx Emission Reduction

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
ONROAD MOBILE: Light Duty Vehicles (LDV)	Commute Emission Reduction Program	Austin-Round Rock MSA (5 Counties)	31.55	31.25	0.3	1.0%

Table 4-7. Commute Program VOC Emission Reduction

ESTIMATED COST

At this time we do not have a cost estimate. Administrative costs to employers and the Clean Air Partners will vary according to the participation level. However, the measure will result in fuel savings.

REFERENCES

Commute Solutions www.commutesolutions.com

Clean Air Partners www.cleanairpartnerstx.org

4.2.4 Low Emission Gas Cans (A4)

Portable gasoline containers, usually called "gas cans," can be a significant source of urban air emissions. The emissions arise from containers that spill, leak, and/or allow permeation, and are measured as volatile organic compounds (VOC).

SOURCE TYPE AFFECTED

Residential and commercial lawn and garden users of gas cans will be affected by this measure. Recreational vehicles (e.g., all-terrain vehicles and off-road motorcycles, and recreational marine vehicles) are included in a limited capacity.

CONTROL STRATEGY

A mandate that all new gas containers purchased in the region meet spill-proof, low emission standards is suggested. While we have a fairly good grasp of emissions from refueling motor vehicles, gas can emissions are highly uncertain at this time. The California Air Resources Board (CARB) was instrumental in developing a methodology to quantify emissions from gas cans, and now several states including Texas are considering using the CARB method to help determine the need for a "no-spill" gas can regulation.

Historically, gas can emissions were part of the emissions inventory for non-road equipment such as lawn mowers, chainsaws, trimmers ("weed whackers"), and other portable power equipment. The 1992 Non-Road Equipment and Vehicle Emissions Study (NEVES)[8] considered refueling emissions as a function of gasoline consumption, and included algorithms for spillage and vapor displacement. The draft NONROAD model[9] has the same algorithms, which are used to estimate this part of the VOC emissions inventory. A major improvement in the NONROAD model over the NEVES was to separate commercial and residential equipment, as commercial equipment tend to be used during the week and residential equipment, which are more numerous in terms of numbers of engines, tend to be used fewer hours, mainly on the weekends. Therefore, we

8 U.S. EPA. 1991. Nonroad Engine and Vehicle Emission Study – Report. EPA-460/3-91-02.
9 http://www.epa.gov/otaq/nonrdmdl.htm

have adapted our surveys and methods to include commercial and residential gas can emissions separately.

The main emphasis of this research is on lawn and garden uses of gas cans. Lawn and garden is the largest category in the NONROAD model that is refueled entirely by gas cans. Recreational vehicles (e.g., all-terrain vehicles and off-road motorcycles) are also refueled by gas cans, but their usage is not nearly as high as that for lawn and garden equipment. Recreational marine engines (e.g., outboard motorboats and personal watercraft) can be refueled by portable gasoline containers, but pressurized marine gas tanks are much more common than the ubiquitous "gas can." Finally, some construction, commercial, agricultural and logging equipment may be refueled with gas cans, but NONROAD assumes that these types of equipment are all refueled at the gas pump.[10]

Future updates to this analysis could include a small expansion factor to account for gasoline container emissions from these other source categories.

IMPLEMENTATION

Preferably state rule, developed by TCEQ, applicable in all five counties. It is recommended that TCEQ implement the measure in the eastern half of the state no later than December 31st 2005.

The TCEQ is considering a rule that would phase-in new gas cans by effectively eliminating most of the gas cans in the "open" condition, eliminating refueling (but not transport) spillage, and reducing many of the remaining categories such as permeation because of new gas can design parameters. Presumably, such a gas can rule would apply to sales of new containers. Therefore, we estimated the useful life of a gas can to be four years, using the CARB default. If a rule were implemented in 2003, it would take until 2008 for the existing gas cans to be replaced by gas cans of the new design.

[10] U.S. EPA. 1998. Refueling Emissions for Nonroad Engine Modeling. Report No. NR-013

Using the NONROAD age distribution curve, we estimated that approximately 94 percent of the gas cans would be replaced by the 2007 ozone season. This estimate is consistent with the Commercial survey finding that 40% of businesses plan to replace some or all of their current containers in the next year. In addition, the residential survey found that 14% of these cans had been replaced during the previous year. Assuming linear attrition rates, this translates to a 7-year turnover cycle for these cans as well (e.g., 2003 through 2009). However, to the extent that residential gas can attrition is non-linear (as is the case with most dynamic populations), potential benefits from a gas can rule would be diminished somewhat.[11]

The next step is to apply reduction estimates to the uncontrolled 2007 emissions. Any reductions would be "negative emissions" that could be attributed to the effect of the TCEQ rule – and ultimately applied as potential State Implementation Plan credits. CARB estimated percentage reductions for all five categories of gas can emissions.[12] Although we do not know the content of a new gas can rule to be adopted in Texas, if approved, we can make some educated guesses about the efficiency of such as "Gas Can Rule." After careful consideration, we applied rule penetration (RP) and rule effectiveness (RE) to the CARB reduction estimates, expressed as control efficiency (CE), as follows:

$$\text{Reduction (\%)} = \text{CARB (CE)} * \text{RE} * \text{RP} \qquad \text{Equation 1}$$

The RP adjusts reductions slightly lower because the rule may not apply to 100 percent of the new gas can sales, and is probably more like 90 percent. The RE is an adjustment that says that the rule might only be followed 80 percent of the time. The product of RP and RE is 72 percent; this factor was then applied to the CARB reduction estimates where deemed to be appropriate. These kinds of adjustments are typical when dealing with the U.S. Environmental Protection Agency. Table 4-8 includes the assumptions that

[11] It would require multiple years of retirement data to generate a more realistic scrappage curve, however.
[12] CARB, 1999. "Initial Statement of Reasons for Proposed Rule Making: Public Hearing to Consider the Adoption of Portable Fuel Container Spillage Control Regulations."

include the default, stated CARB reductions, which were then modified by applying rule effectiveness and rule penetration.

Emission Type	Total Emissions	Percent Reductions - California	Percent Reductions - Texas	Reductions (Tons per day of VOC)
Diurnal	52.55	70.0%	50.4%	24.94
Transport Spillage	5.75	100.0%	0.0%	0.00
Refueling Spillage	9.89	100.0%	72.0%	6.71
Displacement	3.40	40.0%	0.0%	0.00
Total	**77.69**			**34.72**

Table 4-8. 2007 State Emission Reductions

Note that potential reductions were not applied to two sources: transport spillage and valor displacement. This decision was not based on actual testing but rather because common sense dictates that a no-spill gas can would still have emissions during refueling operations (the effect on vehicles in transit is not clear, either). It is quite possible that CARB also over-predicted diurnal emission reduction percentages, but there is no evidence to dispute these claims at this time.

EXPECTED EMISSIONS REDUCTIONS

Based on a total of 13.4 tons per day in the MSA, the potential reductions add up to 2.6 tons per day (Table 4-9). There may be more (or less) reductions depending on how the envisioned gas can rule is written and implemented. This analysis evaluated the potential VOC reductions resulting from adoption of TCEQ's draft Portable Fuel Container rule. The proposed rule assumes that replacement containers would meet CARB standards.

ERG used the statewide emission reduction estimates previously developed in support of TCEQ's rulemaking effort to estimate potential reductions in the five-county area.[13] This analysis provided county-level baseline emissions estimates for 2007. For the five-

[13] ERG, "Emissions from Portable Gasoline Containers in Texas," Final Report, prepared for TRNCC, August 30, 2002.

county area this comes to 1.01 tons per typical ozone season weekday for commercial uses, and 4.18 tons per day for residential uses.

The prior report also estimated that replacement cans meeting new rule requirements would result in an overall reduction of 62.4% per unit. Recent survey results indicated that commercial users replace their gas cans almost annually.[14] And EPA's NONROAD emission factor model indicates a 4 year turnover cycle for residential gas cans. So assuming that such a rule is adopted in early 2004, essentially all portable gas cans will be replaced by the 2007 evaluation period, resulting in a reduction of 0.63 tons per day from commercial uses, and 1.97 tons per day for residential uses (2.60 tons of VOC per day total).

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
AREA SOURCES: Lawn and Garden Equipment (Commercial&Residential)	Low Emission Gas Cans	Austin-Round Rock MSA (5 Counties)	13.40	10.80	2.60	19.4%

Table 4-9. Low Emission Gas Can VOC emission reduction

COSTS

Costs for the program were estimated assuming an $11 incremental price for the larger commercial cans, and $8 for residential cans, as per the CARB Rulemaking documentation. The total number of effected commercial companies was determined from Texas Comptroller records for lawn and garden services in the region (734 as of 2002). The previous ERG survey for TCEQ also found that the average number of gas cans owned by commercial interests was 10.5. These data were combined to estimate a total annual incremental cost of $84,777 per year, and a cost-effectiveness of $368 per ton for commercial gas can use.

For residential uses ERG found that each single-family household (number obtained from Census data) would own 1.35 portable gas cans on average. Accounting for turnover rates, incremental costs, and the number of households in the region, we estimate an

[14] Personal communication with Marilyn Good, Texas Nursery and Landscape Association, August 2002.

annual cost of $1,363,890 (4-year annualized cost), and a cost-effectiveness of $1,899/ton of VOC for the residential sector.

REFERENCE

ERG, Inc., *Technical Support Documentation: Emission control Strategy Evaluation for the Austin/San Marcos (A/SM) MSA EAC Clean Air Action Plan (CAAP)*, February 17th, 2004

4.2.5 Stage 1 Vapor Recovery Requirement Change (A5)

SOURCE TYPE AFFECTED

Service stations that pump over 25,000 gallons of fuel per month and fuel dispensing facilities in the MSA will be affected by this measure.

CONTROL STRATEGY

Stage I vapor recovery is already in place in the Austin region for service stations that pump over 125,000 gallons of fuel per month. This measure would require Stage I on service stations pumping 25,000 gallons per month, thus increasing the number of service stations using the system. Stage I reduces VOC emissions during fuel transfer from the tanker truck to the underground storage tank through a special vapor recovery system.

IMPLEMENTATION

Preferably a modification to state rule 30 TAC 115, Subchapter C, Division 2 *Filling of Gasoline Storage Vessels (Stage 1) for Motor Vehicle Fuel Dispensing Facilities*, developed by TCEQ, applicable in all five counties. The plan must be implemented no later than December 31, 2005.

Within the A/RR MSA there are approximately 41 sites (94 tanks) that are not equipped with Stage 1 Vapor Recovery equipment. This is only 10% or less of the total.

Allocated Gasoline Gallons -- 2002 (assume throughput/station remains constant through 2007)						
	Bastrop	Caldwell	Hays	Travis	Williamson	Grand Total (Gallons)
<10,000	77,639	0	96,309	902,618	295,673	1,372,239
10K - 25K	1,118,909	490,221	1,784,558	13,472,908	4,666,992	21,533,588
25K- 50K	4,452,799	2,451,106	7,648,105	58,736,569	20,001,394	93,289,974
50K - 125K	17,582,848	9,804,424	30,734,052	228,807,145	78,121,386	365,049,856
> 125K	10,960,737	5,602,528	20,394,947	149,330,261	50,438,298	236,726,771
Total (Galons)	34,192,931	18,348,279	60,657,972	451,249,502	153,523,743	717,972,428

Table 4-10. Gasoline station throughput

EXPECTED EMISSION REDUCTION

The Stage I Vapor recovery control has a potential of 4.88 tpd VOC reductions (assuming participation in all five counties). A Stage I control efficiency of 95% (EPA 453/R-94-002a / Stage I NESHAP), rule penetration of 64.4%, and rule effectiveness (RE) of 80% was assumed. The MSA gasoline sales shown in Table 4-10 were used to derive rule penetration (RP) as presented in Table 4-11. The expected emission reductions from Stage I Vapor recovery control are presented for each county by percentage in Table 4-12 and in tons per day in Table 4-13.

Stage I VOC Control	*Rule Penetration (RP)*					
	<10,000	10K - 25K	25K- 50K	50K - 125K	> 125K	Total
Bastrop	0.2%	3.3%	13.0%	51.4%	32.1%	100.0%
Caldwell	0.0%	2.7%	13.4%	53.4%	30.5%	100.0%
Hays	0.2%	2.9%	12.6%	50.7%	33.6%	100.0%
Travis	0.2%	3.0%	13.0%	50.7%	33.1%	100.0%
Williamson	0.2%	3.0%	13.0%	50.9%	32.9%	100.0%

Table 4-11. Stage I Rule penetration for gas stations

Emissions Reductions [%]					
	<10,000	10K - 25K	25K- 50K	50K - 125K	> 125K
Bastrop	52%	51%	49%	39%	24%
Caldwell	53%	53%	51%	41%	23%
Hays	50%	50%	48%	39%	26%
Travis	51%	51%	48%	39%	25%
Williamson	51%	51%	49%	39%	25%

Table 4-12. Expected emission reduction from Stage I Vapor recovery control

		VOC Reduction (tpd)				
County	2007 Base Emissions (tpd)	<10,000	10K - 25K	25K- 50K	50K - 125K	> 125K
Bastrop	0.33	0.17	0.17	0.16	0.13	0.08
Caldwell	0.37	0.20	0.20	0.19	0.15	0.09
Hays	1.31	0.66	0.66	0.63	0.51	0.34
Travis	5.84	2.97	2.96	2.83	2.25	1.47
Williamson	2.21	1.13	1.13	1.08	0.86	0.55
Total	**10.07**	**5.13**	**5.11**	**4.88**	**3.89**	**2.52**
Stage I (SCC: 2501060053) VOC Emissions (tpd)						

Table 4-13. Stage I controls VOC reductions by County

ESTIMATED COST

To estimate costs, ERG used estimates developed for TNRCC's 1999 Stage I RACT analysis. Key costs include purchase and installation of Stage I equipment ($1,750/station – high end estimate), and annual operating costs per station ($368 – high end estimate). Next, these unit costs were combined with data from the TCEQ's PST database to obtain area-wide costs.[15] The following presents the estimated number of gasoline storage tanks in each county, derived from the PST database. The database also provided a field indicating if a particular tank was equipped for Stage I recovery (Table 4-14).[16]

County	Total	Without Stage I
Bastrop	201	137
Caldwell	108	74
Hays	235	130
Travis	1,736	1,080
Williamson	596	330

Table 4-14. Number of Retail Gasoline Tanks and Stage I Units by County (2003)

Using the average number of tanks per station without Stage I equipment (4.0 -- from the PST database), and the number of stations by throughput presented above, the target number of tanks was determined, as shown below (Table 4-15).

[15] http://www.tnrcc.state.tx.us/permitting/r_e/par/pstregis/pstregisquery2.html.
[16] Recent data indicate that the number of tanks equipped with Stage I equipment may be even higher, (upwards of 90%), thereby lowering costs and improving cost-effectiveness even further – personal communication, Scott Johnson, 1-27-04.

gal/mo	Bastrop	Caldwell	Hays	Travis	Williamson
< 9,999	3	2	3	22	7
10,000 - 24,999	21	11	20	165	50
25,000 - 49,999	42	23	40	335	102
50,000 - 124,999	71	38	67	558	170

Table 4-15. Number of Tanks Without Stage I Capability, by Throughput

Using these figures, annual costs were then calculated. Initial capital and installation costs were annualized over a 5-year period at 10% for this purpose. Annual costs by throughput category are presented below (Table 4-16).

gal/mo	Bastrop	Caldwell	Hays	Travis	Williamson
< 9,999	$2,489	$1,659	$2,489	$18,252	$5,808
10,000 - 24,999	$17,423	$9,126	$16,593	$136,892	$41,482
25,000 - 49,999	$34,845	$19,082	$33,186	$277,931	$84,624
50,000 - 124,999	$58,905	$31,527	$55,586	$462,942	$141,040
Total	**$113,661**	**$61,394**	**$107,854**	**$896,017**	**$272,953**

Table 4-16. Annual Costs by Throughput

Cost-effectiveness was then determined for cumulative costs and benefits for the different rule cut-off levels, as on Table 4-17.

Cut-Off	Bastrop	Caldwell	Hays	Travis	Williamson	MSA Average
all	$1,501	$1,477	$822	$910	$812	**$925**
> 10,000	$1,473	$1,438	$805	$894	$797	**$908**
> 25,000	$1,305	$1,267	$709	$790	$705	**$803**
> 50,000	$1,028	$986	$555	$621	$554	**$630**

Table 4-17. Cost-Effectiveness by Rule Cut-Off Level ($/Ton VOC)

REFERENCES

Title 30, Part 1, Chapter 115, Subchapter C, Division 2 *Filling Of Gasoline Storage Vessels (Stage I) For Motor Vehicle Fuel Dispensing Facilities*, §115.227 Exemptions
ERG, Inc., *Technical Support Documentation: Emission control Strategy Evaluation for the Austin/San Marcos (A/SM) MSA EAC Clean Air Action Plan (CAAP)*, February 17th, 2004

4.2.6 Degreasing Controls (A6)

A degreaser is any equipment designed and used for holding a solvent to carry out solvent cleaning operations including, but not limited to, batch-loaded cold cleaners, open-top vapor degreasers, conveyorized (in-line) degreasers, and air-tight and airless cleaning systems. Solvent cleaning machines are used to dry materials and remove soils, such as grease, wax, and oil from metal parts, circuit boards, sheet metal, assemblies, and other materials. Emissions of VOC primarily result from air/solvent interface losses (e.g., evaporation and subsequent release from the machine) and workload losses (e.g., carry-out of solvent on parts).

SOURCE TYPE AFFECTED

The metalworking industries are the major users of solvent degreasing. These include automotive, electronics, plumbing, aircraft, refrigeration, and business machine industries. The printing, chemical, plastics, rubber, textiles, glass, paper, and electric power industries also use solvent degreasing operations. This category does not include dry cleaning.

CONTROL STRATEGY

Cold cleaning was the largest degreasing emissions in the inventory and the one we targeted. In cold cleaning, the part is dipped into or sprayed with solvent. To reduce the amount of solvent evaporation, control requirements including equipment and operating procedures shall be required.

IMPLEMENTATION

Under 30 TAC 106.454 *Degreasing Units*, anyone obtaining a state air permit for a degreasing unit is required to meet with §115.412 and §115.415 as of November 1st, 2001. It is requested that TCEQ extend state rule 30 TAC 115, Subchapter E, Division 1, §§11.412, 115.413, 115.415-.417, 117.419 to the Austin/Round Rock MSA. Therefore the extension of this rule would only apply to operations permitted prior to November 1st, 2001.

The National Degreasing rule (Halogenated Solvent Cleaning NESHAP) only covers those degreasers using one of the listed six halogenated HAPs (methylene chloride, perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, and chloroform). Therefore, the national rule does not regulate other degreasing solvents that may be VOCs, but not HAPs.

EXPECTED REDUCTIONS

It is estimated that 50% of the market is in compliance with the current rules. This was based on the fact that one large degreasing supplier is estimated to have 50% of the market in the MSA and is in compliance with the current rules. The remaining 50% creates a potential for reduction from the 2007 baseline. Degreasing controls are expected to reduce VOC emissions by 6.38 tons of VOC per day. An estimated control efficiency of 85% (TCEQ estimate), rule efficiency of 80% (EPA default), and rule penetration of 100% was used to in this calculation. Table 4-18 presents the degreasing emissions in 2007.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
AREA SOURCES: Degreasing (Cold Cleaning) SCCs: 2415300000, 2415360000, 2415355000, 2415330000, 2415320000, 2415305000, 2415325000, 2415340000, 2415345000, 2415365000, 2415310000, 2415335000	Degreasing Reduction Measures	Austin-Round Rock MSA (5 Counties)	9.38	3.00	6.38	68.0%

Table 4-18. Cold Cleaning Degreasing VOC Emission Reduction

COSTS

At this time we do not have a cost estimate. However, the measure is expected to save money in transitioning from solvent-based cleaners to aqueous. There is additional cost savings in reduced solvent evaporative losses.

References

South Coast Air Quality Management District (SCAQMD), 1997. *Final Staff Report for Proposed Amendments to Rule 1122 - Solvent Degreasers*. June 6, 1997.

SCAQMD, 2002. South Coast Air Quality Management District Rule 1122 - *Solvent Degreasers*. Amended December 6, 2002.

4.2.7 Autobody Refinishing Controls (A7)

The autobody refinishing category is the repairing of worn or damaged automobiles, light trucks, and other vehicles, and refers to any coating applications that occur subsequent to those at original equipment manufacturer (OEM) assembly plants. The majority of these operations occur at small body shops that repair and refinish automobiles. Emissions of VOC results from the paint solvents, thinning solvents, and solvents used for surface preparation and cleanup.

SOURCE TYPE AFFECTED

Facilities performing autobody refinishing operations are classified with the Standard Industrial Classification (SIC) code 7532 (establishments primarily engaged in the repair of automotive tops, bodies, and interiors, or automotive painting and refinishing) (EIIP, 2000).

CONTROL STRATEGY

Adopt California Autobody Refinishing Control standards to reduce VOC emissions from this source by 45%. Rule requires lowering the VOC content of the products used, improving the application technique so that less coating is used and controlling the use of clean-up solvents (proper handling of gun cleaning and clean-up solvents). Emissions occur at all three process stages (surface preparation, painting and equipment cleaning) due to evaporation of solvents in the primers, paints and other coatings, and in the cleaning solutions.

<u>Lower-VOC Coatings</u>

The South Coast Air Quality Management District (SCAQMD) performed studies on the feasibility of using lower VOC content coatings than the federal rule. SCAQMD determined that each of the coating categories in the Federal rule could be lowered to reduce overall VOC emissions. They determined that these lower VOC coatings are currently available on the market and compatible with existing coatings. Table 4-19 compares the VOC limits between the two rules.

Coating Category	VOC Limits from Federal Rule (grams/liter)	VOC Limits from SCAQMD (grams/liter)
Pretreatment Wash Primer	780	600
Primer/Primer Surfacer	580	250
Primer Sealer	550	-
Single/2-Stage Topcoats	600	420
Topcoats of 3 or more stages	630	540
Metallic Topcoat	-	520
Multi-colored topcoats	680	-
Specialty Coatings	840	-

Table 4-19. Comparison of VOC Limits of the Federal Rule and SCAQMD

The publications from U.S. EPA Design for the Environment and Office of Pollution Prevention and Toxics described additional emission control measures. The options included higher transfer efficiency application equipment, automated equipment cleaning and equipment maintenance, work practices, and spray booths with emission controls.

<u>Application Equipment</u>

The two most common coating application tools are conventional spray guns and high volume low pressure (HVLP) spray guns. In conventional spray guns, a low volume of air is pressurized and forced through the spray nozzle. The paint or coating is atomized in the air at the nozzle throat. Air is supplied by an air compressor during spraying operations. With a conventional spray gun, paints or coatings are typically atomized with air pressures of approximately 450 kPa (65 psig). The major disadvantage to conventional spray guns is the excessive spray mist and overspray fog due to the high pressure used at the nozzle. This excessive overspray results in a low transfer efficiency (the ratio of the amount of coating solids deposited onto the surface of the coated part to the total amount of coating solids that exit the spray gun nozzle). Studies have shown conventional spray gun transfer efficiencies as low as 20 percent. A low transfer efficiency results in increased material usage, increased cost, and higher mist particle emissions (U.S. EPA, 2002).

HVLP spray guns use a high volume of air to atomize the coatings at a relatively low air pressure (69 kPa (10 psig)) at the spray nozzle. Some HVLP spray guns are gravity assisted, with the paint cup above the atomization nozzle, and some are "suction" or "siphon cup" spray guns, with the cup below the nozzle. With siphon cup HVLP spray guns, a controlled air pressure is used to meter the flow of paint into the orifice where atomization occurs. HVLP spray guns typically have a higher transfer efficiency than conventional spray guns (e.g., up to 65 percent), but cost more to purchase (U.S. EPA, 2002).

A third type of application tool is an electrostatic spraying system. The transfer efficiencies of these systems are between 60 and 90percent and are widely used in U.S. automotive assembly plants. Air-powered, electrostatic spray guns function in essentially the same way as electrostatic spray guns. Although transfer efficiencies for powder spray guns are similar to wet spray guns, the powder can be reused and these systems can operate with powder utilization rates of up to 98 percent. Neither of these systems are practical for refinishing systems; however, for the following reasons: (1) prohibitively high cost of electrostatic spray guns, (2) large amount of coating contained in the hose connecting electrostatic spray gun to pot, which must be removed when changing colors, (3) high curing temperatures required for powder systems (i.e., resulting in damage to other vehicle components), and (4) grounding methods required for electrostatic systems in an OEM environment cannot be duplicated for automobile refinishing (U.S. EPA, 1997).

Other paint spray equipment are compared in Table 4-20; however the most commonly used application equipment for autobody refinishing facilities are conventional and HVLP guns (U.S. EPA, 1997).

IMPLEMENTATION

Preferably state rule, developed by TCEQ, applicable in all five counties. The plan must be implemented no later than December 31, 2005.

Table 4-20. Comparison of Characteristics of Paint Spray Equipment for Automotive Refinishers

Type of Painting System	Performance Characteristics		System Transfer Efficiency (%)	Cost Range ($)	Population of Shops Using Equipment
	Advantages	Disadvantages			
Conventional	Low cost Low maintenance Excellent material atomization Excellent operator control Quick color change capabilities Coating can be applied by syphon or under pressure	Uses high volume of air Develops excessive spray dust and overspray fog Does not adapt to high volume material output (economics of scale) Low transfer efficiency Pressure fuel systems require high volumes of coatings	20 to 40	up to 350	Specific population data is unknown. Some states have mandated the use of HVLP systems by automotive refinishers.
High Volume Low Pressure	Low blowback and spray fog Will apply high-viscosity high solid coatings (low VOC coatings) Relatively easy to clean Can be used for intricate parts Good operator controls	High initial cost Slower application speed with some coatings Does not fully atomize some coatings Higher maintenance costs Requires operator training	At least 65	500-1000	64% of all shops
Low Volume Low Pressure	Low blowback and spray fog Will apply high-viscosity high solid coatings Easy to clean Can be used for intricate parts Good operator controls Needs less air compression then HVLP Lower energy requirements	High initial cost Slower application speed than HVLP Does not fully atomize some coatings Higher maintenance costs Requires operator training Still relatively new to the market	At least 65	500-1000	Population data is unknown
Powder Coating	Almost zero VOC emissions Excess or waste powder can often be melted Powder can be applied to hot or cold parts Ideal for robotic application Applied in single coal system Economical for long runs of a few colors	Generally, capital equipment outlay is greater than for conventional coatings High energy usage due to high temperature ovens Some powders require temperatures as high as 500°F for curing Not suited for every application (parts that can not tolerate high temperature plastics, rubber, upholstery)	Up to 95	5000-10,000	Population data is unknown Powder coating systems are used primarily in OEM operations.

Source: U.S. EPA, May 1997.

ESTIMATED EMISSION REDUCTION

An OTAG Technical Support Document calculated a Future Control Efficiency (FCE) of 53% based on coatings reformulation and high-volume, low-pressure (HVLP) spray equipment. The limits set by TCEQ rules reduce the Austin MSA emissions by 45%. CAPCO estimated that by 2007 emissions from autobody refinishing would be 202 tons per year. Therefore, the additional 8% reduction is approximately 100 tons per year or 0.05 tpd (Table 4-21).

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
AREA SOURCES: Autobody Shops SCCs: 2401070000, 2401001025 & 2401005000	Autobody Refinishing Controls	Austin-Round Rock MSA (5 Counties)	0.64	0.59	0.05	8.0%

Table 4-21. Autobody Refinishing VOC Emission Reduction

ESTIMATED COST

Table 4-22 below compares the potential emission reduction techniques and their estimated cost to the facilities.

Potential Control Options	Potential Emissions Reduction (%)	Control Option Estimated Cost
1. Low-VOC coating products	1. SCAQMD has VOC limits that are about 30% lower than the federal rule	1. The cost should be low because these coating are available since the SCAQMD facilities are using them and should be approximately the same cost as the federal rule compliant coatings.
2. High Volume Low Pressure (HVLP) spray guns	2. HVLP spray guns have >25% better transfer efficiency than conventional spray guns and result in less VOC emissions and uses 40-55% less coating than conventional spray guns.	2. Conventional guns are about $350 and HVLP guns are ~$500. Use less amount of coatings. The same air compressor can be used.

Table 4-22. Comparison of Control Options, Source: U.S. EPA, 2002.

REFERENCES
U.S. EPA, 2002. Design for the Environment (DfE). Isocyanate and Volatile Organic Compound Emissions from Auto Refinishing Facilities (Draft Final) , U.S. Environmental Protection Agency, Washington, DC, September 2002.
U.S. EPA, 1997. Office of Pollution Prevention and Toxics (OPPT). Automotive Refinishing Industry Isocyanate Profile, U.S. Environmental Protection Agency, Washington, DC, May 1997
Emission Inventory Improvement Program (EIIP), 2000. Volume III: Chapter 13 - Auto Body Refinishing. Prepared for: Area Sources Committee Emission Inventory Improvement Program, Research Triangle Park, NC. January 2000.

4.2.8 Cut Back Asphalt (A8)

SOURCE TYPE AFFECTED

Asphalt Suppliers and Paving Contractors are largely affected by this measure. The Texas Department of Transportation will also be affect through their contracts.

CONTROL STRATEGY

The use of conventional cutback asphalt containing VOC solvents for the paving of roadways, driveways, or parking lots is restricted to no more than 7.0% of the total annual volume averaged over a two-year period of asphalt used by or specified by any state, municipal, or county agency who uses or specifies the type of asphalt application.

When asphalt emulsion is used or produced, the maximum VOC content shall not exceed 12% by weight or the following limitations, whichever is more stringent:

A. 0.5% by weight for seal coats;
B. 3.0% by weight for chip seals when dusty or dirty aggregate is used;
C. 8.0% by weight for mixing with open graded aggregate with less than 1.0% by weight of dust or clay-like materials adhering to the coarse aggregate fraction (1/4 inch in diameter or greater); and
D. 12% by weight for mixing with dense graded aggregate when used to produce a mix designed to have 10% or less voids when fully compacted.

Exemptions:

1. asphalt concrete made with cutback asphalt, used for patching, which is stored in a long-life stockpile (longer than one-month storage); and
2. cutback asphalt used solely as a penetrating prime coat.

IMPLEMENTATION

This measure would restrict the use of cut-back asphalt in the MSA through a TCEQ rule revision (Chapter 115, Subchapter F, Division §§115.510, 115.512, 115.513, 115.515 - 115.517, 115.519) to include the MSA counties in the requirements of these sections. The plan must be implemented no later than December 31, 2005.

EXPECTED EMISSION REDUCTIONS

A conservative rule efficiency of 80% and rule penetration of 80% were used in this calculation. Together with an efficiency of 60%, this brings the total reduction to 38.4%. Therefore, the expected emission reductions from this measure are 1.03 tons per day VOC (Table 4-23). There is no NOx reduction for this measure.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
AREA SOURCES: Asphalt Aplications SCC: 2461020000	Cutback Asphalt Restrictions	Austin-Round Rock MSA (5 Counties)	2.68	1.65	1.03	38.4%

Table 4-23. Asphalt Paving VOC Emission Reduction

ESTIMATED COST

At this time we do not have a cost estimate.

4.2.9 Low Reid Vapor Gas (A9)

SOURCE TYPE AFFECTED

Fuel refiners and suppliers will be directly affected. Gas stations and consumers will be indirectly affected by increased costs of the fuel.

CONTROL STRATEGY

The Clean Gasoline program limits the amount of sulfur per gallon of gasoline and reduces evaporative emissions from vehicles or storage/transfer facilities by limiting Reid Vapor Pressure (RVP). The Reid vapor pressure requirement would be lowered from 7.8 to 7.0 in the MSA during ozone season (daylight savings time), significantly reducing locally generated VOC.

IMPLEMENTATION

To implement this measure, the MSA requests that TCEQ's existing rule 30 TAC Chapter 114 Subchapter H, Division 1, be revised as above. The MSA encourages TCEQ to expand implementation of this measure to the eastern half of the state. The plan must be implemented no later than December 31, 2005.

ESTIMATED EMISSION REDUCTION

ERG evaluated the benefits and costs associated with reducing gasoline RVP from 7.8 to 7.0. ERG used a 5-county aggregate MOBILE6 input file, with I/M, and area-specific registration and VMT-by-hour distributions, to estimate fleet-average VOC emission rates at both RVP levels. The incremental reduction of 0.05 grams per mile was then applied to total fleet VMT in 2007 obtained from CAMPO (44,507,511), to obtain total emission reductions of 2.29 tpd.

Similarly, NONROAD2002 was then run for all non-road gasoline equipment types in the area (using default populations and activity), at both RVP levels. Results indicated a 0.17 tpd reduction in VOC from these engines.

Total emission reductions from both on and non-road applications come to 2.87 tpd for the 5-county region in 2007 (Table 4-24). Note that in conjunction with the I/M program those reductions would be lower (2.46 tpd).

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
ALL ON ROAD & NON ROAD MOBILE	Low RVP Gasoline (7.0)	Austin-Round Rock MSA (5 Counties)	89.65	86.78	2.87	3.2%

Table 4-24. Low Reid Vapor Pressure VOC Emission Reduction

ESTIMATED COSTS

In order to estimate potential costs, estimates of fuel use were required. Gallons of gasoline sold per day in the 5-county region were developed separately for the Stage I Refueling Control analysis (see below), and came to 1,967,048 gal/day. Non-road gasoline engine fuel use was obtained directly from the NONROAD2002 outputs, and came to 76,117 gal/day for the region in 2007.

Next, estimates of the incremental costs per gallon of fuel were necessary. Delivered fuel prices will include the additional cost of any blending process changes. In addition, depending upon the specific blending process used, additional licensing fees may need to be paid to UNOCAL for patent rights (UNOCAL patent 393).

First, actual blending process changes were assumed to be relatively inexpensive, at approximately 1 cent per gallon, based on EPA's 1996 Regulatory Impact Analysis for the Phase II RFG Rulemaking. However, precise costs are difficult to determine, as the blending costs will vary by region and fuel provider.

ERG attempted to obtain "real-world" price information from other regions of the country with similar low RVP/conventional gas fuel programs. However, it was determined that the Atlanta and Birmingham Alabama fuel programs, both with 7.0 RVP requirements, were also coupled with low sulfur requirements, rendering them inappropriate points of comparison. ERG also attempted to obtain incremental cost information for the low RVP program in El Paso but has been unsuccessful at the time of this writing.

Potential license fee costs are also difficult to determine precisely. According to the UNOCAL website (http://www.unocal.com/rfgpatent/rfgnews.htm) some refiners may find it possible to "blend around" their patent specifications altogether. However local stakeholders have indicated that their crude stocks would require them to purchase a license from UNOCAL in order to meet a 7.0 RVP limit.[17] Assuming an additional licensing fee would be applied to the fuel prices, UNOCAL indicates this fee would vary from 1.2 to 3.4 cents per gallon, depending on fuel volumes. Therefore ERG combined actual cost and license fee estimates for a range of 2.2 to 4.4 cents per gallon for the total incremental costs per gallon for this analysis.

Using this cost range, and combining with the fuel sales totals for the region and emission reduction estimates, we obtain the following cost and cost-effectiveness estimates for this measure. (Note that annual costs assume 180 days/year.)

	TPD Reduction	$/Yr (low)	$/Yr (high)	$/ton (low)	$/ton (high)
Bastrop	0.09	$371,007	$742,014	$22,163	$44,326
Caldwell	0.04	$199,094	$398,187	$27,652	$55,304
Hays	0.15	$658,193	$1,316,386	$24,707	$49,414
Travis	1.49	$4,896,989	$9,793,978	$18,210	$36,420
Williamson	0.68	$1,665,902	$3,331,804	$13,570	$27,141
Total	**2.46**	**$7,791,185**	**$15,582,370**	**$17,617**	**$35,234**

Table 4-25. RVP Cost Calculations

REFERENCES

ERG, Inc., *Technical Support documentation: Emission Control Strategy Evaluation for the Austin/San Marcos (A/SM) MSA EAC Clean Air Action Plan (CAAP),* February 17, 2004

[17] Personal communication, Bill Oswald, Flint Hills Resources, February 2004.

4.2.10 BACT and Emission Balancing for New or Modified Point Sources (A10)

SOURCE TYPE AFFECTED

New sources throughout the MSA planning to emit 100 tons or more per year of NOx are affected by this measure.

CONTROL STRATEGY

Require Best Available Control Technology (BACT) and 1:1 emission balancing for all new point sources that would emit 100 tons per year or more of NOx only. Emission balancing would require emission reductions from existing sources to be used for offsetting new allowable emissions. When a stationary point source aggregate emission of VOC reaches twice the 1999 baseline an offset requirement will be evaluated.

IMPLEMENTATION

Preferably state rule, developed by TCEQ, applicable in all five counties and implemented by Spring 2005.

ESTIMATED EMISSION REDUCTION

The emissions reduction cannot be estimated at this time. Implementation dates on the power plant reductions are as in the 2005 to 2006 time frame.

ESTIMATED COSTS

The costs are dependent upon the facility to be built or modified and the availability of balancing emissions.

4.2.11 Petroleum Dry Cleaning (A11)

SOURCE TYPE AFFECTED

Commercial Petroleum Solvent Based Dry Cleaners will be affected by this measure.

CONTROL STRATEGY

The commercial dry cleaning category (SIC 7216) includes numerous storefront operations, most of which have a single dry cleaning machine. The MSA also has some of industrial/institutional cleaning operations (SIC 7218). These larger operations primarily use laundry detergents rather than solvents, as all the industrial cleaners surveyed by CAPCO reported. Laundry facilities have no VOC emissions. Coin-operated dry cleaning (SIC 7215) has become completely obsolete and can be withdrawn from the emission inventory.

Over 85% of all commercial dry cleaners currently use perchloroethylene (PERC) as the solvent. In 1996, PERC was excluded from the EPA's definition of VOC because of its negligible photochemical reactivity (FR, 1996).

Most of the remaining 15% of dry cleaners use some form of VOC solvent. Of these machines, almost all use solvents referred to as synthetic hydrocarbons. Some dry cleaning machines manufactured in the 1950s and 1960s used naptha solvents, such as Stoddard solvent. It is possible (but unlikely) that one or two cleaners in the MSA may still be using such older equipment, which emitted much more VOC than contemporary machines using synthetic hydrocarbons.

In the CAPCO inventory, VOC emissions from dry cleaning category in 2007 were estimated as 1,150 tons per year. It is possible there might be a shift in the industry, due to new fee issues imposed by Texas HB 1366, resulting in increased VOC solvent use. As a conservative assumption the 2007 inventory could be as high as the 1999 inventory (1,199 tpy).

IMPLEMENTATION

Adopt the Texas state rule, 30 TAC 115, Subchapter F, Division 4 *Petroleum Dry Cleaning Systems,* used in DFW and Houston. This regulates the operation of a dry cleaning facility by complying with dryer, filtration system, and fugitive emission requirements. It will also address any current PERC users looking to switch to a VOC solvent due to the new fee issues imposed by Texas HB 1366. The plan must be implemented no later than December 31, 2005.

ESTIMATED EMISSION REDUCTION

The expected emission reductions from this measure range from 0 to 1.06 tons per day VOC, depending on the amount of actual and expected petroleum dry cleaning occurring in the MSA. Emission reductions from this measure are not currently included in the CAAP. The measure is included to mitigate possible future growth in dry cleaning emissions.

ESTIMATED COSTS

The costs depend on the type of system a dry cleaner would switch to if they abandoned using PERC. Therefore, we cannot calculate any costs at this time.

REFERENCES

Federal Register (FR), 1996. February 6, 1996.
SCAQMD, 2002, *Final Staff Report: Proposed Amendment Rule 1421*, Appendix D, Table 1, October 2002.

4.2.12 Texas Emission Reduction Program (TERP) (A12)

The 77th Texas Legislature established the Texas Emissions Reduction Plan (TERP) through the enactment of Senate Bill 5 in 2001. However, the program was not fully funded until the 78th Legislature enacted HB 1365 in 2003. TCEQ expects to have about $115-120 million in revenue in FY 2004, of which approximately $104 million will be available for the Emissions Reduction Incentive Grants Program (see below). Those figures are expected to increase in each of the subsequent fiscal years through FY2008, averaging a total of $150 million each year.

The primary purpose of the TERP is to replace, through voluntary incentive programs, the reductions in emissions of NOx that would have been achieved through mandatory measures that the Legislature directed the TCEQ to remove from the SIP for the Dallas/Fort Worth (DFW) and Houston/Galveston (HGA) ozone nonattainment areas. TERP funding is also expected to be available to help achieve reductions in counties located in the state's other two nonattainment areas and in designated near-nonattainment areas, where air quality is approaching nonattainment levels.

SOURCE TYPE AFFECTED

Owners and operators of heavy-duty diesel equipment will be affected by this measure. The program is available to all public and private fleet operators that operate qualifying equipment in any of the five counties.

CONTROL STRATEGY

The reduction strategy is to secure all available TERP incentives/grants for equipment and fuels in the A/RR MSA. Available incentives/grants cover the incremental cost of cleaner diesel on-road and off-road engines and equipment, cleaner fuel needed for the equipment and clean fuel infrastructure.

IMPLEMENTATION

The TERP program was established to provide monetary incentives for projects to improve air quality in the states' non-attainment areas. The fund consists of fees and surcharges applied to certain vehicles and equipment when they are purchased, leased, inspected, or registered in Texas. The amount of the funds available for grants during each year may vary depending upon the amount of revenue received, as well as the appropriations made to the program. Each year, the TCEQ will issue notices and information regarding the grants, including information on the amount of funds available.

The TERP includes the following financial incentive and assistance programs intended to address the goals of the plan:

The *Emissions Reduction Incentive Grants Program* is administered by the TCEQ. The program provides grants to eligible projects in "affected counties," as delineated in HB

1365, to offset the incremental cost associated with activities to reduce emissions of NOx from high-emitting mobile diesel sources.

The types of projects that may be eligible for these grants include:

- On-Road Heavy-Duty Vehicles (8,500 lb or more)
  Purchase or lease, Replacement, Re-power, Retrofit or add-on of emission-reduction technology
- Non-Road Equipment
  Purchase or lease, Replacement, Re-power, Retrofit or add-on of emission-reduction technology
- Marine Vessels
  Purchase or lease, Replacement, Re-power, Retrofit or add-on of emission-reduction technology
- Locomotives
  Purchase or lease, Replacement, Re-power, Retrofit or add-on of emission-reduction technology
- Stationary Equipment
  Purchase or lease, Replacement, Re-power, Retrofit or add-on of emission-reduction technology (i.e. Oil and Gas Compressors)
- Refueling Infrastructure (for qualifying fuel)
- On-Site Electrification and Idle Reduction Infrastructure
- On-Vehicle Electrification and Idle Reduction Infrastructure
- Use of Qualifying Fuel
- Demonstration of New Technology

The *Heavy-Duty Motor Vehicle Purchase or Lease Incentive Program* is a statewide program also administered by the TCEQ. Under this program, the TCEQ may reimburse a purchaser or lessee of a new on-road heavy-duty (over 10,000 lb) vehicle for incremental costs of purchasing or leasing the vehicle in lieu of a higher-emitting diesel-powered vehicle. The vehicle being purchased or leased must be EPA-certified to meet certain designated lower emissions standards for NOx. This program has yet to be implemented and available funds have been allocated to the Emissions Reduction Incentive Grants Program.

The *Light-Duty Motor Vehicle Purchase or Lease Incentive Program* is similar to the Heavy-Duty Program, and provides incentives statewide for the purchase or lease of light-duty (less than 10,000 lb) motor vehicles that are certified by the EPA to meet a lower emissions standard for NOx. The incentive program will be administered by the Texas Comptroller of Public Accounts but is currently unfunded.

According to the TERP guidance, an activity is not eligible if it is required by any state or federal law, rule, or regulation, memorandum of agreement, or other legally binding document. However, this restriction does not apply to an otherwise qualified activity regardless of the fact that the state implementation plan assumes that the changes in equipment, vehicles, or operations will occur, if on the date the grant is awarded the change is not required by any state, federal, law, rule, or regulation, memorandum of agreement, or other legally binding document. The program guidance outlines additional restrictions and describes other eligible activities.

The TERP program will require a review of each project funded. Contracts will contain provisions that allow the state to recapture grant money for the failure to achieve emission reductions. Furthermore, if the performing party fails to comply with the requirements of the contract, the TCEQ may require that all or a portion of the reimbursement funds be returned or repaid. The TCEQ will complete a contractor evaluation in accordance with the provision that will be outlined in the grant contract. This evaluation will be used to track the compliance and effectiveness of contractors and grant recipients in administering contacts with the TCEQ.

ESTIMATED EMISSION REDUCTIONS AND COSTS

Emission reductions from the TERP program depend upon two factors: the availability of appropriate heavy-duty fleets in a given area, and the voluntary participation of fleet owners and operators in the program.

Since we cannot know a priori what types of emission reduction projects will be funded in the Austin area, or at what level of participation, we assumed that projects and participation levels could be gleaned from looking at previously approved TERP applications in the DFW and HGA regions. ERG obtained the summary for Grants awarded from FY 02 through FY 03 to obtain emission reduction and cost-effectiveness estimates for TERP projects in these regions. Next, we excluded projects that were clearly not representative of the TERP projects expected in the Austin area. This included removing projects involving port/maritime activities, as well as funding for TxLED projects.[18]

Next ERG assumed that the in the first year (2004), funding would most likely go to "low-hanging fruit" projects – i.e., projects sponsored by large, centrally fueled and maintained public fleets such as Cap Metro. We assumed these projects would employ technologies like those already adopted by DART and Houston Metro, such as EGR retrofits. Projects funded in subsequent years were assumed to be similar to the remaining, privately submitted TERP applications from DFW and HGA.

Total emission reductions were estimated using a top-down approach. $91M should be available for heavy diesel retrofit and replacement projects in 2004 for the entire TERP region. In addition, according to TCEQ equipment population estimates, the Austin region is home to approximately 6.9% of the TERP area's heavy-duty on-road fleet, and 5.1% of the TERP area's construction equipment fleet. Assuming a relatively even split between on- and off-road projects, we used a 6% figure as a basis for allocating available funds to the Austin region (~$5.5M). Table 4-26 shows the expected distribution of emission reductions among the five counties within the A/RR MSA.

COUNTY	2007 NOx Uncontrolled [tpd]	2007 NOx Controlled [tpd]	**NOx Reduction [tpd]**	**Percent Reduction (%)**
Bastrop	2.03	1.93	0.10	5.1%
Caldwell	1.50	1.46	0.04	2.7%
Hays	4.29	4.10	0.19	4.4%
Travis	28.93	27.74	1.19	4.1%
Williamson	11.03	10.55	0.48	4.3%
Total	**47.78**	**45.78**	**2.00**	**4.2%**

Table 4-26. TERP NOx emission reduction

[18] Due to restrictions under the TxLED Alternative Compliance Program, TxLED will not be eligible for TERP funding in the Austin area, although it is eligible in all other TERP areas.

Next ERG calculated the average dollar per ton cost of previously funded, representative TERP projects for the first and subsequent years of the program. This came to $4,300 per ton of NOx for year one projects, and $8,600 per ton for subsequent year projects. Assuming the Austin area funds projects at the 6% level as described above, this translates to 3.5 tpd of NOx in year 1, and 1.75 tpd of NOx in years 2 and beyond. (Note that yearly emission reduction totals were divided by 365 to estimate daily totals. To the extent that activity is more heavily weighted toward weekdays, these figures would be even higher.)

To be conservative, a yearly estimate of 2.0 tpd of NOx was assumed for the 2007 modeling. *Note that this assumes that most projects would only have only a one year life, and the effects are not cumulative. While this is realistic for fuel-based projects, we expect significant cumulative benefit resulting from multi-year retrofit projects.*

REFERENCE

TCEQ, http://www.tnrcc.state.tx.us/oprd/sips/terp.html
ERG, Inc., *Technical Support Documentation: Emission control Strategy Evaluation for the Austin/San Marcos (A/SM) MSA EAC Clean Air Action Plan (CAAP)*, February 17th, 2004

4.2.13 Power Plant Reductions (A13)

SOURCE TYPE AFFECTED

Electrical generating utilities in the A/RR MSA and surrounding areas will be affected by this measure. Austin Energy and UT commitments cover all units within the five counties. Additionally, Austin Energy's and LCRA's Fayette Power Project (Sam Seymour) in Fayette County is covered. The Lost Pines 1 facility, operated by LCRA's subsidiary Gentex, will be governed by the existing TCEQ permit.

CONTROL STRATEGY

Reduce NOx emissions from power plants as follows:

Austin Energy - AE would accept a cap of 1,500 tons per year on total NOx emissions from all of its units combined (Decker, Holly and Sand Hill).

The cap would be in place at least through 2012. As AE brings new units on line, additional NOx emission reductions at existing units would be made in order to comply with the cap. AE will achieve this cap through a combination of NOx reduction technologies at their existing plants, retirement of older generating units, increased utilization of renewable energy and energy efficiency.

LCRA - LCRA is considering taking a cap on the emissions from all of its plants in the 5-county area. The final level of this cap is yet to be defined, but would be no greater than current emissions. LCRA would likely follow the precedent it set at the Lost Pines Power Park and offset NOx emissions from any new power plant it built in the five counties. A flexible permit that requires interim NOx emission caps by 2005 and a final NOx cap by 2012 covers the Fayette Power Project (co-owned with Austin Energy). Early performance data on controls installed at one unit show actual emissions are 20-30% below the interim cap. LCRA will consider lowering or accelerating the caps required by the flexible permit.

The University of Texas at Austin - UT will reduce the allowable annual NOx emissions from its grandfathered units by 75%. The historical potential NOx emission from these units is 1,388 tons per year. Under a Voluntary Emission Reduction Permit with the TCEQ the University will limit NOx emissions from grandfathered units to 341 tons per year. The University will meet these reduced emissions levels by limiting operating hours on certain equipment and by installing 10-year BACT controls on other equipment. A proposal to add controls to Boiler #7 by December 2004 and Boiler #3 by December 2005, depends on funding. However, they will be modified no later than March 1, 2007. Boilers #1 and 2 operating hours will be limited to 2,500 hours a year. Combustion turbine generator (CTG) #6 will limited to 3,000 hours of operation on a rolling 12-month basis. After March 1, 2007 CTG #6 will be limited to 1,500 hours of operation on a rolling 12-month basis. The University will continue to operate its permitted unit (Gas turbine/boiler #8) as usual; this unit has average NOx emissions of 394 tons per year.

IMPLEMENTATION:

These measures would best be implemented by agreed order for Austin Energy AE and LCRA or permit for UT. The expected implementation dates for LCRA- Sim Gideon is 12/31/05 and Fayette Power Plant is 12/31/06. It is expected that UT will to be done before 2005.

ESTIMATED EMISSION REDUCTION

The estimated emission reduction for this measure is 7.08 tpd of NOx (Table 4-27). A breakdown by county is provided in Table 4-28. The UT reductions cannot be counted for here because they were not accounted for in the September 1999 episode modeling. However, it is expected that 257 pounds per day of VOC will be reduced.

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	**Net NOx Reduction (tpd)**	**Percent Reduction (%)**
POINT SOURCES	EAC Point Source Reductions	Austin-Round Rock MSA (5 Counties)	32.11	25.03	7.08	22.0%

Table 4-27. Point Source NOx emission reduction

COUNTY	2007 NOx Uncontrolled [tpd]	2007 NOx Controlled [tpd]	**NOx Reduction [tpd]**	**Percent Reduction (%)**
Bastrop	7.65	4.71	2.94	38.5%
Caldwell	2.51	2.51	0.00	0.0%
Hays	10.90	10.90	0.00	0.0%
Travis	11.04	6.90	4.14	37.5%
Williamson	0.08	0.08	0.00	0.0%
Total	**32.19**	**25.10**	**7.08**	**22.0%**

Table 4-28. Point Source NOx emission reduction by County

ESTIMATED COST

The costs vary as to the facility and the control changes implemented to achieve the reductions.

REFERENCES

Ramon Alvarez, PhD., Environmental Defense

4.3 TRANSPORTATION EMISSION REDUCTION MEASURES (TERMS)

SOURCE TYPE AFFECTED

Participants in the TERMs program are local jurisdictions and implementing agencies in the MSA and CAMPO.

CONTROL STRATEGY

TERMs are transportation projects designed to reduce vehicle use, improve traffic flow or reduce congested conditions. A transportation project that proposes to add a single-occupancy vehicle (SOV) roadway capacity is not considered a TERM. General categories of TERMs include traffic signal synchronization and/or improvements, bicycle and pedestrian facilities, high-occupancy vehicle lanes, intersection and traffic flow improvements, park and ride lots, intelligent transportation system (ITS) and transit projects.

TERMs are similar to transportation control measures (TCMs), except that TCMs apply to nonattainment areas. TCMs are included in the SIP and subject to transportation conformity requirements. The A/RR MSA O_3 Flex and EAC CAAP TERMs are not subject to nonattainment SIP or transportation conformity requirements. TERMs help reduce roadway congestion and provide opportunities for alternatives to single occupant vehicle travel. They encourage people to travel (and exercise) by biking and walking.

IMPLEMENTATION

Various jurisdictions and implementing agencies committed to numerous TERMs in the MSA's O_3 Flex Agreement. Additional TERM commitments have been made for the

EAC CAAP. A total of 467 TERM projects have been, or will be, implemented. The listed O_3 Flex and EAC CAAP TERMs have various implementation dates, but all will reduce emissions in 2007 and some will reduce emissions beyond 2007 as well. Some jurisdictions committed to additional TERMs to be implemented after 2007. These will contribute to continued attainment past 2007. A project-specific list of O_3 Flex, EAC CAAP and continued attainment TERMs is found in the Appendices to Chapter 5 of the CAAP. The list provides locations, project limits, implementation dates, and emission reductions for all TERMs. A summary of the O_3 Flex and EAC CAAP TERMs, and the expected emission reductions, is presented in Table 4-29.

TERMs by Project Type	2007 VOC Reductions (lbs/day)	2007 NOx Reductions (lbs/day)
Intersection Improvements	448.82	374.95
Signal Improvements	797.30	705.14
Bicycle/Pedestrian Facilities	69.88	62.54
Grade Separations	5.94	5.28
Park and Ride Lots	98.26	87.99
Traffic Flow Improvements	159.43	145.98
ITS	41.32	41.32
Transit	35.10	14.51
Total (lbs/day)	**1656.05**	**1437.71**
Total (tons/day)	**0.83**	**0.72**

Table 4-29. TERM Projects

ESTIMATED EMISSION REDUCTION

The expected 2007 emission reductions are 0.83 tons per day VOC and 0.72 tons per day NOx. (Table 4-30 and 4-31)

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	**Net VOC Reduction (tpd)**	**Percent Reduction (%)**
ONROAD MOBILE: All OnRoad Mobile Sources	TERMS	Austin-Round Rock MSA (5 Counties)	33.79	33.79	0.83	2.5%

Table 4-30. TERM VOC reduction

Emissions Category	Control Strategy	Area Affected by this rule	2007 Uncontrolled NOx Emissions (tpd)	2007 Controlled NOx Emissions (tpd)	**Net NOx Reduction (tpd)**	**Percent Reduction (%)**
ONROAD MOBILE: All OnRoad Mobile Sources	TERMS	Austin-Round Rock MSA (5 Counties)	62.18	61.46	0.72	1.2%

Table 4-31. TERM NOx reduction

ESTIMATED COST
There are no cost estimates for the TERM.

4.4 TABLE B EMISSION REDUCTION MEASURES

The Early Action Compact Task Force recommends further consideration of the following voluntary measures, with the understanding that they may or may not be quantifiable commitments despite their expected emission reductions. Some of the measures listed below are currently being implemented in some areas in the A/RR MSA and could be expanded for further reductions.

The following is a key to the regional actions EAC signatories have committed to regarding inclusion of the voluntary emission reduction measures.

O = O_3 Flex commitment
E = EAC commitment
E+ = increased EAC commitment from original O_3 Flex commitment
O, E = jurisdiction confirmed O_3 Flex commitment when selecting Table A measures

Emission Reduction Measure	City of Austin	Travis County	City of Round Rock	Williamson County	City of San Marcos	Hays County	City of Bastrop	City of Elgin	Bastrop County	City of Lockhart	City of Luling	Caldwell County
Texas Emission Reduction Program (TERP)	E	E		E		E						
Texas Low Emission Diesel (TxLED) for Fleets	E	E		E								
Transportation Emission Reduction Measures (TERMs)	O, E+	O, E+	O, E+	O, E+	O, E+		E	E				
Access Management							E	E		E		
Alternative Commute Infrastructure Requirements	E						E	E				
Drive-Through Facilities on Ozone Action Days	E									E		
Expedited permitting for mixed use, transit oriented or in-fill development							E	E				
Airport Clean Air Plan, includes:	O											
• Use of electric or alternative fuels for airport GSE	O, E											
• ABIA Airside Incentives for GSE use reduction	O, E											
• Integrate alternative fuels into City's aviation fleet	O, E											
• Operate alternative fueled ABIA surface parking lot shuttle buses	O, E											
• Use existing ABIA alternative fuel infrastructure for off-site parking shuttle buses	O, E											

Emission Reduction Measure	**City of Austin**	**Travis County**	**City of Round Rock**	**Williamson County**	**City of San Marcos**	**Hays County**	**City of Bastrop**	**City of Elgin**	**Bastrop County**	**City of Lockhart**	**City of Luling**	**Caldwell County**
Low VOC Striping Material	O, E	O	O	O		O	E	E		O, E		
Landfill Controls												
Open Burning Restrictions			E				E	E				
Tree Planting	O, E	O	O	O, E+	O	E	E	E		O, E		
Extend energy efficiency requirements beyond SB5 and SB7	E											
Shift the electric load profile	E											
Environmental dispatch of power plants	E											
Clean Fuel Incentives												
Low Emission Vehicles	O, E	O	O	O						O, E		O
Adopt-a-School-Bus Program										E		
Police Department Ticketing										E		
EPA Smart Way Transport Program												
Business Evaluation of Fleet Useage, Including Operations and Right Sizing	E	E		E								
Parking Incentives for Alt Fuel or SULEV vehicles												
Commute Solutions Programs, may include	O, E									E		
• Compressed Work Week	O, E	O	O						O		O	
• Flexible Work Schedule	O, E	O	O									
• Carpool or Alternative Transportation Incentives	O, E											
• Transit Pass Subsidized by Employer	O, E											

Emission Reduction Measure	**City of Austin**	**Travis County**	**City of Round Rock**	**Williamson County**	**City of San Marcos**	**Hays County**	**City of Bastrop**	**City of Elgin**	**Bastrop County**	**City of Lockhart**	**City of Luling**	**Caldwell County**
• Teleworking (full time)	O, E											
• Teleworking (part time)	O, E		O									
Direct Deposit	O, E	O	O	O	O	O, E+	E		O	E		O
e-Government and/or Available Locations	O, E	O	E	O, E+	O							
Voluntary use of APUs for locomotives operating in Central Texas												
Fueling of Vehicles in the Evening	O, E	O	O	O		O, E+			O	O, E	O	O
Urban Heat Island/Cool Cities Program	E											
Resource Conservation	O, E+	O	O	O	O	O, E+					O	
Increase investments by Central Texas electric utility providers in energy demand management programs	E											
Alter production processes and fuel choices												
Contract provisions addressing construction related emissions on high ozone days	E											
Ensure emission reductions in SEPs, BEPs and similar agreements							E	E		E		
Ozone Action Day Education Program, includes:	O, E	O	O	O	O	O, E+	O, E	O, E	O	O, E	O	O
• Employee Education Program	O	O	O	O	O	O	O	O	O	O	O	O
• Public Education Program	O	O	O	O	O	O	O	O	O	O	O	O
Ozone Action Day Notification Program	O	O	O	O	O	O	O	O	O	O	O	O
Ozone Action Day Response Program	O, E	E	O	E		E						O
Alternative Fuel Vehicles	O	O	O									

Emission Reduction Measure	City of Austin	Travis County	City of Round Rock	Williamson County	City of San Marcos	Hays County	City of Bastrop	City of Elgin	Bastrop County	City of Lockhart	City of Luling	Caldwell County
Right Sizing	O	O	O									
5-minute Limit on Diesel Idling	O		O	O						O	O	O
Cleaner Diesel	O	O	O	O		O	O	O	O			
Vehicle Maintenance	O	O	O	O	O	O			O			O
Vapor Recovery on Pumps			O									O
Low VOC Asphalt		O	O	O								
Low-Emission Gas Cans	O		O	O		O	O	O		O	O	
Transit-Oriented Development	O											
Shaded Parking	O	O										
Landscaping voluntary start at noon on high ozone days (education program)										E		

4.4.1 Texas Emission Reduction Program (TERP)

CONTROL STRATEGY

Secure all available TERP incentives/grants for equipment and fuels in the five county area. Available incentives/grants cover the incremental cost of cleaner diesel on-road and off-road engines and equipment, cleaner fuel needed for the equipment and clean fuel infrastructure. This control strategy is covered in detail in section 4.2.13.

4.4.2 Texas Low Emission Diesel (TxLED) for Fleets

CONTROL STRATEGY

Purchase and use Texas Low Emission Diesel in on-road and non-road vehicles and equipment.

4.4.3 Transportation Emission Reduction Measures (TERMs)

CONTROL STRATEGY

Implement transportation projects and programs that reduce emissions. Projects and programs include improved transit options and level of service, intersection improvements, grade separations, signal synchronizations and/or improvements, peak and/or off-peak traffic flow improvements, park and ride facilities, bike/ped facilities, high occupancy vehicle lanes, rail, demand management, intelligent transportation systems etc. Many TERMS are already planned and funded. CAMPO has issued a call for projects that may provide funding for additional TERMS.

4.4.4 Access Management

CONTROL STRATEGY

Adopt access management regulations or guidelines for new or re-development. TxDOT has proposed guidance available. Access management includes managing roadway access by limiting the number and location of allowable curb cuts and driveways, consolidating access to multiple business through one main driveway, side road etc. Access management reduces congestion, vehicle delay and associated emissions.

4.4.5 Alternative Commute Infrastructure Requirements

CONTROL STRATEGY

Require all new non-residential developments of 25,000 sq. ft or more and developments that increase their square footage 25% or more and have/expect 100+ employees on the site to include bicycle commuting facilities (parking/racks and showers) and preferential carpool/vanpool parking spaces.

4.4.6 Drive-Through Facilities on Ozone Action Days

CONTROL STRATEGY

Require or encourage businesses with drive-through facilities to post signs on Ozone Action Days asking customers to park and come inside instead of using the drive-through facilities. Encourage the public to comply.

4.4.7 Expedited permitting for mixed use, transit oriented or in-fill development.

CONTROL STRATEGY

Provide an expedited permitting process and/or other incentives for mixed use, transit oriented or in-fill development. Developments would have to meet certain performance criteria in order to qualify for expedited permitting.

4.4.8 Use of electric or alternative fuels for airport GSE

CONTROL STRATEGY

This category includes new and in-use ground support equipment (GSE) used in airport operations. GSE perform a variety of functions, including: starting aircraft, aircraft maintenance, aircraft fueling, transporting cargo to and from aircraft, loading cargo, transporting passengers to and from aircraft, baggage handling, lavatory service, and food service. The Air Transportation industry has informed Central Texas that they will oppose any requirements on their industry.

4.4.9 ABIA Airside incentives for GSE use reduction

CONTROL STRATEGY

ABIA has begun and will complete the addition of building supplied power and preconditioned air for all aircraft parked at the gate. This will eliminate the need to run on-board auxiliary power units (APUs), and air-conditioning (ACUs) and ground power units (GPUs) by the air carriers if they will participate. It is not clear if we can mandate their use, or if it will need to be on a voluntary basis. Implementation might require creating incentives or use restrictions. Estimated 0.16 tpd NOx reduction.

4.4.10 Integrate alternative fuels into City's aviation fleet

CONTROL STRATEGY

Begin replacement of Aviation Fleet equipment with propane fuel starting FY2003. Purchase of 10 propane pro-turf mowers, and 4 propane non-road truck-alls. Planned purchases at this time. Future replacement is subject to budget provisions.

4.4.11 Operate alternative fueled surface parking lot shuttle buses

CONTROL STRATEGY

ABIA currently operates 29 propane buses for passenger service between the terminal and the parking lots. Averages 25,000 gallons of propane per month. Estimated 60% NOx reduction. Take credit for current operations.

4.4.12 Use existing ABIA alternative fuel infrastructure for off-site parking shuttle buses

CONTROL STRATEGY

Propane fueling infrastructure is available at ABIA that could be used to refuel off-site parking shuttle buses. Encourage or mandate these services to shift to propane by 2005. Estimated 60% NOx reduction.

4.4.13 Low VOC Striping Material

CONTROL STRATEGY

Require use of reformulated striping material products (i.e., water-based paints or thermoplastic) to achieve VOC reductions. Traffic marking activities refer to the striping of center lines, edges, and directional markings on roads and parking lots. VOC emissions from traffic marking vary depending on the marking material used, and the frequency of application. Generally, there are six different types of traffic marking materials (EIIP, 1997a): 1) solvent-based paint; 2) water-based paint; 3) thermoplastics; 4) field-reacted systems; 5) preformed tapes; and 6) permanent markers. Solvent-based paints typically are the least expensive among the material types, but produces the highest VOC emissions. Alternative techniques may have none or negligible VOC emissions, but the materials and equipment are typically more expensive. However, cheaper techniques may also require multiple applications in comparison to more costly techniques. Traffic markings using conventional paints (solvent- and water-based) will need to be applied annually, while the use of thermoplastics can last between 5 and 9 years (Utah DOT, 2003).

4.4.14 Landfill Controls

CONTROL STRATEGY Adopt control strategy for municipal solid waste landfills based upon the EPA's New Source Performance Standard (NSPS) and Guidelines. A municipal solid waste landfill is a disposal facility in a contiguous geographical space where household waste is placed and periodically covered with inert material. Landfill gases are produced from the aerobic and anaerobic decomposition and chemical reactions of the refuse in the landfill. Landfill gases consist primarily of methane and carbon dioxide, with volatile organic compounds making up less than one percent of the total emissions. Although the percentage for VOC emissions seems small, the total volume of gases is large.

4.4.15 Open Burning Restrictions

CONTROL STRATEGY Amend and/or adopt regulations to ban the open burning of such items as trees, shrubs, and brush from land clearing, trimmings from landscaping, and household or business trash, during the peak ozone season. It reduces VOCs and NOx.

4.4.16 Tree Planting

CONTROL STRATEGY

Implement landscaping ordinances to require additional urban tree planting. Reforestation improves air quality and energy efficiency.

4.4.17 Extend energy efficiency requirements beyond SB5 and SB7.

CONTROL STRATEGY

Require additional energy efficiency measures beyond SB5 and SB7, such as building design, revisions to codes and standards, and energy management programs for large commercial facilities. Additional energy efficiency measures could provide significant reductions in energy demand and demand-related emissions.

4.4.18 Shift the electric load profile

CONTROL STRATEGY

Require commercial facilities to develop overnight the reservoir of cold water needed to meet air conditioning needs the following day. Total energy consumption and emissions are not reduced, but the emissions are not generated during the day, reducing the potential for ozone formation.

4.4.19 Environmental dispatch of power plants

CONTROL STRATEGY

To meet peak demands, this strategy would involve "ramping up" power generation facilities that are either cleaner than normally used or located away from high NOx-producing areas (e.g., plants in Bastrop and Marble Falls rather than the Decker or Holly Street plants in downtown Austin).

4.4.20 Clean Fuel Incentives

CONTROL STRATEGY

Encourage and/or provide incentives to implement fuels that are cleaner than conventional gasoline and diesel, including alternative fuels, lower sulfur gasoline and low sulfur diesel.

4.4.21 Low Emission Vehicles

CONTROL STRATEGY

Encourage and/or provide incentives for the purchase and use of Tier 2 Bin 3 or cleaner vehicles for fleets and private use.

4.4.22 Adopt-a-School-Bus Program

CONTROL STRATEGY

Encourage local school districts to participate in this CLEAN AIR Force sponsored program to replace or retrofit old diesel school buses with new, cleaner buses. Replacements and retrofits are implemented using 50% corporate sponsorship funds and 50% school district funds. EPA provides seed money to the CLEAN AIR Force for a fundraiser and program administration.

4.4.23 Police Department Ticketing

CONTROL STRATEGY

Implement aggressive police enforcement by local agencies of speed limits 55 mph or more and smoking vehicle restrictions. If the smoking vehicle is fixed within 60 days, the ticket could be waived.

4.4.24 EPA Smart Way Transport Program

CONTROL STRATEGY

EPA sponsored voluntary partnership with freight carriers and shippers to reduce fuel consumption and emissions through strategies such as idle reduction, improved aerodynamics, improved logistics management, automatic tire inflation systems, wide-base tires, driver training, low-viscosity lubricants, reduced highway speed and lightweight vehicle components. Participating carriers and shippers will meet voluntary performance goals and track progress. EPA will provide a calculation and tracking software tool and technical support. Several carriers and shippers have already signed up.

4.4.25 Business Evaluation of Fleet Usage, Including Operations and Right Sizing

CONTROL STRATEGY

Evaluate and improve the efficiency of fleet usage, including using alternative or clean fueled vehicles, using the cleanest vehicle appropriate for the job, consolidating and coordinating trips, etc.

4.4.26 Parking Incentives for Alt Fuel or Low Emission vehicles

CONTROL STRATEGY

Provide parking incentives for Tier2 Bin 3 or cleaner vehicles. These clean vehicles could be allowed to park for free at parking meters, have designated parking spaces. This would encourage the use of these cleaner vehicles.

4.4.27 Commute Solutions Programs

CONTROL STRATEGY

Encourage and provide tools to implement Commute VMT reduction programs (e.g. Teleworking, compressed work week, carpooling/vanpooling, bus fares, subsidized transit pass, flextime, carpool or alternative transportation incentives etc.). The Commute Solutions program provides information and tools to implement these programs. Could be used to support a commute emission reduction regulation.

4.4.28 Direct Deposit

CONTROL STRATEGY

Offer employees direct deposit potentially saving at least one vehicle errand per pay period.

4.4.29 e-Government and/or Available Locations

CONTROL STRATEGY

Provide web-based services, both for information and transactions, and/or multiple locations for payments, etc., Reduces VMT and associated emissions.

4.4.30 Voluntary use of APUs for locomotives operating in Central Texas

CONTROL STRATEGY

Controls for locomotives are pre-empted by Federal law, but voluntary controls might have some success, since using Auxiliary Power Units (APUs) also decreases fuel costs to the railroad companies. CSX has been considering the use of APUs to reduce fuel use.

4.4.31 Fueling of Vehicles in Evening

CONTROL STRATEGY

Promote fueling vehicles after peak hot periods of the day have passed during ozone season.

This does not reduce NOx emissions but moves the high emissions time frame to later hours.

4.4.32 Urban Heat Island/Cool Cities Program

CONTROL STRATEGY

Develop and implement Urban Heat Island (UHI) mitigation strategies. Since ozone forms at higher temperatures, the purpose of this strategy is to keep the city as cool as possible, through vegetation, cool roofing and light colored pavement.

4.4.33 Resource Conservation

CONTROL STRATEGY

Expand and quantify ongoing resource conservation programs (materials recycling, water and energy conservation, etc.).

4.4.34 Increase investments by Central Texas electric utility providers in energy demand management programs

CONTROL STRATEGY

This measure would involve the development of energy demand management programs in areas outside the Austin Energy service area. Austin Energy offers financial incentives to commercial and residential customers for installation of energy efficient appliances and technologies and they report a good correlation between their demand programs and reduced emissions at their power plants. This measure would encourage other utility providers in the region to develop similar programs.

4.4.35 Alter production processes and fuel choices

CONTROL STRATEGY

This strategy involves exploring opportunities to improve efficiency, to make changes in certain combustion processes, and/or to alter fuel choices where cost-effective. Some point sources in the area (e.g., Austin White Lime) are using natural gas for cost reasons. Given their production processes, using natural gas results in higher NOx emissions than using coal. Representatives have expressed interest in examining their production process and/or revisiting their fuel choices, particularly during the ozone season. Other point sources such as LeHigh Cement are also looking at rescheduling and fuel changes to reduce NOx.

4.4.36 Contract provisions addressing construction related emissions on high ozone days

CONTROL STRATEGY

Public contracts may include provisions to limit construction activities and equipment operation on high ozone days. A specified number of these high ozone days would be built into the contract. While controversial, it is one of the only ways to target non-road construction emissions.

4.4.37 Ensure emission reduction in SEPs, BEPS and similar agreements

CONTROL STRATEGY

Ensure that the primary impact of all air quality related SEPs, BEPs or similar agreements applicable to the EAC area, is to reduce emissions and improve air quality. EPA and/or TCEQ would consult, to the extent possible, with the local EAC signatories when developing any air quality related environmental mitigation agreement, such as a SEP, BEP or other similar agreement.

4.4.38 Ozone Action Day Education Program

CONTROL STRATEGY

Implement a public ozone education program, including ozone action days and recommended actions.

4.4.39 Ozone Action Day Notification Program

CONTROL STRATEGY

Entities will notify employees of ozone action days the day before and encourage employees to reduce emissions.

4.4.40 Ozone Action Day Response Program

CONTROL STRATEGY

Implement a program of specific emission reduction measures taken on ozone action days.

4.4.41 Alternative Fuel Vehicles

CONTROL STRATEGY

A/SM MSA participants to the O3 Flex Agreement are committed to encouraging the expanded use of alternative fuels and alternative fuel vehicles among the owners and/or operators of fleets of 15 vehicles or more. To qualify as an alternative fuel vehicle, the vehicle must operate 75% of the time on one of the federal Energy Policy Act fuels. Approved alternative fuels are compressed natural gas (CNG), liquefied natural gas (LNG), liquefied petroleum gas (LPG), electricity, methanol, ethanol, and biodiesel (at a minimum 20% mix). Alternative fuels reduce NOx and VOCs at varying levels and are an appropriate strategy for reducing or even eliminating emissions. Credits are available under the federal Energy Policy Act (EPAct) for use of alternative fuels. Bastrop Independent School District has chosen to use biodiesel at a 20% mix with an additive to reduce NOx as their future fuel of choice. The school district runs a fleet of 92 buses.

4.4.42 Right Sizing

CONTROL STRATEGY

In addition to alternative fuels and alternative fuel vehicles, signatories and participants have incorporated selection of the right size vehicle for a given use into their fleet operation policies.

4.4.43 5-minute Limit on Diesel Idling

CONTROL STRATEGY

Participating entities will direct vehicle operators under their employ, or on their property or worksite, to limit vehicle or equipment engine idling to no more than five consecutive minutes. Exemptions may be made for emergency or law enforcement vehicles on active duty, vehicles or equipment that must operate the engine to perform job duties (such as providing power for a mechanical operation or heating and air conditioning for multiple passenger vehicles), and vehicles or equipment that are being operated for maintenance or diagnostic purposes.

4.4.44 Cleaner Diesel

CONTROL STRATEGY

Capital Metro, the cities of Austin, Bastrop and Elgin, Travis County and the Austin Independent School District have agreed to purchase a diesel product that is believed to reduce particulate matter and increase overall efficiency. Use of this fuel increases engine performance, with corresponding air quality benefits through fuel efficiency. While reductions of NOx emissions from this product are not quantifiable at this time, the commitment to this fuel represents a good-faith effort on the part of these entities to purchase the best currently available diesel fuels.

4.4.45 Vehicle Maintenance

CONTROL STRATEGY

In addition to alternative fuels and alternative fuel vehicles, signatories and participants have incorporated regular maintenance in a manner that will minimize emissions, into their fleet operation policies.

4.4.46 Vapor Recovery on Pumps

CONTROL STRATEGY

In addition to alternative fuels and alternative fuel vehicles, signatories and participants have incorporated upgrading private pumps with vapor recovery systems, into their fleet operation policies.

4.4.47 Low VOC Asphalt

CONTROL STRATEGY

VOC emissions reductions can be achieved by using medium-cure and/or rapid-set asphaltic concrete materials and water-based or thermoplastic striping. Examples of the medium and rapid-cure asphalt are HFRS-2P (rapid-set) and SSI (medium-cure). Participating entities that are responsible for building and/or maintaining roadways in the region will commit to use these types of materials whenever feasible. Exceptions may be granted for emergency repairs.

4.4.48 Low Emission Gas Cans

CONTROL STRATEGY

Gasoline-powered lawn and garden equipment are a significant source of VOCs in the region. A particularly effective control measure is the use of nonpermeable, spill-proof gasoline containers. An estimated 0.2 tons per day of VOC reductions could result from 100% use in the commercial sector. Several of the A/SM MSA signatories have selected this measure to include in their commitments.

4.4.49 Transit-Oriented Development

CONTROL STRATEGY

Local governments implement development criteria either requiring or providing incentives for sprawl reduction such as vertical zoning, mixed use zoning, enhanced mobility choices, reducing distances between home sites, work sites, and service sites. These types of development criteria will reduce the impacts of new development on air quality.

4.4.50 Shaded Parking

CONTROL STRATEGY

In addition to alternative fuels and alternative fuel vehicles, signatories and participants have incorporated shaded parking for fleet vehicles, to the extent possible, into their fleet operation policies.

4.4.51 Landscaping voluntary start at noon on high ozone days (education program)

CONTROL STRATEGY

Outreach to local stakeholders will include education and encourage voluntary implementation of delaying landscape work until noon on high ozone days.

Austin-Round Rock MSA
Attainment Maintenance Analysis

Early Action Compact Milestone
Technical Report

Prepared by
The Capital Area Planning Council (CAPCO)
On behalf of
The Austin-Round Rock MSA Clean Air Coalition
Austin, Texas, March 2004

TABLE OF CONTENTS

1 Introduction 1

2 Federal and State Rules 2

3 Local Measures 4

4 Photochemical Modeling and Design Value Analysis 6

4.1 Photochemical Modeling 6

4.2 Trends in Ozone Monitoring Data in Austin 9

5 Emissions Trends from 2007 to 2012 12

5.1 Area Sources 13

5.2 Non-Road Mobile Sources 16

5.3 On-Road Mobile Sources 18

5.4 Point Sources 27

6 The Continuing Planning Process 32

1 Introduction

Section II, E of the Austin-Round Rock MSA Early Action Compact entitled "Maintenance for Growth" lists three options for the area to demonstrate that attainment of the ozone standard will be maintained through 2012. Due to the insufficient time for the development of a 2012 modeling emissions inventory, option c was selected for the analysis. The objective of this document, in accordance with option c, is to identify and quantify federal, state, and/or local measures indicating sufficient reductions to offset growth estimates. Staff has evaluated the anticipated future growth of the region to ensure that the area will remain in attainment of the 8-hour standard for the time period 2007 through 2012 and 2015, as appropriate. This evaluation included analysis of population growth and its effect on on-road mobile emissions and area sources, and new and planned new point sources. Details that support this summary may be found in the referenced appendices.

Descriptions of Federal, State and Local reduction measures are presented in the *Austin/Round Rock Emissions Reduction Strategies* document (March 2004). Local reduction measures are described in detail by the source type affected, the control strategy, implementation plan, estimated emission reduction, and estimated cost.

2 Federal and State Rules

2.1 Introduction

Control strategy projections are estimates of future year emissions that also include the expected impact of modified or additional control regulations. We determined future scheduled regulations, whether at the federal, state, or local level, and applied them to sources in our area. Fuel switching, fuel efficiency improvements, improvements in performance due to economic influences, or any occurrence that alters the emission producing process may also affect future year emissions. These should all be reflected in the projections through the future year control factor, emission factor, or in some cases, by adjusting the activity growth forecast. Control factors and emission factors vary by source category and are continuously being revised and improved based on field and laboratory measurements. In many cases, it will also be necessary to account for multiple programs, which affect the same source category. Therefore, expected controls are calculated for each action and applied appropriately on the stated dates. Other programs are complex and determining appropriate control factors or adjustments to activity forecasts for specific source categories is not straightforward. For example, initiatives to reduce energy use, such as the EPA Green Lights program, are aimed at reducing electricity demand. This, in turn, is tied to reductions in emissions from individual utility boilers. Emission caps or allowance programs set overall constraints on future emission levels, but this must also be translated into reductions at individual units in most cases. For trading programs, a simplified approach may be to constrain emissions at individual units to the level used to calculate the emission budget. More complex approaches would examine how individual units will respond – by controlling emissions or purchasing credits.

2.2 Federal and State Rules

In 1999, the Texas Legislature passed two laws governing emissions for point sources in Texas. The 2007 and 2012 emission inventories account for Senate Bill 7, which limits NOx emissions from grand-fathered electric generating utilities (EGU) in central and eastern Texas and Senate Bill 766, which increases emissions fees on grand-fathered non-electric generating facilities. Tables 4.1-1 and -2 summarize state and federal rules effective through the 2007 – 2012 planning period for the Austin-Round Rock MSA.

The CAAP projects emission reductions from the following federal and state initiatives.

Table 0-1 EPA-ISSUED RULES Estimated NOx			
	Category	Reductions in 2007 (tpd)	
Area Source measures:		VOC	NOx
	Architectural and Industrial Maintenance Coatings	1.44	n/a
	Auto Body Refinishing	0.52	n/a
On-Road measures:			
	Tier 2 Vehicle Emission Standards	5.71	16.79
	National Low Emission Vehicle Program	1.70	3.01
	Heavy-Duty Diesel Engine Rule	0.34	11.78
Non-Road measures:			
	Small Spark-Ignition Handheld Engines Emissions from Compression-Ignition Engines Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines Recreational Marine Standards	9.27	3.48
	Locomotives	n/a	2.28
Point Source Measures:			
	ALCOA Consent Decree	n/a	54

Table 2.1-1. Federal emission reduction rules

Sec.	Category	Reductions in 2007 (tpd)	
	Area Source:	VOC	NOx
3.1	Degreasing Units	1.96	n/a
3.2	HB 2914 Grand fathered Pipelines	TBD	TBD
	On-road Source:		
3.3	Stage 1 Vapor Recovery	3.72	n/a
	Non-road Source:		
3.4	Low Emission Diesel	TBD	TBD
	Point Source:		
3.5	SB 7 EGU NOx Reductions	n/a	10.09
3.6	SB 766 Voluntary Emissions Reduction Permit	TBD	TBD
3.7	HB 2912 Grandfathered Requirements	TBD	TBD
3.8	Cement Kiln NOx Limits	n/a	2.16

Table 2.1-2. Summary of TCEQ-Issued Rules for Reduction Strategies

3 Local Measures

Various emission reduction techniques can effectively reduce ozone precursors. Emission reduction methods employed nationally (e.g., automotive emission reductions), statewide and regionally (emission reductions from EGUs) benefit the Austin area, but more reductions are needed to ensure clean air for the region. The EAC provides the mechanism for implementation of local emission reduction techniques to show attainment of the standard. Table 3.1 presents list of the local emission reduction measures.

Emission Reduction Measures (State Regulations)		NOx Reductions (tpd)	VOC Reductions (tpd)
A1	Inspection and Maintenance (I&M)	3.19	4.19
A2	Idling Restrictions on Heavy Diesel	0.19	0.00
A3	Commute Emission Reduction Program	0.27	0.30
A4	Stage I Vapor Recovery Requirement Change	0.00	4.88
A5	Low Emission Gas Cans	0.00	1.97
A6	Degreasing Controls	0.00	6.38
A7	Autobody Refinishing Controls	0.00	0.05
A8	Cutback Asphalt	0.00	1.03
A9	Low Reid Vapor Pressure Gas	0.00	2.87
A10	BACT and Offsets for New or Modified Point Sources	TBD	TBD
A11	Petroleum Dry Cleaning	0.00	1.06
A12	Texas Emission Reduction Program (TERP)	2.00	0.00
A13	Power Plant Reductions	7.08	0.00
	Total (Does not include TBD)	**12.73**	**23.64**

Table 3.1 List of local emissions reduction strategies. Reductions in 2007. Note: The I&M program assumes participation from Hays County. Without Hays Co participation reductions are 2.89tpd and 3.84tpd of NOx and VOC respectively.

The emissions share of the local reduction measures is presented in figures 3.1 and 3.2. Detailed description of each local reduction measure is presented in the *Austin/Round Rock Emissions Reduction Strategies* document (March 2004). In this report the selected measures are described by the source type affected, the control strategy, implementation plan, estimated emission reduction, and estimated cost.

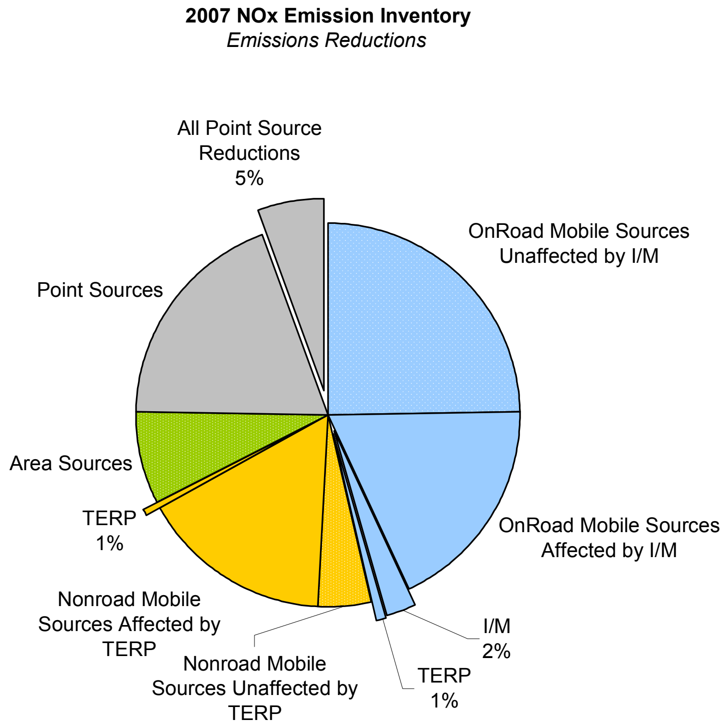


Figure 3.1 Share of the local emission reduction measures to the 2007 NOx Emissions Inventory

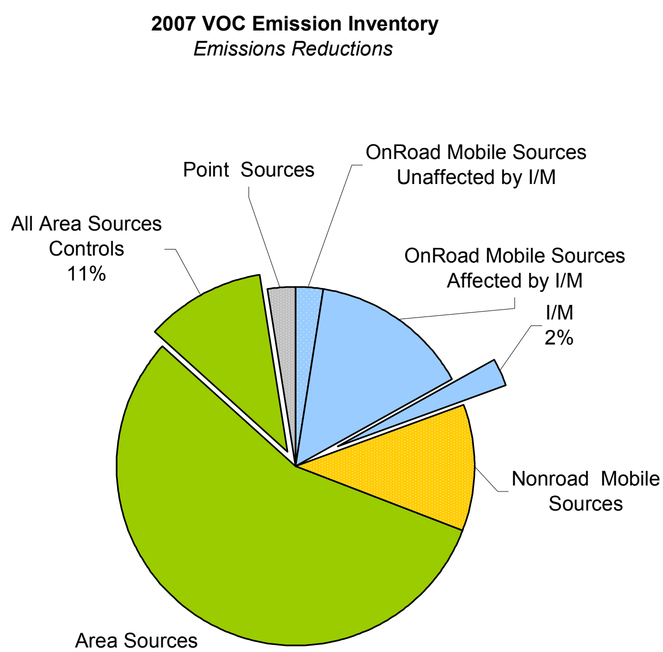


Figure 3.2 Share of the local emission reduction measures to the 2007 VOC Emissions Inventory

4 Photochemical Modeling and Design Value Analysis

This chapter discusses impacts of the federal and local measures on 2007 ozone levels.

Projected 2007 emission inventories were developed for the modeling domain and used with the identical meteorological data and CAMx configuration developed for the Base Case to model the Future Case. Relative reduction factors and future 8-hour ozone design values at Austin's CAMs sites were calculated in accordance with the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999) and the U.S. EPA's *Protocol for Early Action Compacts* (2003). The results indicate that regardless of whether current 8-hour ozone design values are calculated based on the years straddling the latest emission inventory for the area (1998-2000) or the time period of the attainment designation (2001-2003), the attainment test is passed at both Austin monitors during this modeling episode.

4.1 Photochemical Modeling

Figure 4.1-1 presents design values for Austin-Round Rock MSA and emissions trends. Note that EPA regulatory monitoring sites were installed after 1996.
The design values for the years that straddle 1999 were used as the "current" year to estimate the design value for 2007. These design values were the highest measured in the Austin area at both monitors. More recent monitoring provides lower design values and the latest design values for the years straddling 2002 do not exceed the standard. Since the worst-case design values were used in this CAAP, it is important to put these values into perspective.
Analysis of the various metrics related to the meteorological conditions indicates that the conditions favorable to formation of high ozone occurred more often than normal during 1999 and less often than normal in 2001. The selection of the "current" year is based on the date of the most recent emissions inventory. If an emissions inventory were prepared for 2002, then the current year would be 2002, which has a maximum design value of 84

ppb. Note that the 2007 design value is affected by federal and state rules that will reduce regional and local emission in 2007. The effects of local emission reduction measures selected in the EAC CAAP were modeled separately.

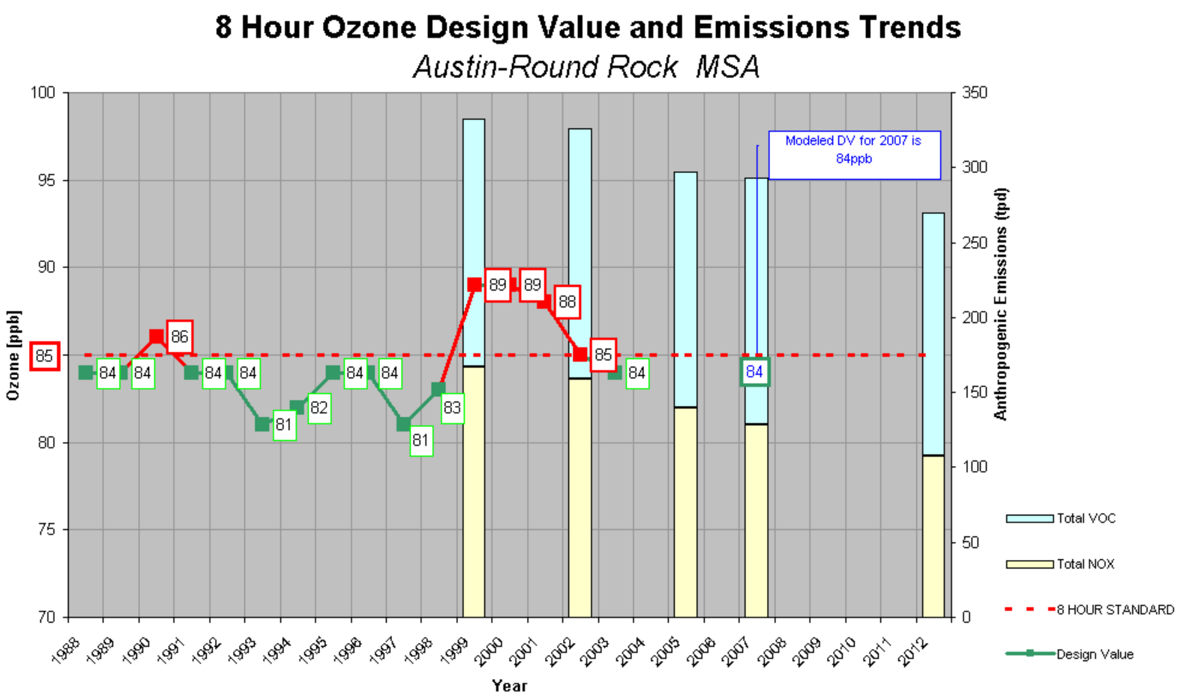


Figure 4.1-1 Austin-Round Rock MSA design value and emissions trends

Future Case modeling used projected 2007 emission inventories with the meteorological data and CAMx configuration developed for the successful Base Case. Inputs followed EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999) and their *Protocol for Early Action Compacts* (2003). Photochemical modeling is an iterative process. The emissions inventories used in the model are often refined to better predict emissions. The modeling for the future case has been performed with five versions of the 2007 emissions inventory, each with minor modifications or improvements. This modeling provides results that are close to the standard of 85 ppb, but in three cases the design value has been slightly below the standard (84.8 ppb, 84.5 ppb, 84.91 ppb, 84.55 ppb and 84.37 ppb) and in two cases the design value has been slightly above the standard (85.6 ppb and 85.08 ppb). It is likely that the 2007 emissions inventory for the Houston/Galveston area will be modified by TCEQ in the near future, which may affect future case model values. Results of future case modeling are too close to the standard to provide meaningful conclusions about the area's likelihood of demonstrating attainment by 2007 without local emission reduction measures.

Monitor site	1999 design value	Relative reduction factor	Estimated design value for 2007 *	Attainment of the 8-hour standard?
Audubon	89 ppb	0.948	84.37	Yes
Murchison	87 ppb	0.948	82.48	Yes

Table 4.1-2 Model results for base 2007 modeling with the September 1999 Episode

Emission Reduction Measure	NOx Reductions tpd	VOC Reductions tpd
[1]I/M	2.89	3.84
Heavy Duty Vehicle Idling Restrictions	0.19	0.0
Commute Emission Reduction Program	0.27	0.30
Low Emission Gas Cans	0.0	2.60
Stage I Vapor Recovery	0.0	4.88
Degreasing Controls	0.0	6.38
Autobody Refinishing	0.0	0.05
Cut Back Asphalt	0.0	1.03
Low Reid Vapor Pressure Gas	0.0	2.87
TERP	2.0	0.0
Power Plant Reductions	7.08	0.0
TERMs	0.719	0.828

Table 4.1-3 List of Modeled Emission Reduction Measures

[1] Note that NOx and VOC reductions due to the Inspection and Maintenance program are estimated for Travis and Williamson County. The Low Emission Gas Cans measure includes residential and commercial use.

Strategy Model Run	Emission Reduction Measure
1	I/M only (without Hays County)
2	All State Assisted Measures (with TERMs) but without I&M in Hays County and without low Reid Vapor Pressure gasoline
3	TERP only (modeled at 2 tpd reduction)
4	All measures with VOC reductions and no NOx reductions
	Low Emission Gas Cans
	Stage I Vapor Recovery
	Degreasing Controls
	Autobody Refinishing
	Cut Back Asphalt
	Low Reid Vapor Pressure Gas
5	Point Sources Only

Table 4.14 List of Emission Reduction Measures Modeled for Each Strategy.

Control Strategy Run	Monitor site	1999 design value	Relative reduction factor	Estimated design value for 2007 *	Attainment of the 8-hour standard?
1	Audubon	89 ppb	0.944	84.02	Yes
	Murchison	87 ppb	0.944	83.13	Yes
2	Audubon	89 ppb	0.937	83.39	Yes
	Murchison	87 ppb	0.934	81.26	Yes
3	Audubon	89 ppb	0.946	84.19	Yes
	Murchison	87 ppb	0.947	82.39	Yes
4	Audubon	89 ppb	0.946	84.19	Yes
	Murchison	87 ppb	0.945	82.22	Yes
5	Audubon	89 ppb	0.944	84.02	Yes
	Murchison	87 ppb	0.943	82.04	Yes

Table 4.1-5 Model Results for Emission Reduction Measures Applied to Base 2007 EI with the September 1999 Episode

4.2 Trends in Ozone Monitoring Data in Austin

TCEQ (previously the Texas Natural Resource Conservation Commission and prior to that the Texas Air Control Board) has monitored ozone concentrations at two sites in Austin since 1983. The site at Murchison has not moved, but the other site was moved in 1997 to the current site named Audubon. To be consistent, these analyses will be limited to the time period beginning in 1997 when ozone concentrations were measured at both the Murchison and Audubon sites.

Since the EAC addresses 8-hour ozone concentrations, these analyses will be performed for 8-hour time periods. A number of analysis metrics can be used to evaluate trends in ozone concentrations. Among these are the highest concentration, the second highest concentration, the third highest concentration and the fourth highest concentration. At each monitor the annual 8-hour ozone design value is calculated over three consecutive years. It is the average of the fourth highest daily 8-hour ozone concentration measured over each of the three consecutive years. The area-wide design value is the highest of the design values for all of the monitors in the area. The average for the design value is truncated and if that value is greater than or equal to 85 ppb, the standard is exceeded.

Figure 4.2-1 shows the four highest 8-hour ozone concentrations and the design values at the Audubon monitoring site from 1997 to 2003. Figure 4.2-2 shows those same values for the Murchison monitoring site. Figure 4.2-3 shows the design values for Audubon and Murchison and the area design values from 1997 to 2002.
An analysis of historical trends of monitoring in the Austin area indicates that a design value of 89 ppb is the highest ever measured. A simple analysis of potential 8-hour ozone design values in Austin based on historical monitoring data indicated that in 2003 87 ppb is the highest design value likely to be monitored.

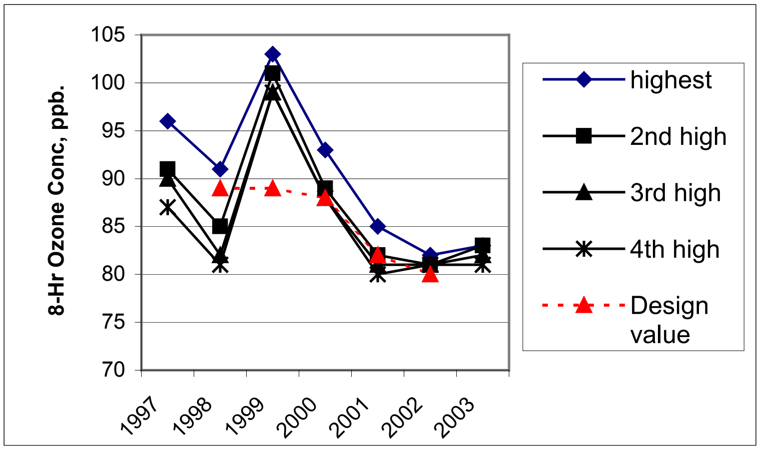


Figure 4.2-1. Four Highest 8-hour Ozone Concentrations and Design Values (ppb) at the Audubon monitoring station for the 1997 through 2003 period.

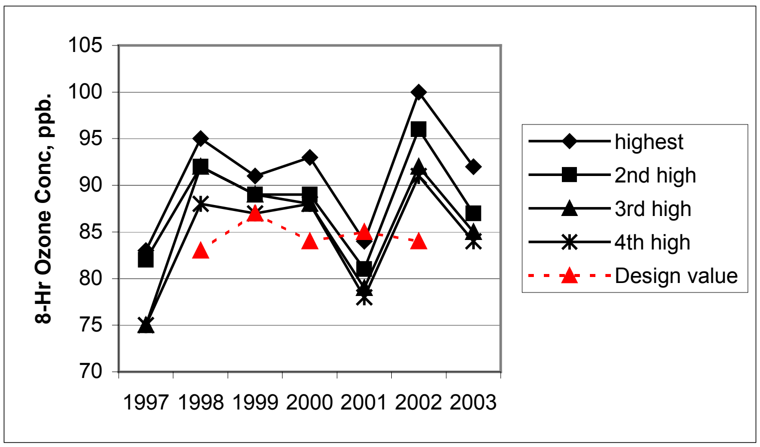


Figure 4.2-2 Four Highest 8-hour Ozone Concentrations and Design Values (ppb) at the Murchison monitoring station for the 1997 through 2003 period.

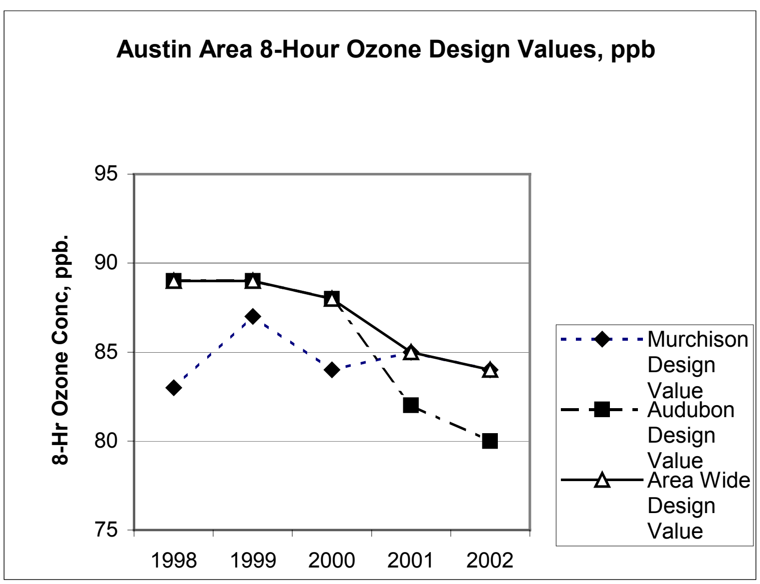


Figure 4.2-3. Design Values for Austin Area

5 Emissions Trends from 2007 to 2012

The goal in developing emission projections is to attempt to account for as many of the important variables that affect future year emissions as possible. They are a function of change in activity (growth or decline) combined with changes in the emission rate or controls applicable to the source. To a large extent, projection inventories are based on forecasts of industrial growth, population growth, changes in land use patterns, and transportation growth. Changes in the emission rate of sources can be influenced by such causes as technological advances, environmental regulations, age or deterioration, how the source is operated, and fuel formulations.

Figures 5.1 and 5.2 display NOx and VOC emissions in 2007 and 2012. Most significant reductions are visible in the onroad mobile category.

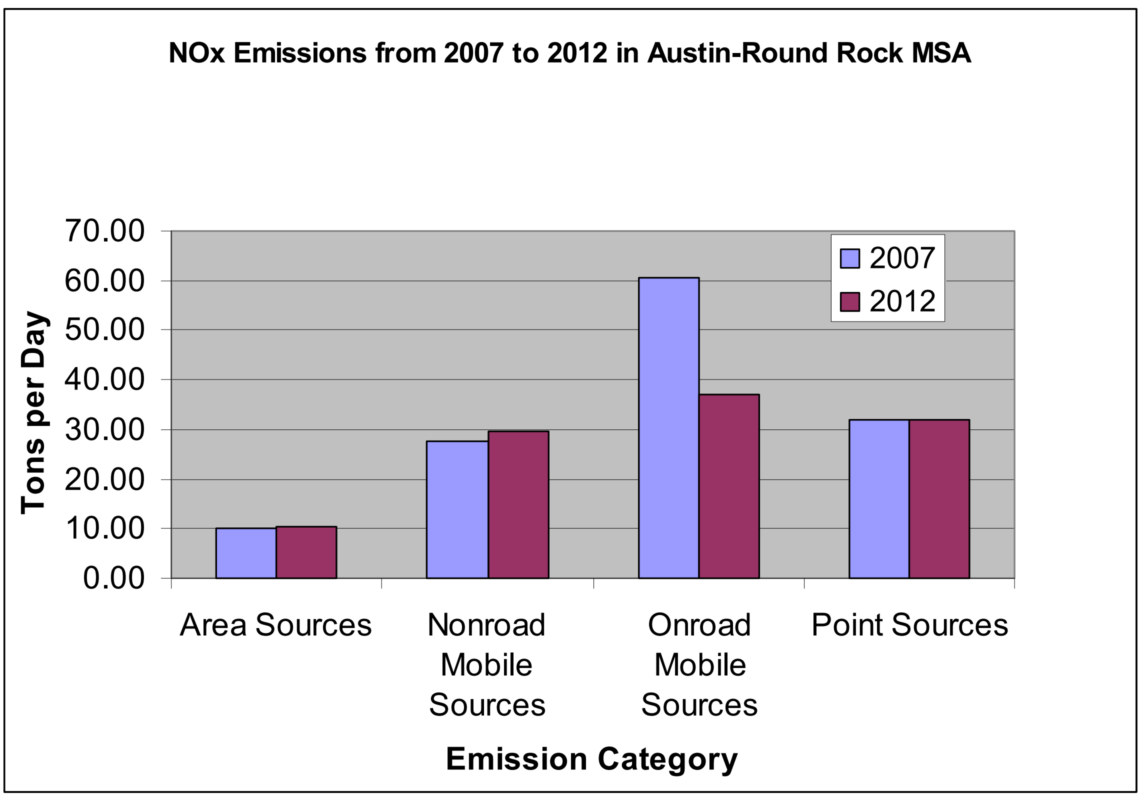


Figure 5.1 Austin-Round Rock MSA NOx Emissions from 2007 to 2012

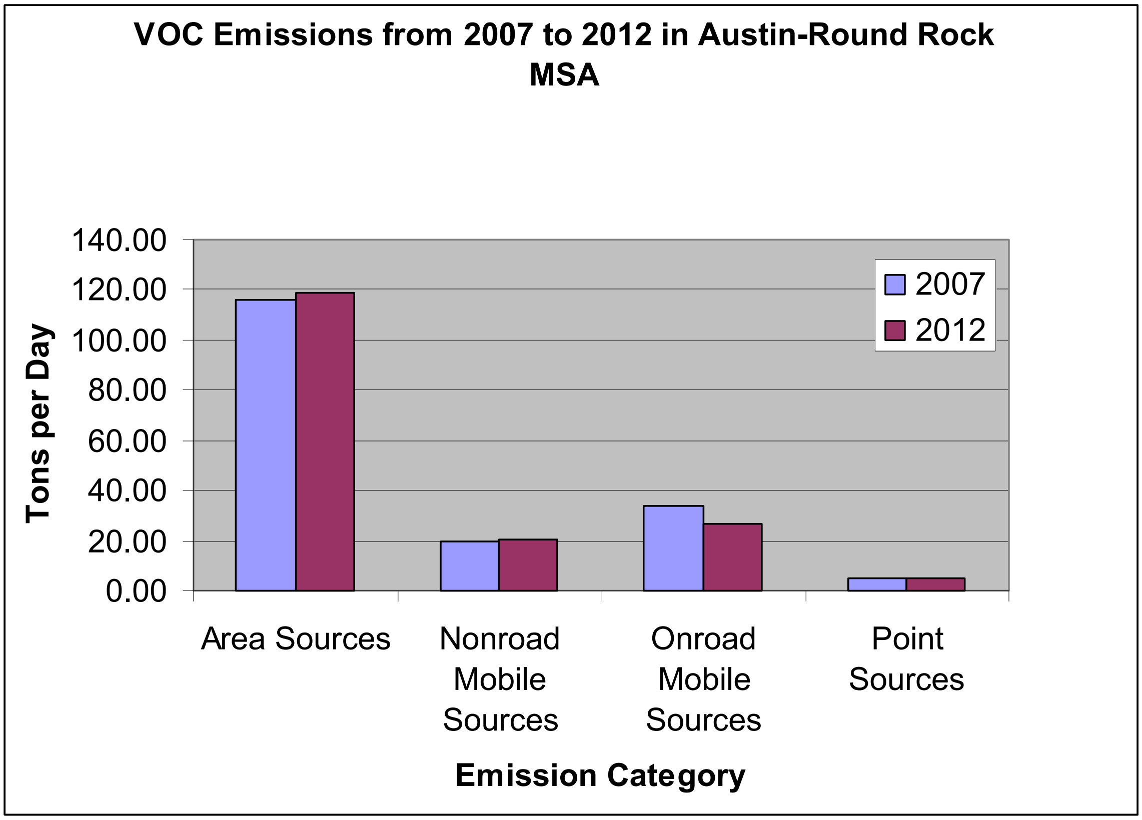


Figure 5.2 Austin-Round Rock MSA VOC Emissions from 2007 to 2012

Note that total anthropogenic emissions in 2012 are smaller by 20.89tpd and 3.89tpd of NOx and VOC respectively from 2007 future year base. These emissions reductions are mainly due to the federal and state rules discussed earlier and due to the cleaner vehicles and new technology that will be available by 2012..

5.1 Area Sources

The emissions associated with area sources are directly related to population and economic activity. These two data sources are typically used to estimate area source emissions.

The population of the region has been growing for the past 60 years and is expected to continue to grow through 2012.

	Population (thousands)				
County	1999	2002	2005	2007	2012
Bastrop	55.68	62.78	74.41	76.77	96.49
Caldwell	31.49	34.71	37.31	40.09	46.52
Hays	93.62	109.48	128.14	144.51	184.50
Travis	788.50	851.59	931.17	985.47	1095.30
Williamson	236.61	289.85	328.62	358.66	428.30
TOTAL	1205.90	1348.41	1499.66	1605.50	1851.11

Table 5.1-1 Population Growth (CAPCO Regional Forecast 2000 to 2030, REMI, 2003)

As the population increases, so will the economic activity in the region. Though the economy of the region has slowed in recent years, the overall trend from 1999 through 2012 continues to show an increase.

	Employment as Manufacturing Total (thousands)				
County	1999	2002	2005	2007	2012
Bastrop	0.93	0.96	1.02	1.06	1.12
Caldwell	0.43	0.41	0.43	0.44	0.46
Hays	3.86	3.61	3.89	4.11	4.61
Travis	68.90	65.13	64.39	66.08	68.53
Williamson	9.10	9.09	9.36	9.68	10.11
TOTAL	83.23	79.21	79.10	81.36	84.83

Table 5.1-2 Total manufacturing employment forecast (CAPCO Regional Forecast, REMI, 2003)

With this increase in population and economic growth in the region, emissions from area sources are expected to increase only 14.2% from 1999 to 2012.

Area Sources Emission Trend	1999	2007	2012
BASTROP			
NOx	0.60	0.76	0.82
VOC	4.52	5.53	6.16
CALDWELL			
NOx	0.54	0.67	0.68
VOC	15.29	15.75	17.17
HAYS			
NOx	0.58	0.79	0.85
VOC	5.47	7.67	8.21
TRAVIS			
NOx	3.21	4.05	4.28
VOC	50.60	57.04	57.58
WILLIAMSON			
NOx	3.00	3.84	3.86
VOC	14.68	20.44	21.25
MSA			
NOx	7.93	10.12	10.50
VOC	90.56	106.42	110.37

Table 5.1-3 Area Source Emission Trends Break Down (Tons per Day), CAPCO

For more details, please see the report, *Emissions Inventory Comparison and Trend Analysis for the Austin-Round Rock MSA: 1999, 2002, 2005, 2007, & 2012*, in the Appendices to Chapter 6.

5.2 Non-Road Mobile Sources

Projected MSA non-road mobile emissions for 2002, 2005, 2007 and 2012 were developed using the EPA's NONROAD model and accounted for several federal programs including: Standards for Compression-ignition Vehicles and Equipment, Standards for Spark-ignition Off-road Vehicles and Equipment, Tier III Heavy-duty Diesel Equipment, Locomotive Standards, Recreational Marine Standards, and Lawn and Garden Equipment. The non-road mobile emissions totals were calculated by using the following equation:

$$\frac{\text{Base Case Year Non Road Model Emissions}}{\text{Projection Year Non Road Model Emissions}} = \frac{\text{Base Case Emission Inventory}}{\text{Projection Year Emission Inventory}}$$

Non-Road VOC Emissions					
	1999	2002	2005	2007	2012
Bastrop	0.92	0.54	0.54	0.99	0.57
Caldwell	0.61	0.40	0.44	0.68	0.89
Hays	1.53	1.28	1.23	1.77	1.30
Travis	15.59	16.53	14.15	12.70	13.93
Williamson	3.84	3.93	3.28	3.73	3.39
Total	22.49	22.68	19.63	19.87	20.07

Table 5.2-1 Non-Road Mobile Source NOx Emissions (tons per day), Austin-Round Rock MSA

Non-Road NOx Emissions					
	1999	2002	2005	2007	2012
Bastrop	1.72	1.39	1.68	1.66	1.81
Caldwell	1.42	1.17	1.43	1.39	2.41
Hays	1.88	1.68	1.89	1.84	1.94
Travis	16.69	16.24	17.98	16.21	16.38
Williamson	6.73	6.45	6.90	6.36	7.11
Total	28.44	26.93	29.88	27.46	29.65

Table 5.2-2 Non-Road Mobile Source CO Emissions (tons per day), Austin-Round Rock MSA

The following figures graphically depict the Non-road mobile emission trend.

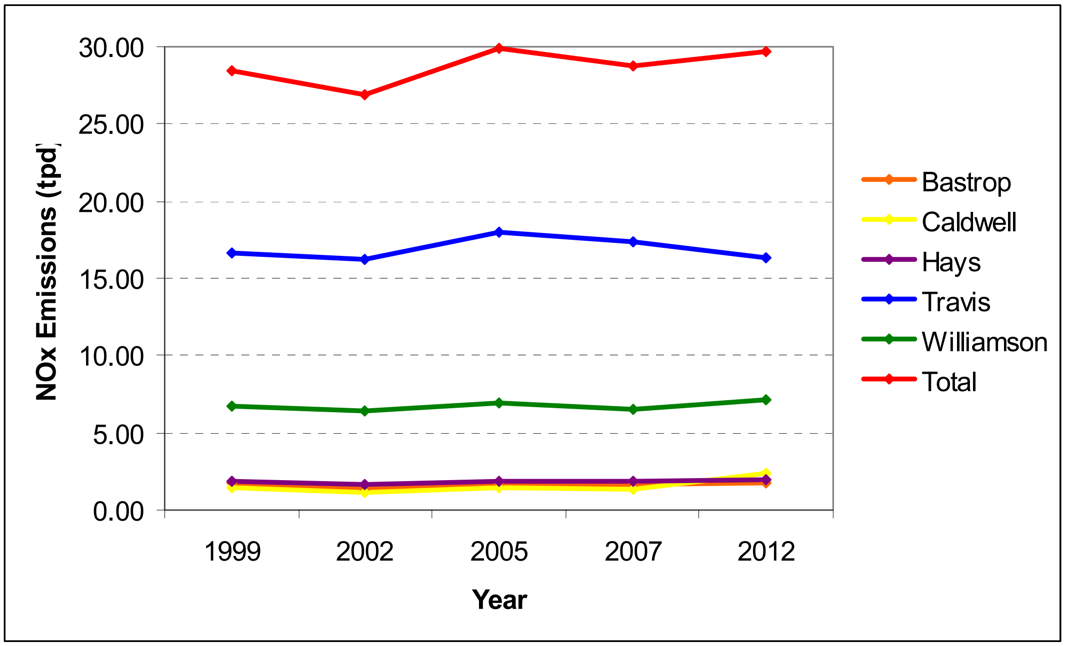


Figure 5.2-1 Non-Road Mobile NOx Emissions, Austin-Round Rock MSA

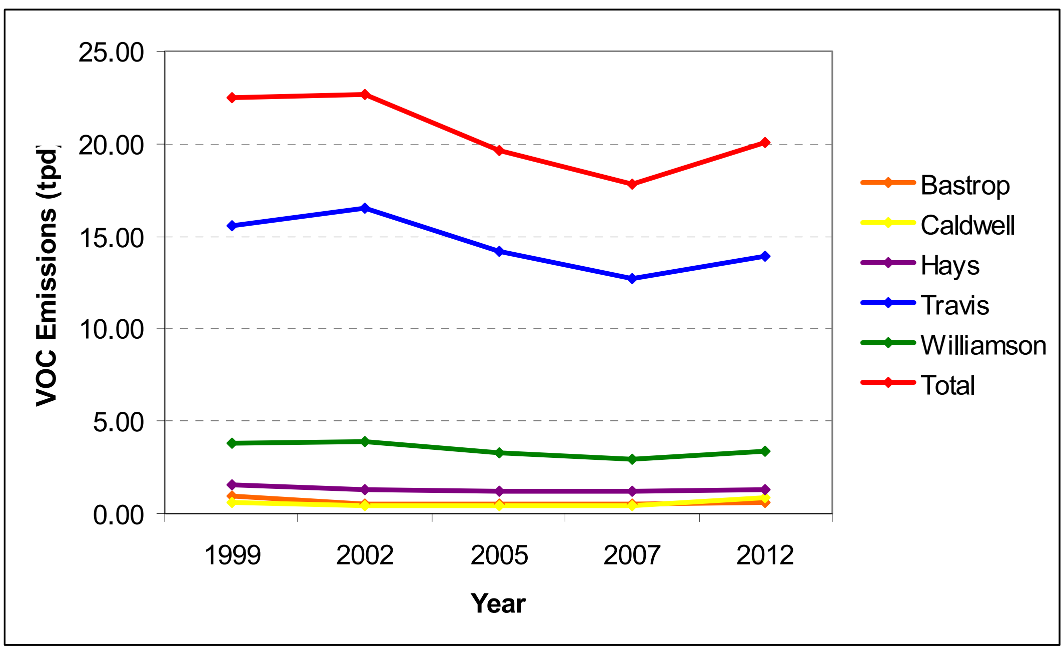


Figure 5.2-2 Non-Road Mobile VOC Emissions, Austin-Round Rock MSA

Emissions were grown using the Nonroad model (version 2002a). Population, and the distribution of population in urban and rural areas, has considerable affect this category. However, the population growth that is expected is offset by new technology and upcoming emission regulation on non-road mobile engines due to state and federal regulations. This accounts for the near straight line effect seen in the NOx trend in Figure 5.2-1. However, for VOC the continued population increases are shown from 2007 to 2012 (Figure 5.2-2).

5.3 On-Road Mobile Sources

VMT Screen: Because on-road mobile emissions account for a significant amount of the region's ozone forming emissions, the region has focused much of its attention on growth in that area. It was, therefore, reasonable to perform a test to determine if the future planned transportation network(s) will contribute increasing or decreasing amounts of NOx and VOC. One test that uses readily available data is a review of the relative change in VMT, also referred to as a VMT "screen". Staff has chosen to use the VMT screen that EPA originally developed for its proposed transitional ozone classification.

The VMT screen tests if any expected increase in VMT in a future year will be offset by technology and control measures. That is, that the expected associated emissions in a future year will not exceed the associated emissions of the base year.

The current CAMPO long-range transportation plan is based on VMT for the years 1997, 2007, 2015 and 2025. TxDOT supplied the1999 VMT. The "VMT Screen" for years 2007 and 2015 of the plan, *Mobility 2025*, gave the following results.

	NOx		**VOC**	
	Three-County		Three-County	
	CAMPO LRP		CAMPO LRP	
Year	No Controls	With I&M	No Controls	With I&M
1999	29,002,000		29,002,000	
2007	19,815,722	18,801,663	20,413,830	17,869,330
2015	9,162,901	7,316,813	15,036,818	11,943,306

Table 5.3-1 Emission Reductions in VMT from 1999 to 2015, with and without I/M

VMT in the three-county region is expected to increase 40% from 1999 to 2007 and 90% from 2007 to 2015. The associated NOx will decrease by so much during those years that it will be as though there were a 31.7% decrease in VMT from 1999 to 2007 and a 68.4% decrease from 1999 to 2015. Additional, though less substantial, decreases will be realized from the region's implementation of an I/M program in Travis, Williamson and Hays Counties in 2005 (35.2% and 74.8%). Also, VOC will be reduced by 29.6% from 1999 until 2007 and 48.2% from 1999 to 2015. Reductions of VOC will also be greater with the I/M program (38.4% and 58.8%). The expected increases in population and the planned expansion of the roadway system will contribute to an increase in VMT, but will not cause on-road emissions to exceed 1999 levels.

Because Bastrop and Caldwell Counties are outside the CAMPO boundaries, and because they will not participate in the I/M program, a separate VMT screen was conducted for the aggregate 5-county region. The results are similar to those realized for the CAMPO area.

	NOx	**VOC**
	Five-County MSA	Five-County MSA
	TTI VMT	TTI VMT
Year	No Control Measures	No Control Measures
1999	32,506,000	32,506,000
2007	27,677,756	22,332,084
2015	9,796,164	15,907,780

Table 5.3-2 Emission Reductions in VMT from 1999 to 2015

VMT is expected to increase in the five-county region by 36% from 1999 to 2007 and 79.3% from 1999 to 2015. Without I/M in the five-county region, NOx from VMT is expected to decline by 33.3% from 1999 to 2007 and 69.9% from 1999 to 2015. The VOC will also decline (31.3% and 51.1%). Again, the expected increases in population and the planned roadway system that will contribute to an increase in VMT will not contribute to emissions exceeding the amount of on-road emissions seen in 1999.

One conclusion from this analysis is that the currently planned roadway system will not exacerbate the production of ozone in the MSA through 2015. The details of all calculations are included in the Appendices to Chapter 6.

Emissions Comparisons: Another way to evaluate VMT and associated emissions is to compare the estimated emissions for future years to the base year emissions. Multiplying the emission factor by the VMT results in an estimate of the daily emissions associated with on-road travel. This evaluation shows a decrease in both NOx and VOC emissions, despite an increase in VMT.

TTI, Five-County, No Controls								
NOx					**VOC**			
Year	**VMT (miles)**	**EF (g/mi)**	**VMT X EF (tons)**		**Year**	**VMT (miles)**	**EF (g/mi)**	**VMT X EF (tons)**
1999	32,506,000	2.433	87		1999	32,506,000	1.425	51
2007	44,508,000	1.185	58		2007	44,508,000	0.715	35
2015	58,274,000	0.409	26		2015	58,274,000	0.389	25

Table 5.3-3 Emission Reductions from 1999 to 2015

Both evaluation techniques, the VMT screen and comparison of emissions, show large enough decreases in on-road emissions to more than offset the anticipated growth in VMT through 2015. These decreases in emissions will be even greater once the I/M program is implemented.

The following tables are the VMT screens. Each title includes the targeted precursor, the area covered, source of VMT, and any additional local control measures included in the emissions factor. For example, "**NOx, 5-county, TTI VMT, No controls**" means that the emission factors are for NOx, the entire 5-county MSA is covered, the VMT is from the TTI report on the September episode, and there were no additional local control measures included in the MOBILE6 input files.

NOx, 3-County, TxDOT & CAMPO VMT, No Controls

NOx

Emission Factors	
1999	2.4490
2007	1.1920
2015	0.4070

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	19,815,722.34
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	9,162,901.18

2025 Plan VMT		
1999	29,002,000	* HPMS 1999 VMT
2007	40,712,000	
2015	55,135,000	

VOC, 3-County, TxDOT & CAMPO VMT, No Controls

VOC

Emission Factors	
1999	1.4080
2007	0.7060
2015	0.3840

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	20,413,829.55
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	15,036,818.18

2025 Plan VMT		
1999	29,002,000	* HPMS 1999 VMT
2007	40,712,000	
2015	55,135,000	

NOx, 3-County, TxDOT & CAMPO VMT, I&M

NOx

Emission Factors	
1999	2.4490
2007	1.1310
2015	0.3250

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	18,801,662.72
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	7,316,812.98

2025 Plan VMT	
1999	29,002,000 *
2007	40,712,000
2015	55,135,000

* HPMS 1999 VMT

VOC, 3-County, TxDOT & CAMPO VMT, I&M

VOC

Emission Factors	
1999	1.4080
2007	0.6180
2015	0.3050

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	17,869,329.55
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	11,943,306.11

2025 Plan VMT	
1999	29,002,000
2007	40,712,000
2015	55,135,000

* HPMS 1999 VMT

NOx, 5-county, TTI VMT, No controls

NOx

Emission Factors	
1999	2.4330
2007	1.1850
2015	0.4090

VMT Screen

		1999 VMT =	32,506,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	21,677,755.86
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	9,796,163.58

TTI VMT	
1999	32,506,000
2007	44,508,000
2015	58,274,000

* TTI VMT Sept. 20, 1999 episode

VOC, 5-County, TTI VMT, No Controls

VOC

Emission Factors	
1999	1.4250
2007	0.7150
2015	0.3890

		1999 VMT =	32,506,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	22,332,084.21
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	15,907,779.65

TTI VMT	
1999	32,506,000
2007	44,508,000
2015	58,274,000

* TTI VMT Sept. 20, 1999 episode

5.4 Point Sources

The Texas Commission on Environmental Quality provided emission data for point sources in the CAPCO region for the 1999 EI. In the 1999 EI, the point source was sub-categorized into major point source and minor point source. Point source inventory was developed for 1999 and 2007 for the EAC Clean Air Plan. A uniform change for 2002 and 2005 was assumed and 2012 is expected to stay unchanged based on feedback from power plant stakeholders.

Austin Energy and Lower Colorado River Authority (LCRA) provided emissions for the EGUs they operate in the area. The NEGU (Non-Electric Generating Units) emission totals for the five counties were provided by TCEQ. Table 5.4-1 provides projected total emissions for the areas power plants (EGUs) for 1999 and 2007.

EGU Point Source Emissions (tpd) in the MSA and Surrounding Area					
		1999		**2007**	
County	**Facility Name**	**NOx**	**VOC**	**NOx**	**VOC**
Bastrop	Sam Gideon Electric Power Plant	7.10	0.33	3.94	0.11
Bastrop	Lost Pines 1 Power Plant	n/a	n/a	1.50	0.23
Bastrop	Bastrop Clean Energy Center	n/a	n/a	2.21	0.12
Fayette	Fayette Power Project	60.82	0.55	28.12	0.78
Hays	Hays Energy Facility	n/a	n/a	3.70	0.96
Milam	Sandow Steam Electric	24.20	0.33	13.19	0.32
Travis	Decker Lake Power Plant	8.15	0.44	3.80	0.12
Travis	Holly Street Power Plant	2.88	0.12	2.98	0.01
Travis	Sand Hills	n/a	n/a	1.03	0.20
Travis	Hal C Weaver Power Plant	1.99	0.03	1.86	0.05
Total		105.14	1.80	62.32	2.91
Total MSA		**20.12**	**0.92**	**21.01**	**1.81**

Table 5.4-1 Point Source Emissions from EGU, Austin – Round Rock MSA and Surrounding

Austin Energy's proposed Ten-Year Strategic Plan includes an Energy (generation) Resource Plan. Under this plan, the Holly Power Plant will be retired by Dec. 31, 2007. Cost-effective energy efficiency and load shifting are established as the first response toward meeting new load; and cost-effective renewable energy sources will be increased as practical to reduce generation dependency on fossil fuels, such as natural gas. As part of their resource strategy, Austin Energy has developed an objective to make a strong commitment to renewable energy. The two measures are to achieve a renewable portfolio standard of 20% and an energy efficiency target of 15% by 2020.

1999&2007 NEGU Major Point Source Emissions (tpd) in the MSA and Surrounding Area					
		1999		2007	
County	**Facility Name**	**NOx**	**VOC**	**NOx**	**VOC**
Caldwell	Durol Western Manufacturing, Inc.	0.00	0.01	0.00	0.00
Caldwell	Luling Gas Plant	0.89	0.26	0.29	0.04
Caldwell	Maxwell Facility	0.00	0.15	0.00	0.06
Caldwell	Prairie Lea Compressor Station	2.66	0.04	2.23	0.03
Caldwell	Teppco Crude Oil LLC, Luling Station	0.00	0.01	n/a	n/a
Comal	APG Lime Corp	1.15	0.00	1.15	0.00
Comal	Sunbelt Cemebt of Texas LP	7.61	0.12	3.79	0.13
Comal	TXI Operations LP	3.34	0.14	3.43	0.15
Hays	Parkview Metal Products, Inc.	0.00	0.10	0.00	0.03
Hays	Southern Post Co. Commercial Metal	0.00	0.06	0.00	0.01
Hays	Southwest Solvents and Chemicals	0.00	0.00	0.00	0.00
Hays	Texas LeHigh Cement	7.20	0.18	5.24	0.55
Milam	Aluminum Company of America	54.26	4.25	4.64	0.38
Travis	RIN3M Austin Center	0.15	0.03	0.15	0.03
Travis	Advanced Micro Devices, Inc.	0.00	0.00	0.23	0.17
Travis	Austin White Lime Co.	0.89	0.00	0.94	0.02
Travis	IBM Corporation	0.09	0.04	0.01	0.04
Travis	Lithoprint Co., Inc.	0.00	0.05	n/a	n/a
Travis	Motorola-Ed Bluestein	0.46	0.17	0.01	0.04
Travis	Motorola Integrated Circuit Division	0.09	0.08	0.02	0.02
Travis	Multilayer TEK, L.P.	0.00	0.18	0.01	0.21
Travis	Raytheon Systems, Co.	0.02	0.02	0.01	0.00
Travis	Twomey Welch Aerocorp, Inc.	0.00	0.00	0.00	0.00
Williamson	Aquatic Industries, Inc.	0.00	0.11	0.00	0.04
Total		**78.82**	**6.02**	**22.14**	**1.95**
Total MSA		**12.46**	**1.50**	**9.13**	**1.28**

Table 5.4-2 Point Source Emissions from major NEGU

Table 5.4-2 provides projected NEGU emission totals for 1999 and 2007. The largest emitter from the NEGU Major Point Source category is the Aluminum Company of

America (ALCOA). They have committed to reducing their emissions by 90% by 2007, which will have a substantial impact on the reduction for the entire category.

The total MSA point source VOC emission amounts increase slightly from 1999 to 2012 due to the new permitted EGUs. This occurred due to the development of several new point source related projects in the region. The projected reduction in NOx emission levels is due to the governmental regulations aimed at reducing point source related emission of NOx. Figures 5.4-1 and -2 graphically illustrates the trend for major point source emissions for all counties in the Austin-Round Rock MSA.

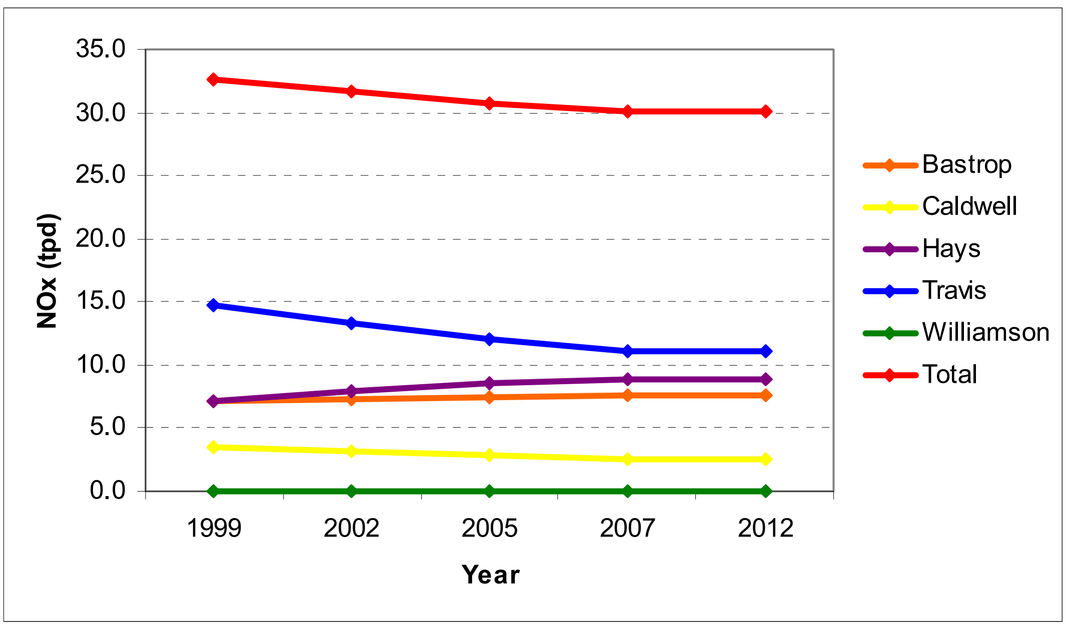


Figure 5.4-1 Point Source NOx Emissions Trend, Austin-Round Rock MSA

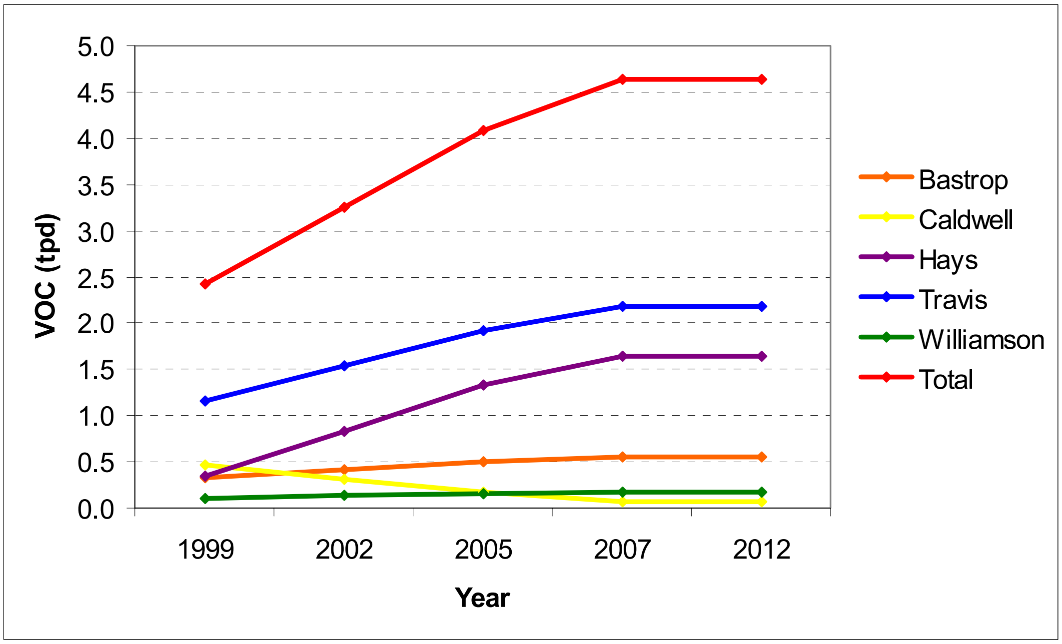


Figure 5.4-2 Point Source VOC Emissions Trend, Austin-Round Rock MSA

Power – Austin Energy and Renewable Sources

Austin Energy's proposed Ten-Year Strategic Plan is the high-level blueprint for their priorities for the next decade. The plan emphasizes reliability, customer service, cost effectiveness, positioning for technology, and greater generation diversity.

Included within the larger plan is an Energy (generation) Resource Plan. Under the energy resource plan, the Holly Power Plant will be retired by Dec. 31, 2007; cost - effective energy efficiency and load shifting are established as the first response toward meeting new load; and cost-effective renewable energy sources will be increased as practical to reduce generation dependency on fossil fuels, such as natural gas. The closing of the Holly Power Plant will reduce NOx emissions by 2.4 TPD in Travis County. As part of their resource strategy, Austin Energy has developed an objective to make a strong commitment to renewable energy. The two measures are to achieve a renewable portfolio standard of 20% and an energy efficiency target of 15% by 2020.

A more detailed description of these rules can be also found in the document "Local Emission Reduction Strategies" and Chapter 5 of the CAAP.

6 The Continuing Planning Process

CAPCO and CAMPO staff will analyze air quality and related data and perform necessary modeling updates annually. In addition to the data sources used for the above analyses, staff may add information from The Central Texas Sustainability Indicators Project (CTSIP). The CTSIP is a nonprofit organization that tracks 40 key indicators (e.g., water pollution, air quality, density of new development) that show the economic, environmental and social health of our MSA. The results of all these analyses will be reported in the June semi-annual reports beginning in June 2005.

Using similar methods as for the above analysis, staff will evaluate:

1. future transportation patterns;
2. all relevant actual new point sources; and
3. impacts from potential new source growth.

<u>Future Transportation Patterns</u>: As part of the *Mobility 2030* plan development process CAMPO staff will perform the VMT screen for years 2007 and 2017. The screen will test to be sure that any expected increase in VMT over the planning horizons will be offset by technology and control measures, that is, that the expected associated emissions will not exceed the associated emissions of the base year (1999).

As part of this analysis, the emission factors will be reviewed and updated as necessary. Review of the emission factors includes checking and updating the fleet mix.

This test will also be performed prior to adoption of any CAMPO long-range transportation plan update or amendment that significantly increases VMT.

<u>New Point Sources and Potential New Point Sources</u>: In addition to the VMT screen and review of area sources, staff will include a list and impact analysis of the relevant new and potential new point sources. Staff will obtain data on these relevant new and potential new point sources from TCEQ.

The annual analysis will determine the adequacy of the selected control measures. After review by the appropriate elected officials, these measures will be adjusted if necessary.

Photochemical Modeling for Austin's Early Action Compact: Analysis of Emission Control Strategies for Ozone Precursors

Submitted to

The United States Environmental Protection Agency
U.S. EPA Region 6, 6PD-L
1445 Ross Avenue
Dallas TX 75202-2733

and the

The Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

By

The Capital Area Planning Council (CAPCO)
2512 IH 35 South, Suite 200
Austin, TX 78704

with Contractor:
The University of Texas at Austin
10100 Burnet Rd., M.S. R7100
Austin, TX 78758

March 2004

Executive Summary

Austin has prepared an Early Action Compact (EAC) for submission to the Texas Commission on Environmental Quality (TCEQ) and the United States Environmental Protection Agency (U.S. EPA). The objectives of this report are to document the relative effectiveness of reductions of anthropogenic emissions of nitrogen oxides (NOx) and volatile organic compounds (VOC), the effectiveness of emission control strategies for ozone precursors, and the impacts of regional transport on air quality in the Austin area. These studies were conducted using the September 13-20, 1999 CAMx modeling episode with 2007 projected emissions. Relative reduction factors and future 8-hour ozone design values for Continuous Air Monitoring Stations (CAMS) in Austin are calculated for each emission control scenario in accordance with the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999) and the U.S. EPA's *Protocol for Early Action Compacts* (2003).

Comprehensive discussions of the Base Case model development are provided in "Development of the September 13-20, 1999 Base Case Photochemical Model for Austin's Early Action Compact", submitted by The Capital Area Planning Council to the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency, March 2004. Model performance has been evaluated using statistical and graphical metrics for both 1-hour and 8-hour averaged ozone concentrations. The September 13-20, 1999 CAMx photochemical model meets or exceeds established U.S. EPA performance criteria for attainment demonstrations.

Projected 2007 emission inventories were developed for the modeling domain and used with the identical meteorological data and CAMx configuration developed for the Base Case to model the Future Case. Comprehensive discussions of the Future Case model development are provided in "Photochemical Modeling for Austin's Early Action Compact: Development of the September 13-20, 1999 Photochemical Model with 2007 Projected Emissions and Analysis of Future 8-Hour Ozone Design Values", submitted by The Capital Area Planning Council to the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency, March 2004. Modeling based on Austin's predicted 2007 emission inventory indicates that the area will be on the cusp of attainment or non-attainment with the National Ambient Air Quality Standard for 8-hour averaged ozone concentrations.

Emission control strategies have been evaluated that will provide the Austin area with a margin of safety for attaining the standard. Control strategies assessed include a vehicle inspection and maintenance program, voluntary NOx reductions at local power plants beyond those already required by Senate Bill 7, implementation of the Texas Emissions Reduction Program (TERP), a commute program, VOC controls on area sources, transportation emission reduction measures (TERMS), and idling restrictions on heavy-duty diesel engines. The results presented in this report indicate that all of the emission control scenarios under consideration will facilitate Austin's progress toward maintaining attainment with the 8-hour NAAQS and reducing population exposure to ozone.

TABLE OF CONTENTS

Page

Executive Summary....................ii

1. Background....................1
    1.1 The September 13-20, 1999 Base Case and Future Case CAMx Models....................1
    1.2 Assessment of emission control strategies for ozone precursors....................2

2. Model preparation for emission control scenarios....................3
    2.1 Precursor Response Studies....................3
    2.2 Regional Transport Studies....................3
    2.3 Emission Control Strategy Development....................4

3. Precursor response studies of the relative effectiveness of anthropogenic NOx or VOC emission reductions in the Austin area and the impacts of regional transport on air quality in the Austin area....................11

4. Relative reduction factors and future design values for emission control scenarios in the Austin area....................23
    4.1 Methodology....................23
    4.2 Relative reduction factors and future design values for emission control scenarios....................24

5. References....................35

Appendix A: Differences in maximum predicted daily 8-hour averaged ozone concentrations between the 2007 Future Case with no local controls applied and with emission control scenarios under evaluation by the Austin MSA

TABLES

Page

1: Matrix of precursor response simulations conducted with the September 13-20, 2007 Future Case CAMx modeling episode for the Austin area 5

2: Emission reduction programs for ozone precursors considered by the five-county Austin area 6

3: Implementation approaches for emission control programs under consideration by the five-county Austin area 8

4: Packages of the five basic emission control programs described in Table 2 that were evaluated by the Austin area using the 2007 Future Case 10

5a: Impacts of eliminating ('zeroing') anthropogenic emissions in non-attainment and near non-attainment areas in eastern Texas on air quality in the Austin area 20

5b: Impacts of eliminating ('zeroing') anthropogenic emissions in eastern Texas, Louisiana, and Missouri, respectively, on air quality in the Austin area 21

6: Relative reduction factors and future design values at Austin's Murchison monitor 29

7: Relative reduction factors and future design values at Austin's Audubon monitor 31

8: Daily reduction factors at Austin's Murchison monitor 33

9: Daily reduction factors at Austin's Audubon monitor 34

FIGURES

Page

1: Maximum predicted 8-hour ozone concentrations on September 15 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area 14

2: Maximum predicted 8-hour ozone concentrations on September 16 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area 15

3: Maximum predicted 8-hour ozone concentrations on September 17 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area 16

4: Maximum predicted 8-hour ozone concentrations on September 18 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area 17

5: Maximum predicted 8-hour ozone concentrations on September 19 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area 18

6: Maximum predicted 8-hour ozone concentrations on September 20 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area 19

7: 32-Hour Back-Trajectories for September 15, 1999 through September 20, 1999 22

8: Differences in predicted daily maximum 8-hour ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC) 26

9: Differences in predicted daily maximum 8-hour ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC) 26

10: Differences in predicted daily maximum 8-hour ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC) 27

11: Differences in predicted daily maximum 8-hour ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC) 27

12: Differences in predicted daily maximum 8-hour ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC) 28

13: Differences in predicted daily maximum 8-hour ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC) 28

1. Background

In accordance with the U.S. EPA's *Protocol for Early Action Compacts* (2003), the Capital Area Planning Council (CAPCO), which coordinates air quality planning activities in the five-county Austin area, submitted preliminary documentation of the development of the September 13-20, 1999 Base Case and 2007 Future Case to the TCEQ and the U.S. EPA in November 2003 and December 2003, respectively, and final documentation in March 2004. The Austin area demonstrated that the model achieves performance criteria established by the U.S. EPA. Modeling based on Austin's predicted 2007 emission inventory indicates that the area will be on the cusp of attainment or non-attainment with the National Ambient Air Quality Standard for 8-hour averaged ozone concentrations.

The objectives of this report are to document the relative effectiveness of anthropogenic NOx or VOC emission reductions, the effectiveness of emission control strategies for ozone precursors, and the impacts of regional transport on air quality in the Austin area. These studies were conducted using the September 13-20, 1999 CAMx modeling episode with 2007 projected emissions. The assessment of emission controls is based on the methodology prescribed by the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999) and the U.S. EPA's *Protocol for Early Action Compacts* (2003). In accordance with this guidance, relative reduction factors and future 8-hour ozone design values for Continuous Air Monitoring Stations (CAMS) in Austin are calculated for each emission control scenario, and the effectiveness of each scenario is evaluated by comparing with results of the Future Case.

1.1 The September 13-20, 1999 Base Case and 2007 Future Case CAMx Models

The area has utilized resources from the State of Texas' Near Non-attainment Areas Program to develop a conceptual model of meteorological conditions during high ozone events in Central Texas. The conceptual model was used to select the September 13-20, 1999 multi-day high ozone episode for development with the Comprehensive Air Quality Model with Extensions (CAMx) photochemical grid model. The September 13-20, 1999 modeling episode fulfills both the requirements of the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999) and the U.S. EPA's *Protocol for Early Action Compacts* (2003) that require representation of meteorological regimes typical of ozone exceedances. The episode covers one synoptic cycle for ozone in Austin with two initialization days and six high ozone days. It includes two weekend days (September 18th and 19th), such that control strategies can be evaluated with different emission characteristics.

The model domain is a nested regional/urban scale 36-km/12-km/4-km grid. The area has conducted extensive refinements and analyses of the MM5 version 3.5 meteorological model configuration, emission inventories, boundary and initial conditions, and dry deposition algorithms, since initiating development of the photochemical model in 2001. In accordance with U.S. EPA guidance, MOBILE6.2-based inventories for 1999 and 2007 on-road mobile source emissions have been developed for the Austin metropolitan area. Emissions for non-road mobile sources for both years were developed using the U.S. EPA's NONROAD2002a model. Emissions from non-road mobile sources, stationary sources, and area sources have been estimated for Austin and other urban areas in the 4-km domain, using local activity data and projections when available. Comprehensive discussions of the model development are provided in "Development of the September 13-20, 1999 Base Case Photochemical Model for Austin's Early Action Compact", submitted by The Capital Area Planning Council to the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency in March 2004, and "Photochemical Modeling for Austin's Early Action Compact: Development of the September 13-20, 1999 Photochemical Model with 2007 Projected Emissions and Analysis of Future 8-Hour Ozone Design Values", submitted by The Capital Area Planning Council to the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency in March 2004.

Model performance has been evaluated using statistical and graphical metrics for both 1-hour and 8-hour averaged ozone concentrations. The September 13-20, 1999 CAMx photochemical modeling episode meets or exceeds established U.S. EPA performance criteria for attainment demonstrations. Modeling based on Austin's predicted 2007 emission inventory indicates that the area will be on the cusp of attainment or non-attainment with the National Ambient Air Quality Standard for 8-hour averaged ozone concentrations. Although the Austin area is currently in attainment with the 8-hour NAAQS based on ambient data collected from 2001 through 2003, in recognition of the results for the modeled Future Case, the Austin area has evaluated emission control strategies that will provide the area with a margin of safety for attaining the standard in the future.

1.2 Assessment of Emission Control Strategies for Ozone Precursors

The following report describes studies of the relative effectiveness of anthropogenic NOx or VOC emission reductions, the effectiveness of emission control strategies for ozone precursors, and the impacts of regional transport on air quality in the Austin area using the September 13-20, 1999 CAMx modeling episode with 2007 projected emissions. The remainder of the report is subdivided into the following sections:

Section No.	**Description**
2.	Model preparation for emission reduction scenarios
3.	Precursor response studies of the relative effectiveness of anthropogenic NOx or VOC emission reductions in the Austin area and the impacts of regional transport on air quality in the Austin area
4.	Relative reduction factors and future design values for emission control scenarios in the Austin area
5.	References

2. Model Preparation for Emission Reduction Scenarios

The model configuration, meteorological fields, boundary and initial conditions, dry deposition algorithms, chemical mechanisms, and biogenic emission inventories remained the same between the September 13-20, 2007 Future Case CAMx modeling episode and the emission reduction scenario modeling. The only differences between the simulations are the reductions made to the 2007 projected anthropogenic emission inventory for each scenario described below.

Austin's 2007 emission inventory, which is the foundation for evaluating the control strategies, is documented in a separate report (CAPCO, 2003) in accordance with EAC reporting requirements. The discussion below summarizes each emission reduction scenario evaluated by the Austin area and describes how the emission reductions associated with each scenario were implemented and processed for CAMx.

2.1 Precursor Response Studies

The objectives of the precursor response studies are to examine the relative sensitivity of maximum predicted daily ozone concentrations in the five-county Austin area and maximum predicted daily ozone concentrations in 7x7 grids around Austin's two Continuous Air Monitoring Stations (i.e., CAMS3 at Murchison Middle School and CAMS38 at Audubon) to reductions in anthropogenic NOx or VOC emissions. The precursor response studies were conducted by reducing all anthropogenic emissions of NOx or VOCs in the emission inventory files for the September 13-20, 2007 Future Case across the five-county Austin area. Because all anthropogenic emissions are targeted and not specific source categories, the results provide a quantitative indication of whether air quality in the area is predicted to be more responsive to reductions in NOx emissions or VOC emissions. Table 1 shows a matrix of eight precursor response simulations conducted for the study. The University of Texas at Austin developed the Fortran 90 software to apply the emission reductions to CAMx-ready emission files. The software is publicly available from UT upon request. Results of the precursor response studies are described in Chapter 3.

2.2 Regional Transport Studies

In order to evaluate the impacts of regional transport on air quality in the Austin area, eleven modeling simulations were conducted in which anthropogenic emissions in each of the eight ozone non-attainment and near non-attainment areas in eastern Texas and in the states of Texas, Louisiana, and Missouri, respectively, were eliminated or 'zeroed'. The non-attainment areas included Houston/Galveston, Beaumont/Port Arthur, and Dallas/Fort Worth. The near non-attainment areas included Austin, Victoria, San Antonio, Corpus Christi, and Tyler/Longview/Marshall. In each 'zero-out' run, anthropogenic emissions of VOCs, NO_x, and carbon monoxide (CO) were eliminated from a non-attainment or near non-attainment area, referred to as the source area, and the impacts were then evaluated in the Austin area. Three additional 'zero-out' modeling runs were conducted to evaluate the impacts of transport from sources within Texas (i.e., zero-out of all anthropogenic emissions in Texas) and from sources in Louisiana and

Missouri (i.e., zero-out of all anthropogenic sources in Louisiana and Missouri, respectively).

The University of Texas at Austin developed the Fortran 90 software to apply the emission reductions to CAMx-ready emission files. The software is publicly available from UT upon request. Results, presented in Chapter 3, were analyzed in the form of:

1. Maximum predicted daily 1-hour and 8-hour ozone concentrations, respectively, for the projected 2007 Future Case and Zero-Out Case in the Austin area.
2. Maximum predicted difference in 1-hour and 8-hour ozone concentrations, respectively, between the projected Future Case and Zero-Out Case in the Austin area.

2.3 Emission Control Strategy Development

Five basic emission control programs were considered for Austin's Early Action Compact. Descriptions of these programs along with their associated reductions and source categories are presented in Table 2. Implementation approaches for each emission control program are summarized in Table 3.

The Austin area then evaluated various packages of the five basic programs described in Table 2 by applying the appropriate emission reductions to the 2007 Future Case inventory. Emission reductions for each package were accomplished using the Emission Preprocessor System v.2.0 (EPS2) cntlem module to apply control factors to Austin's 2007 Future Case inventory. These control factor files are available from UT upon request. Results for the following packages are presented in this report:

1. I&M programs in Travis and Williamson Counties only
2. Voluntary point source reductions in the Austin area
3. Area source VOC reductions in the Austin area
4. TERP implementation in the Austin area
5. All controls excluding low RVP gasoline and I&M in Hays County
6. All controls excluding low RVP gasoline and I&M in Hays County and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd
7. <u>All controls excluding low RVP gasoline, I&M in Hays County, and commute program reductions</u>
8. All controls excluding low RVP gasoline and I&M in all counties

Reductions of ozone precursor emissions for each package are summarized in Table 4. The final package adopted by the five-county Austin MSA and submitted to the TCEQ and the U.S. EPA is underlined. An additional sensitivity test was conducted with point source VOC emissions doubled relative to the 2007 Future Case inventory in the Austin area in order to examine the benefits of emission offsets for New Source Review.

Relative reduction factors and future design values were calculated for each scenario as described in Chapter 4. Ozone isopleth maps showing differences in maximum predicted daily 8-hour average ozone concentrations between the 2007 future case with no local controls applied and with emission control scenarios under evaluation by the Austin MSA are shown in Appendix A.

Table 1. Matrix of precursor response simulations conducted with the September 13-20, 2007 Future Case CAMx modeling episode for the Austin area.

Ozone Precursor	Anthropogenic Emission Reduction in the Five-County Austin Area (%)			
	15%	25%	50%	75%
NOx	X	X	X	X
VOC	X	X	X	X

Table 2. Emission reduction programs for ozone precursors considered by the five-county Austin area.*

Emission Control Scenario	Description	NOx Reduction (tpd)	VOC Reduction (tpd)
Inspection & Maintenance Program (I&M)	All gasoline vehicles 2 to 24 years old registered and operated in Travis and Williamson Counties will undergo annual emissions inspection testing at safety inspection stations. Hays County opted out of the I&M program. The OBDII testing program will be used to test 1996 model-year and newer vehicles. The Two-Speed Idle test will be used to test 1995 and older vehicles. On-road remote sensing equipment will be used to identify high-emitting vehicles in Travis and Williamson counties or those commuting from contiguous counties. A passing inspection test or waiver is required to renew vehicle registration or receive a safety inspection sticker.	2.89	3.84
Stationary Point Sources	Voluntary reductions of NOx emissions beyond those required by SB7 from local power plants including Austin Energy, Lower Colorado River Authority, University of Texas at Austin.	7.08	None
Area Source VOC Controls and Low Reid Vapor Pressure Gasoline	This group of programs focuses on VOC controls only with no accompanying NOx reductions. Measures in this package include: 1. Low emission gas cans: measure to lower emissions of VOCs in the Austin MSA from portable fuel containers that spill, leak, and/or allow permeation (2.60 tpd VOC reduction). 2. Stage I vapor recovery: measure requires additional gas stations and fuel dispensing facilities in the MSA to comply with TCEQ Stage I Vapor Recovery rules by lowering exemption threshold defined in rules from 125,000 gallons a month to 25,000 gallons a month (4.88 tpd VOC reduction). 3. Degreasing controls: measure regulates degreasing operations by revising TCEQ rules to apply to Austin MSA (6.39 tpd VOC reduction). 4. Autobody refinishing: measure regulates autobody refinishing operations by revising TCEQ rules to apply to Austin MSA (0.05 tpd VOC reduction). 5. Cut Back Asphalt: measure restricts use	None	17.81

	of cut-back asphalt in the Austin MSA through a TCEQ rule revision. (1.03 tpd VOC reduction). 6. Low RVP Gasoline: measure lowers gasoline RVP requirement from 7.8 to 7.0 in all MSA counties from May 1 to October 31 (2.87 tpd VOC reduction).		
Texas Emission Reduction Program (TERP)	HB 1365 designates five-county Austin MSA as eligible for participation in TERP. TERP is a voluntary program available to public and private fleet operators that operate qualifying equipment. The objective of the program is to provide grants to eligible projects in "affected counties" to offset the incremental cost associated with activities to reduce emissions of NOx from high-emitting mobile diesel sources.	2.00	None
Additional Mobile Source Control Measures	1. TERMS: Transportation projects designed to reduce vehicle use, improve traffic flow or reduce congestion in various locations in the Austin MSA (0.828 tpd VOC reduction; 0.719 tpd NOx reduction). 2. Commute Program: measure requires every existing or future employer with 200 or more employees per location to submit a detailed plan to TCEQ or local designee that demonstrates how the employer will reduce the equivalent of their NOx and VOC commute related emissions by 10% (0.27 tpd NOx reduction; 0.30 tpd VOC reduction). 3. Heavy Duty Vehicle Idling Restrictions: measure restricts engine idling of vehicles with a gross vehicle rating of more than 14,000 pounds to five consecutive minutes throughout the Austin MSA (0.19 tpd NOx reduction.)	1.18	1.13

*Total NOx and VOC Reductions are shown for Monday, September 20th 2007.

Table 3. Implementation approaches for emission control programs under consideration by the five-county Austin area.*

Emission Control Scenario	Counties	Sources/SCCs	NOx Reduction (tpd)	VOC Reduction (tpd)
Inspection & Maintenance Program (I&M)	Travis and Williamson Hays County opted out of the I&M program)	LDGV LDGT	2.89	3.84
Stationary Point Sources	Selected power plants in Austin MSA	Austin Energy, Lower Colorado River Authority, University of Texas at Austin.	7.08	None
Area Source VOC Controls and Low Reid Vapor Pressure Gasoline in the Five-County Austin MSA			None	17.81
Low Emission Gas Cans (Commercial)	Five-county MSA	2260004016 2260004021 2260004026 2260004031 2260004071 2265004011 2265004016 2265004026 2265004031 2265004041 2265004046 2265004051 2265004056 2265004066 2265004071 2265004076 2267004066 2270004031 2270004046 2270004056 2270004066 2270004071 2270004076	0.00	0.63
Low Emission Gas Cans (Residential)	Five-county MSA	2265004010	0.00	1.97
Low RVP Gasoline	Five-county MSA	All nonroad and all on-road mobile sources	0.00	0.17 (nonroad) 2.70 (on-road)
Stage I Vapor	Five-county MSA	2501060053	0.00	4.88

Recovery				
Degreasing Controls	Five-county MSA	2415300000 2415360000 2415355000 2415330000 2415320000 2415305000 2415325000 2415340000 2415345000 2415365000 2415310000 2415335000	0.00	6.39
Autobody Refinishing	Five-county MSA	2401070000 2401001025 2401005000	0.00	0.05
Cutback Asphalt	Five-county MSA	2461020000	0.00	1.03
TERP	Five-county MSA	All Nonroad and on-road mobile HDDV sources	0.87 (non-road) 1.13 (on-road)	0.00
Additional Mobile Source Control Measures	Five-county MSA	TERMS: All on-road mobile Idling: HDDV and HDGV Commute: LDGV, LDGT, LDDV, LDDT, MC	TERMS: 0.72 Idling: 0.19 Commute: 0.27	TERMS: 0.83 Idling: None Commute: 0.30

*Total NOx and VOC Reductions are shown for Monday, September 20th 2007.

Table 4. Packages of the five basic emission control programs described in Table 2 that were evaluated by the Austin area using the 2007 Future Case.* The final package adopted by the five-county Austin MSA and submitted to the TCEQ and the U.S. EPA is shown underlined.

Emission Control Package	NOx Reduction (tpd)	VOC Reduction (tpd)
Inspection & Maintenance Program (I&M) in Travis and Williamson Counties only	2.89	3.84
Voluntary Point Source Reductions in the Austin area	7.08	None
Area Source VOC Controls and Low Reid Vapor Pressure Gasoline	None	17.81
Texas Emission Reduction Program (TERP)	2.00	None
All controls listed in Table 2 excluding low RVP Gasoline and I&M in Hays County	13.15	19.91
All controls listed in Table 2 excluding low RVP Gasoline and I&M in Hays County and with Alcoa Emissions reduced from 26.7 tpd to 4.44 tpd	35.37	19.91
<u>All controls listed in Table 2 excluding low RVP Gasoline and I&M in Hays County, and commute program reductions</u>	12.88	19.61
All controls listed in Table 2 excluding low RVP Gasoline and I&M in all counties	10.26	16.07

*Total NOx and VOC Reductions are shown for Monday, September 20th 2007.

3. Precursor Response Studies of the Relative Effectiveness of Anthropogenic NOx or VOC Emission Reductions in the Austin Area and the Impacts of Regional Transport on Air Quality in the Austin Area

Precursor response studies provided a quantitative indication of whether the Austin area may be more responsive to reductions in NOx emissions or VOC emissions. The results became the foundation for studies of specific emission control programs discussed in the next chapter. This chapter of the report includes the results of both the precursor response and regional transport studies. Analyzing these results simultaneously rather than independently provided a more comprehensive perspective of the types of controls (i.e., NOx or VOC) and the relative importance of local versus regional controls on air quality in the Austin area.

Daily results of the precursor response studies conducted for the Austin area are shown in Figures 1-6. Results for the model initialization days were not included in the analysis. It is important that the reader note variations in scales on the plot for September 20 relative to the rest of the episode days. This was done intentionally to account for higher peak predicted 8-hour ozone concentrations on September 20.

Regardless of prevailing meteorological conditions and the magnitude of ozone precursor emissions, reductions of anthropogenic NOx emissions were predicted to be more effective than VOC reductions for reducing both area-wide peak 8-hour ozone concentrations and peak 8-hour daily ozone concentrations near the Austin monitors during this episode. These results suggested that although there are predicted to be air quality benefits from reducing anthropogenic VOC concentrations in the Austin area, emission control strategies that included NOx reductions would be important components of Austin's air quality plan.

It appeared, however, that the effectiveness of local NOx emissions reductions, while clearly beneficial for air quality in the Austin area, could level off under certain conditions. On three episode days, Friday, September 17, Saturday, September 18 and Sunday, September 19, differences between area-wide peak predicted 8-hour ozone concentrations from a 50% reduction in anthropogenic NOx emissions and a 75% reduction in anthropogenic NOx emissions were less than 0.1 ppb. Although this trend was not observed in grid cells near Austin's monitors during the episode, which are used in the modeled attainment test, it was, nonetheless, important to consider these results with the overall perspective of air quality planning in the Austin area.

Regional transport studies lent preliminary evidence for the hypothesis that high regional background concentrations on some episode days were predicted to limit the effectiveness of local NOx reductions for reducing area-wide peak 8-hour ozone concentrations. Air quality impacts in the Austin area of zeroing emissions in each of the non-attainment and near non-attainment areas and in Texas, Louisiana, and Missouri, respectively are summarized in Table 5. Ozone isopleth maps showing differences in maximum predicted daily 8-hour average ozone concentrations between the 2007 future case with no local controls applied and with each zero-out simulation are presented in a separate report "Analysis of the Impacts of Regional Transport on Air Quality in the Austin and Victoria Areas using the September 13-20, 1999 Photochemical Modeling Episode with 2007 Projected Emissions", to be submitted by The University of Texas at Austin to the Capital Area Planning Council, the City of Victoria, and the Texas Commission on Environmental Quality in April 2004.

Results of the regional transport studies actually showed that on all episode days except for September 20, maximum predicted daily 8-hour ozone concentrations from a 75% reduction in anthropogenic NOx emissions in the five-county Austin area were nearly identical to maximum daily 8-hour ozone concentrations when all anthropogenic emissions in the five-county area were eliminated ('zero-out Austin'). On two episode days, September 18 and September 19, maximum predicted daily 8-hour ozone concentrations from a 50% reduction in anthropogenic NOx emissions in the five-county Austin area were nearly identical to maximum daily 8-hour ozone concentrations when all anthropogenic emissions in the five-county area were eliminated. Thus, eliminating both anthropogenic NOx and VOC emissions in the Austin area on most episode days, except September 20, provided little additional benefit for reducing area-wide peak 8-hour ozone concentrations beyond reductions of NOx emissions alone by 50%-75%. Ozone formation during this particular episode, which is a nearly ideal example of the typical multi-day high ozone event described in the conceptual model for the Austin area, is predicted to be NOx-limited.

The notable difference on September 20 relative to the other episode days was the predominance of southwesterly flow and minimal transport of air from the continental United States and southeastern Texas into the Austin area, which can be observed in the 32-hour back trajectories for the episode shown in Figure 7. Ozone concentrations averaged over 8-hours at Austin's Audubon monitor did not exceed 70 ppb; area-wide peak predicted 8-hour ozone concentrations and peak predicted 8-hour ozone concentrations at Austin's Murchison monitor were in close agreement. Local reductions of NOx emissions on this day were markedly more effective than on other episode days The difference in area-wide peak 8-hour ozone concentrations in the Austin area between the future case and Austin zero-out simulation was 18 ppb (88 ppb-70 ppb shown in Table 5), which was 10 ppb greater than on any other episode day. Similarly, the maximum difference in 8-hour ozone concentrations between the two cases within the Austin area was 29 ppb, which was 5 ppb greater than on any other episode day.

The Texas and Louisiana zero-out simulations provided striking examples of the potential importance of regional emission controls for improving air quality in Austin. Peak area-wide 8-hour ozone concentrations in Austin decreased by as much as 33 ppb and 4 ppb, as a result of eliminating anthropogenic emissions in eastern Texas and Louisiana, respectively. The average area-wide maximum 8-hour ozone concentration in the Austin area after all Texas sources were removed was 57.5 ppb, while the average difference between the area-wide maximum 8-hour ozone concentrations from the Texas zero-out simulation and the 2007 Future Case was 23.3 ppb. The average difference between the area-wide maximum 8-hour ozone concentrations from the Louisiana zero-out simulation and the 2007 Future Case in the Austin area was 2.5 ppb, which was greater than that from any near non-attainment or non-attainment area in Texas. This value for Missouri was 0.7 ppb, which was also greater than that from any near non-attainment or non-attainment area in Texas except Houston. Although these studies applied unrealistic levels of controls on anthropogenic emission sources and results should not be viewed as an absolute indication of the magnitude of ozone reductions in the region, they suggested the value of examining both local and regional approaches for improving air quality.

Figure 1. Maximum predicted 8-hour ozone concentrations on September 15 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area. Results are shown for the maximum predicted daily 8-hour ozone concentrations in the five-county Austin area and the maximum predicted daily 8-hour ozone concentrations in 7x7 grids around Austin's two Continuous Air Monitoring Stations (i.e., CAMS3 at Murchison Middle School and CAMS25 at Audubon).

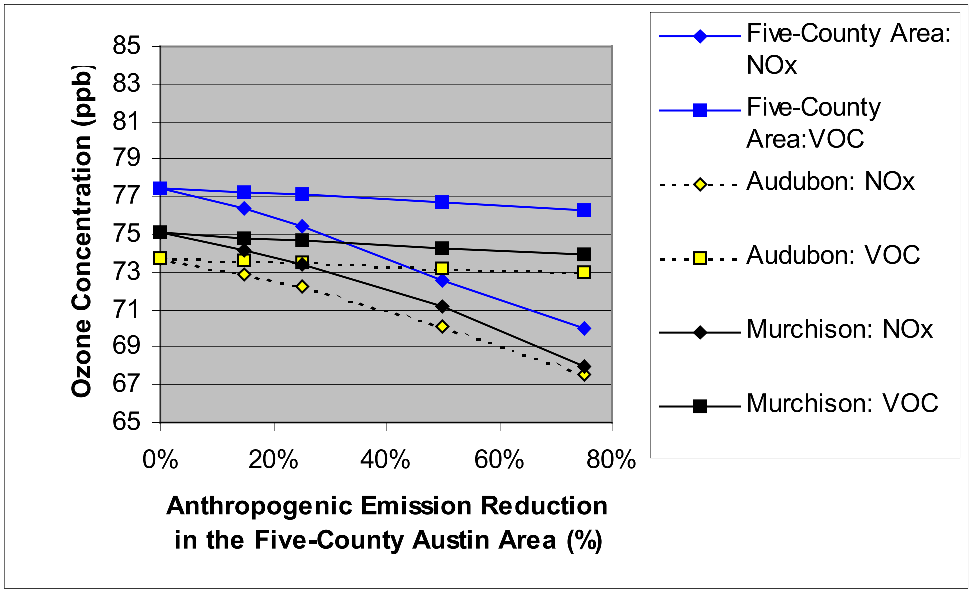


Figure 2. Maximum predicted 8-hour ozone concentrations on September 16 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area. Results are shown for the maximum predicted daily 8-hour ozone concentrations in the five-county Austin area and the maximum predicted daily 8-hour ozone concentrations in 7x7 grids around Austin's two Continuous Air Monitoring Stations (i.e., CAMS3 at Murchison Middle School and CAMS25 at Audubon).

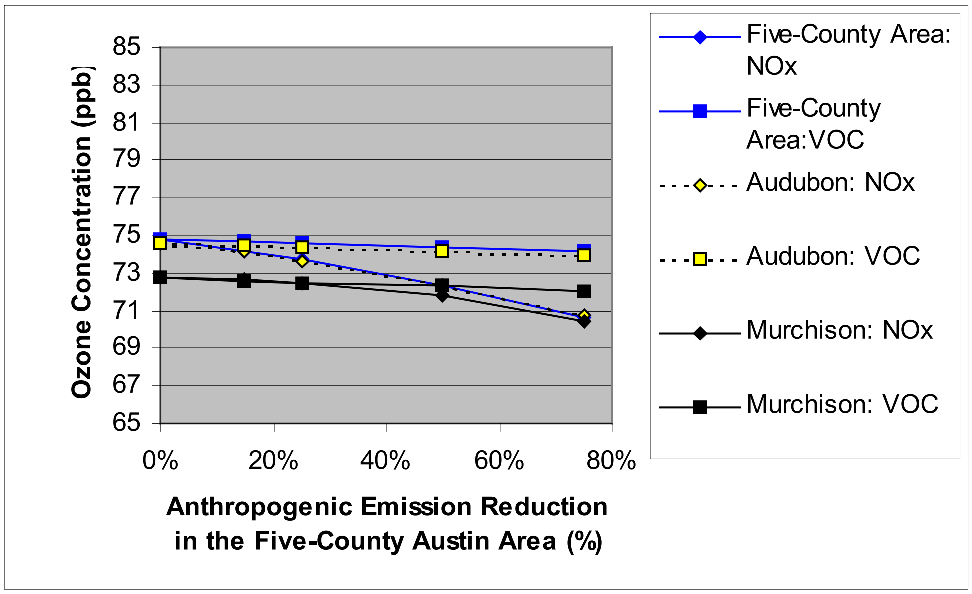


Figure 3. Maximum predicted 8-hour ozone concentrations on September 17 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area. Results are shown for the maximum predicted daily 8-hour ozone concentrations in the five-county Austin area and the maximum predicted daily 8-hour ozone concentrations in 7x7 grids around Austin's two Continuous Air Monitoring Stations (i.e., CAMS3 at Murchison Middle School and CAMS25 at Audubon).

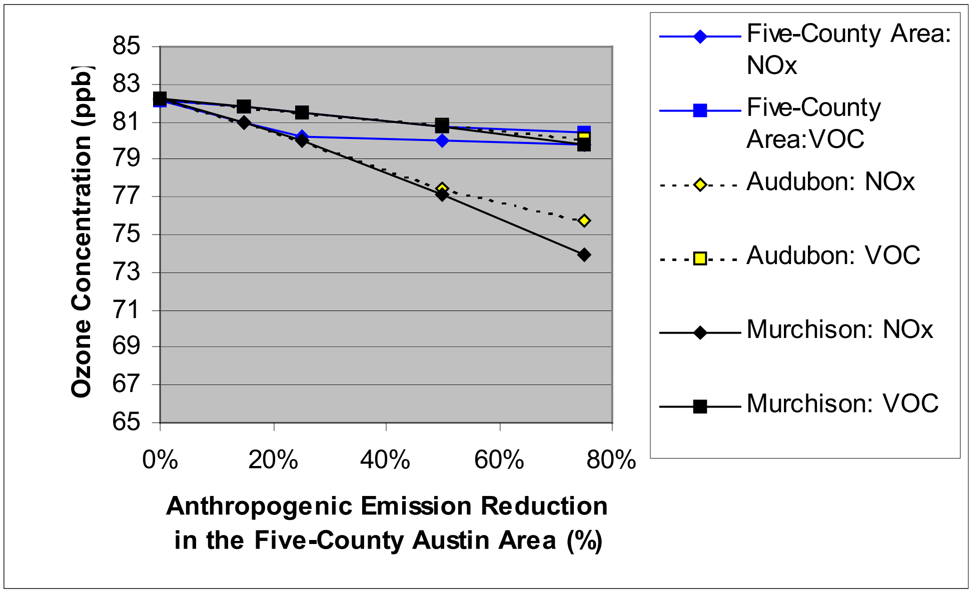


Figure 4. Maximum predicted 8-hour ozone concentrations on September 18 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area. Results are shown for the maximum predicted daily 8-hour ozone concentrations in the five-county Austin area and the maximum predicted daily 8-hour ozone concentrations in 7x7 grids around Austin's two Continuous Air Monitoring Stations (i.e., CAMS3 at Murchison Middle School and CAMS25 at Audubon).

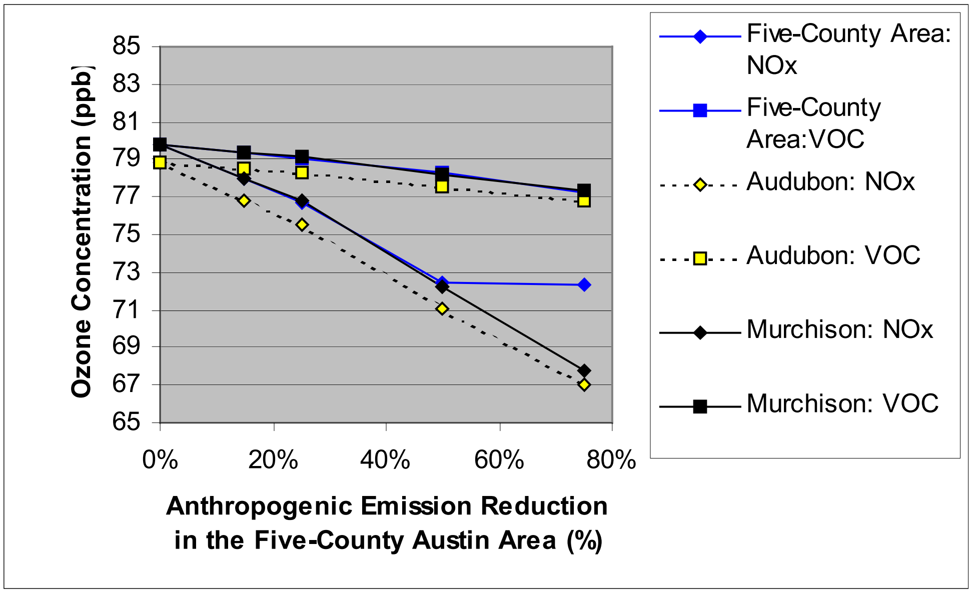


Figure 5. Maximum predicted 8-hour ozone concentrations on September 19 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area. Results are shown for the maximum predicted daily 8-hour ozone concentrations in the five-county Austin area and the maximum predicted daily 8-hour ozone concentrations in 7x7 grids around Austin's two Continuous Air Monitoring Stations (i.e., CAMS3 at Murchison Middle School and CAMS25 at Audubon).

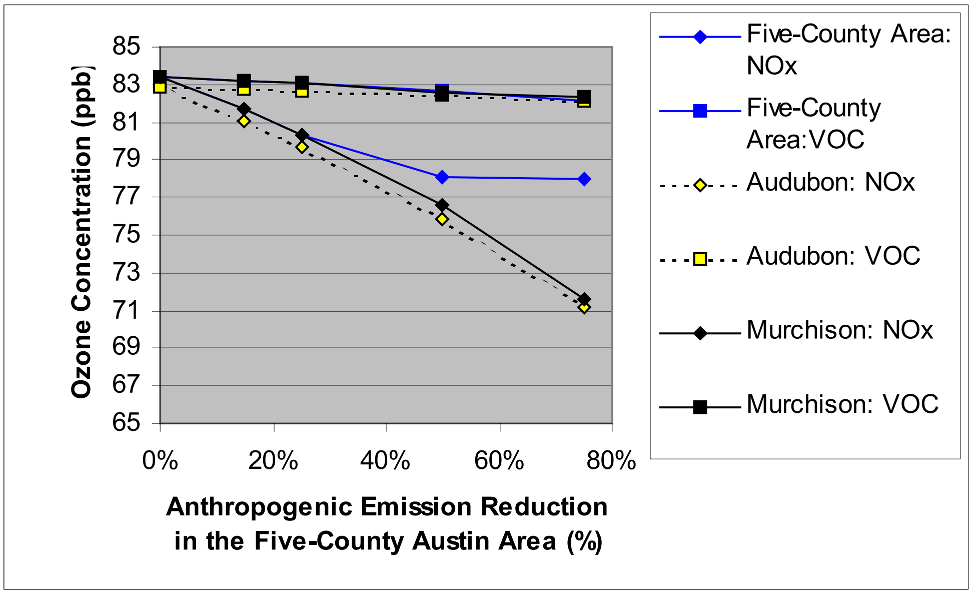


Figure 6. Maximum predicted 8-hour ozone concentrations on September 20 as function of anthropogenic NOx or VOC emissions reductions in the five-county Austin area. Results are shown for the maximum predicted daily 8-hour ozone concentrations in the five-county Austin area and the maximum predicted daily 8-hour ozone concentrations in 7x7 grids around Austin's CAMS3 monitor at Murchison Middle School. Maximum predicted ozone concentrations at Austin's CAMS25 at Audubon did not exceed 70 ppb on September 20.

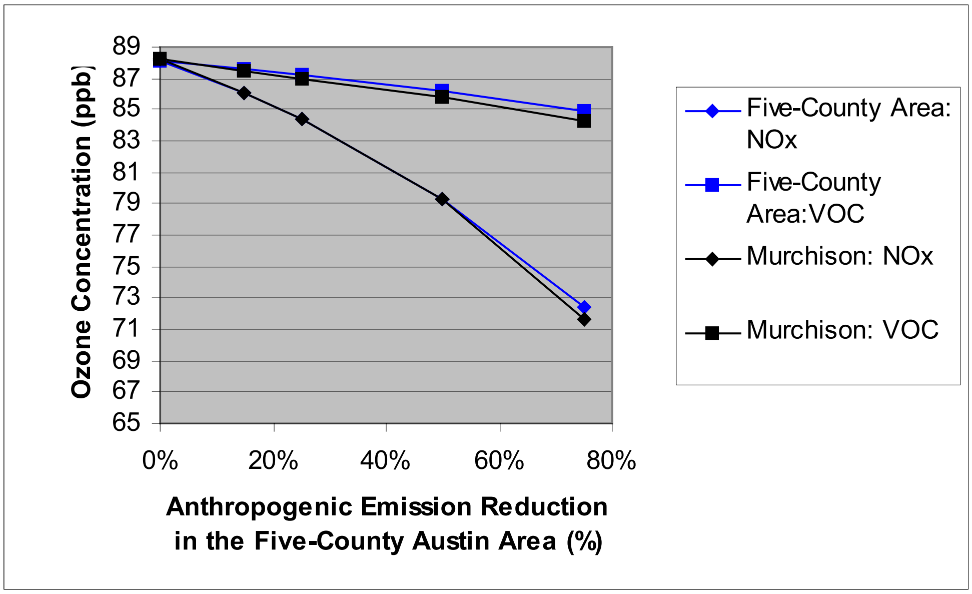


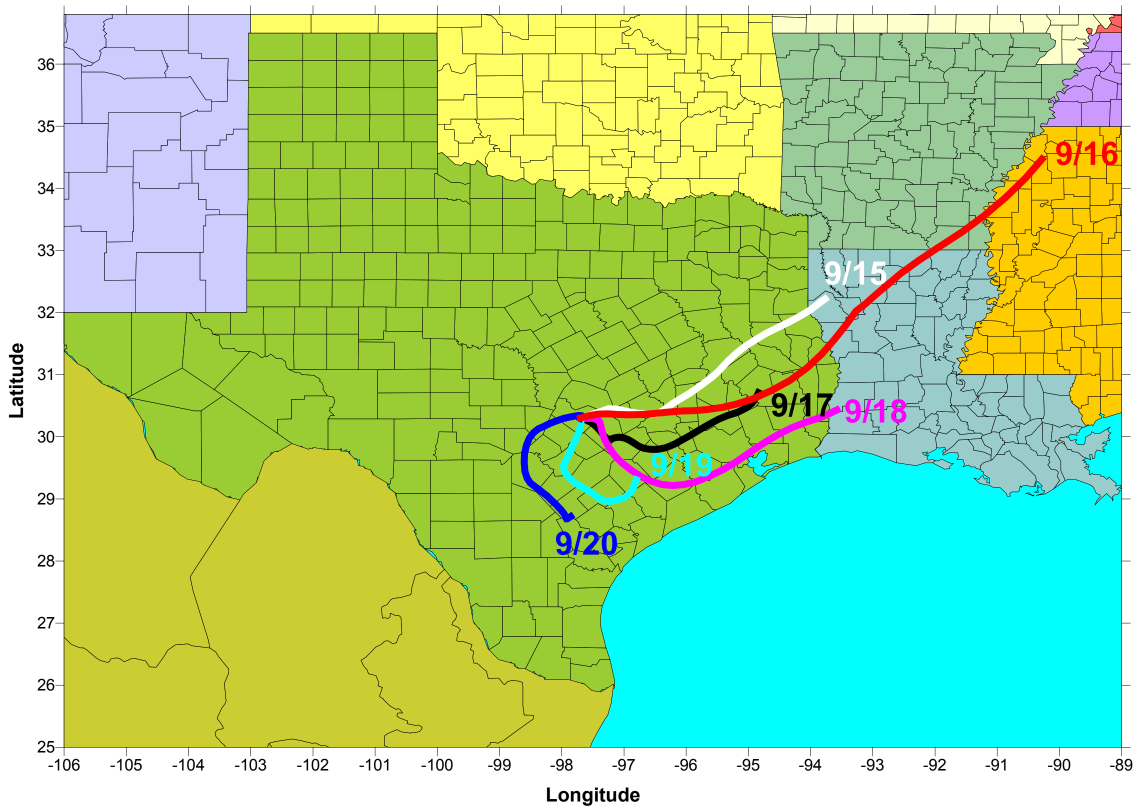
Table 5a. Impacts of eliminating ('zeroing') anthropogenic emissions in non-attainment and near non-attainment areas in eastern Texas on air quality in the Austin area. Peak predicted 8-hour ozone concentrations from the Future Case ('Initial') and the zero-out simulation ('Zero') are shown, as well as the maximum difference in 8-hour ozone concentrations ('MaxD') between the two cases within the five-county Austin area.

		Zero-out Austin			Zero-out San Antonio			Zero-out Victoria			Zero-out Corpus Christi			Zero-out Houston			Zero-out Beaumont			Zero-out Dallas			Zero-out Tyler		
	Day	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**
1-hr avg. O_3 Conc. (ppb)	070915	88	78	26	88	88	1	88	88	0	88	88	0	88	88	1	88	88	0	88	88	0	88	88	11
	070916	78	74	16	78	78	0	78	78	0	78	78	0	78	78	13	78	78	2	78	78	0	78	78	10
	070917	94	87	31	94	94	2	94	94	0	94	94	0	94	93	17	94	93	2	94	94	1	94	94	7
	070918	92	89	37	92	92	3	92	92	0	92	92	0	92	91	16	92	92	2	92	92	0	92	92	1
	070919	97	86	32	97	96	20	97	97	10	97	97	0	97	93	18	97	97	2	97	97	0	97	97	0
	070920	95	77	36	95	95	11	95	95	8	95	95	5	95	94	6	95	95	2	95	95	5	95	95	1
8-hr avg. O_3 Conc. (ppb)	070915	77	70	16	77	77	0	77	77	0	77	77	0	77	77	0	77	77	0	77	77	0	77	77	6
	070916	75	70	13	75	75	0	75	75	0	75	75	0	75	75	9	75	75	2	75	75	0	75	75	6
	070917	82	79	22	82	82	1	82	82	0	82	82	0	82	82	12	82	82	2	82	82	1	82	82	6
	070918	80	72	24	80	80	2	80	80	1	80	80	0	80	79	15	80	80	2	80	80	0	80	79	1
	070919	83	78	19	83	83	14	83	83	4	83	83	2	83	79	15	83	83	2	83	83	0	83	83	0
	070920	88	70	29	88	88	7	88	88	4	88	88	4	88	87	5	88	88	2	88	88	1	88	88	0

Table 5b. Impacts of eliminating ('zeroing') anthropogenic emissions in eastern Texas, Louisiana, and Missouri, respectively, on air quality in the Austin area. Peak predicted 8-hour ozone concentrations from the Future Case ('Initial') and the zero-out simulation ('Zero') are shown, as well as the maximum difference in 8-hour ozone concentrations ('MaxD') between the two cases within the five-county Austin area.

		Zero-Out Texas			Zero-Out Louisiana			Zero-Out Missouri		
	Day	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**	**Initial**	**Zero**	**MaxD**
1-hr avg. O_3 Conc. (ppb)	070915	88	61	32	88	84	9	88	87	2
	070916	78	58	21	78	76	9	78	77	3
	070917	94	64	39	94	90	9	94	92	3
	070918	92	60	43	92	91	8	92	91	2
	070919	97	61	44	97	95	5	97	97	1
	070920	95	57	45	95	94	2	95	95	1
8-hr avg. O_3 Conc. (ppb)	070915	77	59	21	77	73	7	77	77	2
	070916	75	56	19	75	73	8	75	74	3
	070917	82	61	28	82	78	8	82	80	3
	070918	80	57	30	80	78	7	80	79	1
	070919	83	57	30	83	81	4	83	83	1
	070920	88	55	39	88	87	2	88	88	0

Figure 7. 32-Hour Back-Trajectories for September 15, 1999 through September 20, 1999



4. Relative Reduction Factors and Future Design Values for Emission Control Scenarios in the Austin Area

The *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS, U.S. EPA Office of Air Quality Planning and Standards, EPA-454/R-99-004, May 1999* describes a methodology for conducting an attainment test under the 8-hour ozone NAAQS. The methodology is dependent upon three critical elements:

1. Current design values (DV)
2. Relative reduction factors (RRFs)
3. Future design values (DV).

The methodology used to calculate relative reduction factors for Austin's 2007 Future Case model and emission control scenario evaluation is based on a protocol and software developed by ENVIRON. The implementation protocol submitted by ENVIRON has received approval from U.S. EPA's Office of Air Quality Planning and Standards. The protocol along with current design values for the Austin area are discussed in "Photochemical Modeling for Austin's Early Action Compact: Development of the September 13-20, 1999 Photochemical Model with 2007 Projected Emissions and Analysis of Future 8-Hour Ozone Design Values, submitted by The Capital Area Planning Council to the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency, March 2004". Portions of that discussion are repeated below for the sake of clarity.

4.1 Methodology

In accordance with U.S. EPA guidance, future design values for an area are determined by scaling base-year design values by relative reduction factors. The calculation is carried out for each monitor. In addition, a screening calculation is also carried out to identify grid cells with consistently high ozone and estimate scaled DVs for these screening cells. Screening cells were not identified from Austin's 2007 Future Case model. The attainment test is passed if all the future year scaled DVs are less than 85 ppb.

Relative reduction factors and future design values are calculated according to the following methodology for cells associated with monitor sites:

1. Find the daily maximum 8-hour ozone in an *n* x *n* block of cells (n =7 for a 4-km grid in accordance with U.S. EPA guidance) around each monitor for both the Base Case and Future Case. Repeat for each modeling day.
2. Exclude days when the Base Case daily maximum 8-hour ozone was below 70 ppb.
3. Average the daily maximum 8-hour ozone across days for the Base Case and Future Case, respectively.
4. Calculate the relative reduction factor:
   $$RRF = \frac{\text{average Future Case daily maximum ozone concentration}}{\text{average Base Case daily maximum ozone concentration}}$$
5. Calculate the predicted future design value
   Future DV = Current year DV x RRF.
6. Repeat 1-5 for each monitor

Austin had two CAMS stations in operation during 1999, the CAMS 3 site, located at Murchison Middle School and the CAMS 38 Audubon site, located about 18 miles northwest of downtown Austin. U.S. EPA guidance (1999) specifies that the current-year design value for the attainment test is the highest of (1) the design value for the three-years straddling the year of the most current emission inventory for the area or (2) the three-year period used for the non-attainment designation. Austin's most current emission inventory is for 1999, thus, the current design value would be based on ambient data collected during 1998-2000. The design value for the Murchison monitor based on ambient data for 1998-2000 is 87 ppb. The design value for the Audubon monitor for 1998-2000 is 89 ppb. The approach based on the three years used for the non-attainment designation would require the use of ambient data collected during 2001-2003. The design value for the Murchison monitor based on ambient data for 2001-2003 is 84 ppb. The design value for the Audubon monitor for 2001-2003 is 80 ppb. It is important to note that Austin would be designated as attainment based on data collected during 2001-2003. For purposes of this report, current design values are calculated using both the 1998-2000 and 2001-2003 periods, respectively, in accordance with U.S. EPA guidance.

4.2 Relative Reduction Factors and Future Design Values for Emission Control Scenarios

Figures 8-13 show differences in predicted daily maximum 8-hour averaged ozone concentrations between the case with all emission control measures that will be adopted for Austin's EAC and the 2007 Future Case with no local controls applied. Relative reduction factors and future design values for the 2007 Future Case and the emission control scenarios are shown in Table 6. Daily relative reduction factors for each monitor are shown in Tables 7 and 8, respectively.

Spatial distributions of differences between predicted daily maximum 8-hour ozone concentrations indicate that on some episode days, small disbenefits or increases in ozone concentrations with emission reductions, may occur in a small number of selected cells close to the urban core of Austin and near isolated point sources. These disbenefits do not appear to affect relative reduction factors near monitors (i.e., all RRFs indicate a reduction in ozone concentrations).

Austin is predicted to be on the cusp of attainment or non-attainment with the 8-hour NAAQS. However, these results are based on emission reductions in 2007 that are supposed to occur in Texas outside of the Austin area and in areas outside of Texas. If these reductions do not occur, the regional transport studies suggested that 8-hour ozone concentrations in the Austin area could possibly exceed the standard.

In recognition of these results, emission control strategies have been evaluated that will provide the Austin area with a margin of safety for attaining the standard. Control strategies assessed include a vehicle inspection and maintenance program, voluntary NOx reductions at local power plants beyond those already required by SB7, implementation of the Texas Emissions Reduction Program (TERP), a commute program, VOC controls on area sources, transportation emission reduction measures (TERMS), and idling restrictions on heavy-duty diesel engines. Although regional emission controls in eastern Texas may be beneficial for improving Austin area air quality, the area focused on the analysis and implementation of local emission control programs for their Early Action Compact. The results indicate that Austin's emission control program will facilitate its progress toward maintaining attainment with the 8-hour NAAQS and reducing population exposure to ozone.

Figure 8. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC).

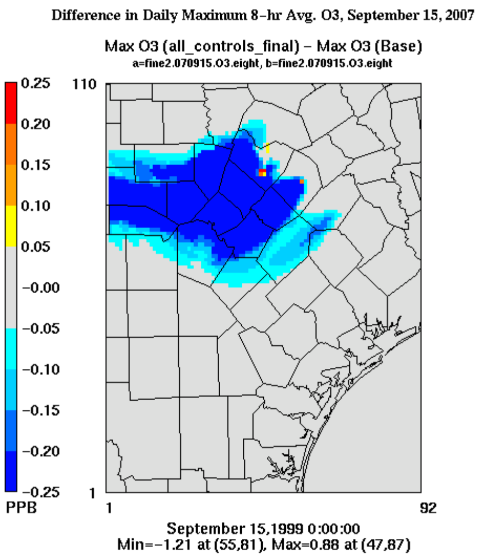


Figure 9. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC).

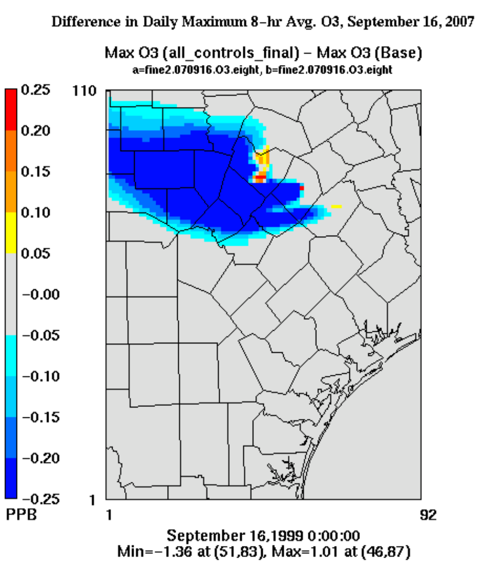


Figure 10. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC).

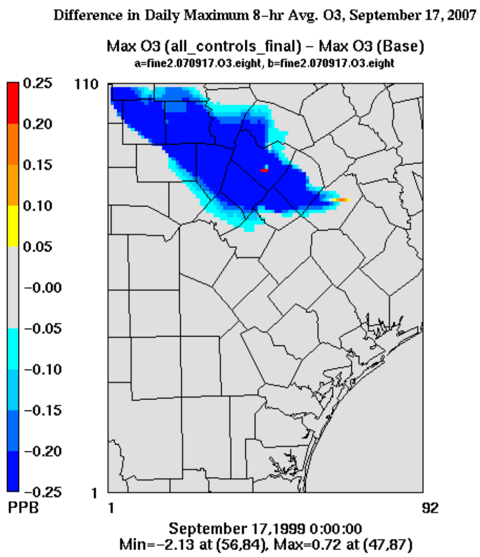


Figure 11. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC).

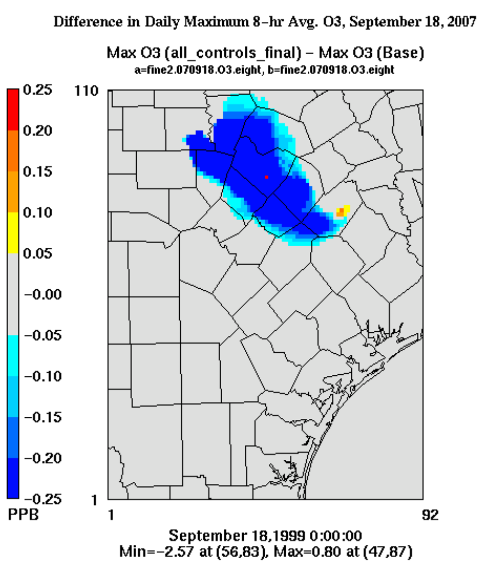


Figure 12. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC).

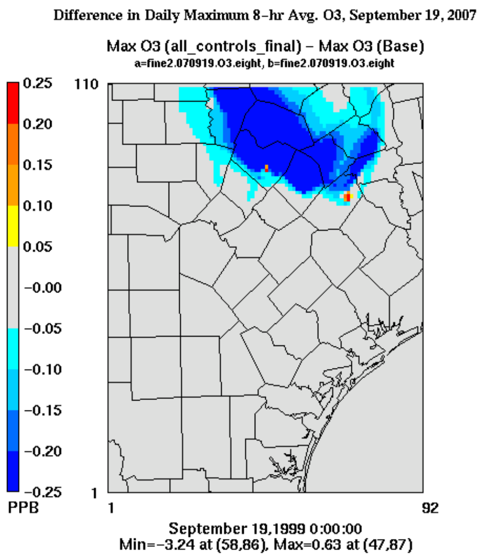


Figure 13. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with all emission controls applied for the Austin area excluding low RVP gasoline, I&M in Hays County, and the commute program (package adopted for Austin's EAC).

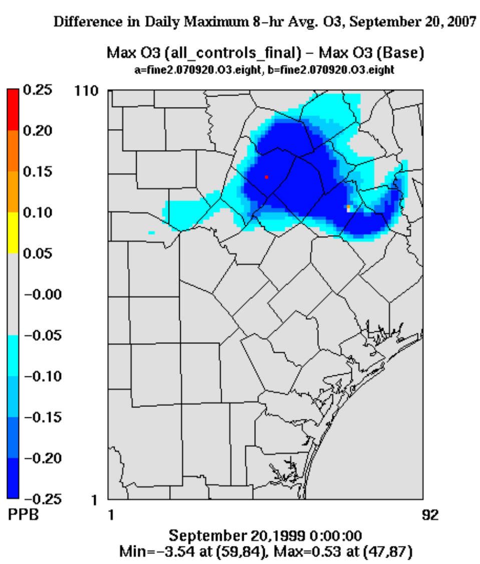


Table 6. Relative reduction factors and future design values at Austin's Murchison monitor. The final package adopted by the five-county Austin MSA and submitted to the TCEQ and the U.S. EPA is underlined. Note that future design values would be truncated based on the modeled attainment test protocol in the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999).

Emission Control Scenario	Modeled Average Base-Year Daily Maximum Ozone Concentration (ppbv)	Modeled Average Future-Year Daily Maximum Ozone Concentration (ppbv)	RRF	Current Design Value (ppbv)	Future Design Value (ppbv)*
2007 Future Case	84.6	80.2	0.948	87 (1998-2000) 84 (2000-2003)	82.48 (1998-2000) 79.63 (2000-2003)
Inspection & Maintenance Program in Travis and Williamson Counties (I&M)	84.6	79.9	0.944	87 (1998-2000) 84 (2000-2003)	82.13 (1998-2000) 79.30 (2000-2003)
Stationary Point Sources	84.6	79.8	0.943	87 (1998-2000) 84 (2000-2003)	82.04 (1998-2000) 79.21 (2000-2003)
Area Source VOC Controls and Low Reid Vapor Pressure Gasoline	84.6	80.0	0.945	87 (1998-2000) 84 (2000-2003)	82.22 (1998-2000) 79.38 (2000-2003)
Texas Emission Reduction Program (TERP)	84.6	80.1	0.947	87 (1998-2000) 84 (2000-2003)	82.39 (1998-2000) 79.55 (2000-2003)
All controls listed above excluding low RVP and I&M in Hays County	84.6	79.1	0.934	87 (1998-2000) 84 (2000-2003)	81.26 (1998-2000) 78.46 (2000-2003)

All controls listed above excluding low RVP and I&M in Hays County and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd	84.6	78.5	0.927	87 (1998-2000) 84 (2000-2003)	80.65 (1998-2000) 77.87 (2000-2003)
All controls listed above excluding low RVP gasoline and I&M in Hays County, and commute program reductions	84.6	79.1	0.934	87 (1998-2000) 84 (2000-2003)	81.26 (1998-2000) 78.46 (2000-2003)
All controls listed above excluding low RVP gasoline and I&M in all counties	84.6	79.4	0.938	87 (1998-2000) 84 (2000-2003)	81.61 (1998-2000) 78.79 (2000-2003)
Doubling point source emissions of VOCs in the Austin area	84.6	80.3	0.949	87 (1998-2000) 84 (2000-2003)	82.56 (1998-2000) 79.72 (2000-2003)

*Note that future design values would be truncated based on the modeled attainment test protocol in the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999).

Table 7. Relative reduction factors and future design values at Austin's Audubon monitor. The final package adopted by the five-county Austin MSA and submitted to the TCEQ and the U.S. EPA is underlined. Note that future design values would be truncated based on the modeled attainment test protocol in the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999).

Emission Control Scenario	Modeled Average Base-Year Daily Maximum Ozone Concentration (ppbv)	Modeled Average Future-Year Daily Maximum Ozone Concentration (ppbv)	RRF	Current Design Value (ppbv)	Future Design Value (ppbv)
2007 Future Case	81.0	76.7	0.948	89 (1998-2000) 80 (2000-2003)	84.37 (1998-2000) 75.84 (2000-2003)
Inspection & Maintenance Program (I&M) in Travis and Williamson Counties	81.0	76.4	0.944	89 (1998-2000) 80 (2000-2003)	84.02 (1998-2000) 75.52 (2000-2003)
Stationary Point Sources	81.0	76.5	0.944	89 (1998-2000) 80 (2000-2003)	84.02 (1998-2000) 75.52 (2000-2003)
Area Source VOC Controls and Low Reid Vapor Pressure Gasoline	81.0	76.6	0.946	89 (1998-2000) 80 (2000-2003)	84.19 (1998-2000) 75.68 (2000-2003)
Texas Emission Reduction Program (TERP)	81.0	76.6	0.946	89 (1998-2000) 80 (2000-2003)	84.19 (1998-2000) 75.68 (2000-2003)
All controls listed above excluding low RVP and I&M in Hays County	81.0	75.8	0.937	89 (1998-2000) 80 (2000-2003)	83.39 (1998-2000) 74.96 (2000-2003)
All controls listed above excluding low RVP and I&M in Hays County and with Alcoa emissions	81.0	75.3	0.930	89 (1998-2000) 80 (2000-2003)	82.77 (1998-2000) 74.40 (2000-2003)

reduced from 26.7 tpd to 4.44 tpd					
All controls listed above excluding low RVP gasoline and I&M in Hays County, and commute program reductions	81.0	75.9	0.937	89 (1998-2000) 80 (2000-2003)	83.39 (1998-2000) 74.96 (2000-2003)
All controls listed above excluding low RVP gasoline and I&M in all counties	81.0	76.1	0.940	89 (1998-2000) 80 (2000-2003)	83.66 (1998-2000) 75.20 (2000-2003)
Doubling point source emissions of VOCs in the Austin area	81.0	76.8	0.948	89 (1998-2000) 80 (2000-2003)	84.37 (1998-2000) 75.84 (2000-2003)

*Note that future design values would be truncated based on the modeled attainment test protocol in the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS* (1999).

Table 8. Daily reduction factors at Austin's Murchison monitor. The final package adopted by the five-county Austin MSA and submitted to the TCEQ and the U.S. EPA is underlined

Emission Control Scenario	NOx Reduction (tpd)	VOC Reduction (tpd)	Daily RRF					
			9/15	9/16	9/17	9/18	9/19	9/20
2007 Future Case	None	None	0.964	0.964	0.947	0.945	0.931	0.942
Inspection & Maintenance Program (I&M)	2.89	3.84	0.962	0.964	0.943	0.939	0.927	0.937
Stationary Point Sources	7.08	None	0.963	0.964	0.945	0.934	0.922	0.935
Area Source VOC Controls and Low Reid Vapor Pressure Gasoline	None	17.81	0.962	0.963	0.944	0.94	0.929	0.937
Texas Emission Reduction Program (TERP)	2.00	None	0.963	0.964	0.946	0.943	0.93	0.94
All controls listed above excluding low RVP and I&M in Hays County	13.15	19.91	0.957	0.963	0.936	0.921	0.913	0.922
All controls listed above excluding low RVP and I&M in Hays County and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd	35.37	19.91	0.949	0.934	0.929	0.921	0.913	0.922
<u>All controls listed above excluding low RVP gasoline and I&M in Hays County, and commute program reductions</u>	12.88	19.61	0.957	0.963	0.936	0.922	0.914	0.923
All controls listed above excluding low RVP gasoline and I&M in all counties	10.26	16.07	0.959	0.963	0.94	0.927	0.918	0.927
Doubling point source emissions of VOCs in the Austin area	-	-	0.965	0.964	0.948	0.946	0.932	0.943

Table 9. Daily reduction factors at Austin's Audubon monitor. The final package adopted by the five-county Austin MSA and submitted to the TCEQ and the U.S. EPA is underlined

Emission Control Scenario	NOx Reduction (tpd)	VOC Reduction (tpd)	Daily RRF					
			9/15	9/16	9/17	9/18	9/19	9/20
2007 Future Case	None	None	0.968	0.954	0.94	0.933	0.928	0.972
Inspection & Maintenance Program (I&M)	2.89	3.84	0.965	0.952	0.936	0.927	0.922	0.97
Stationary Point Sources	7.08	None	0.967	0.954	0.938	0.925	0.92	0.971
Area Source VOC Controls and Low Reid Vapor Pressure Gasoline	None	17.81	0.966	0.953	0.937	0.93	0.927	0.971
Texas Emission Reduction Program (TERP)	2.00	None	0.966	0.953	0.938	0.931	0.926	0.97
All controls listed above excluding low RVP and I&M in Hays County	13.15	19.91	0.962	0.95	0.929	0.912	0.911	0.966
All controls listed above excluding low RVP and I&M in Hays County and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd	35.37	19.91	0.954	0.923	0.922	0.911	0.911	0.965
<u>All controls listed above excluding low RVP gasoline and I&M in Hays County, and commute program reductions</u>	12.88	19.61	0.962	0.95	0.929	0.913	0.912	0.966
All controls listed above excluding low RVP gasoline and I&M in all counties	10.26	16.07	0.964	0.951	0.933	0.919	0.917	0.968
Doubling point source emissions of VOCs in the Austin area	-	-	0.968	0.954	0.941	0.934	0.928	0.972

5. References

Capital Area Planning Council, in preparation for submission in December 2003. "Development of a 2007 Emission Inventory for the Austin Metropolitan Area." To be submitted to the United States Environmental Protection Agency and the Texas Commission on Environmental Quality.

United States Environmental Protection Agency. 2003. "Protocol for Early Action Compacts Designed to Achieve and Maintain the 8-Hour Ozone Standard." U.S. Environmental Protection Agency, Research Triangle Park, NC.

United States Environmental Protection Agency. 1999. "Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS, EPA 454/R-99-004, U.S. Environmental Protection Agency, Research Triangle Park, NC. May 1999.

University of Texas at Austin. 2004. "Development of the September 13-20, 1999 Base Case Photochemical Model for Austin's Early Action Compact, submitted by The Capital Area Planning Council to the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency, March 2004 (original submission to the U.S. EPA, November 2003).

University of Texas at Austin. 2004. "Photochemical Modeling for Austin's Early Action Compact: Development of the September 13-20, 1999 Photochemical Model with 2007 Projected Emissions and Analysis of Future 8-Hour Ozone Design Values, submitted by The Capital Area Planning Council to the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency, March 2004 (original submission to the U.S. EPA December 2003).

Appendix A. Differences in Maximum Predicted Daily 8-hour Averaged Ozone Concentrations Between the 2007 Future Case with No Local Controls Applied and with Emission Control Scenarios Under Evaluation by the Austin MSA

Appendix A includes ozone isopleth maps showing differences in maximum predicted daily 8-hour averaged ozone concentrations between the 2007 Future Case with no local controls applied and with emission control scenarios under evaluation by the Austin MSA. The following figures/scenarios have been included:

Figure No.	**Emission Control Scenario**
A.1-A.6	I&M programs in Travis and Williamson Counties only
A.7-A12	Voluntary point source reductions in the Austin area
A.13-A.18	TERP implementation in the Austin area
A.19-A.24	Area source VOC reductions in the Austin area
A.25-A.30	All controls excluding low RVP gasoline and I&M in Hays County
A.31-A.36	All controls excluding low RVP gasoline and I&M in Hays County and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd
A.37-A.42	<u>All controls excluding low RVP gasoline, I&M in Hays County, and commute program reductions</u>
A.43-A.48	All controls excluding low RVP gasoline and I&M in all counties
A.49-A54	Doubling VOC emissions form point sources in the Austin area

The final package of emission controls adopted for Austin's EAC is underlined above.

Figure A.1. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with I&M programs in Travis and Williamson Counties.

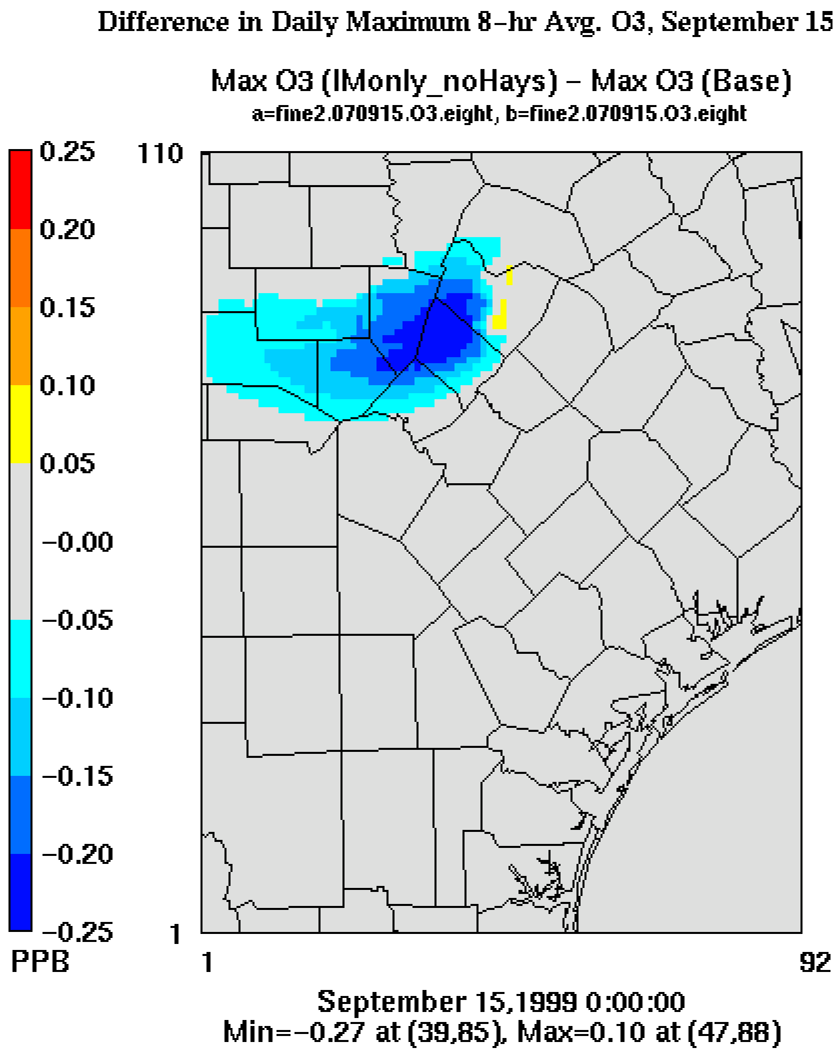


Figure A.2. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with I&M programs in Travis and Williamson Counties.

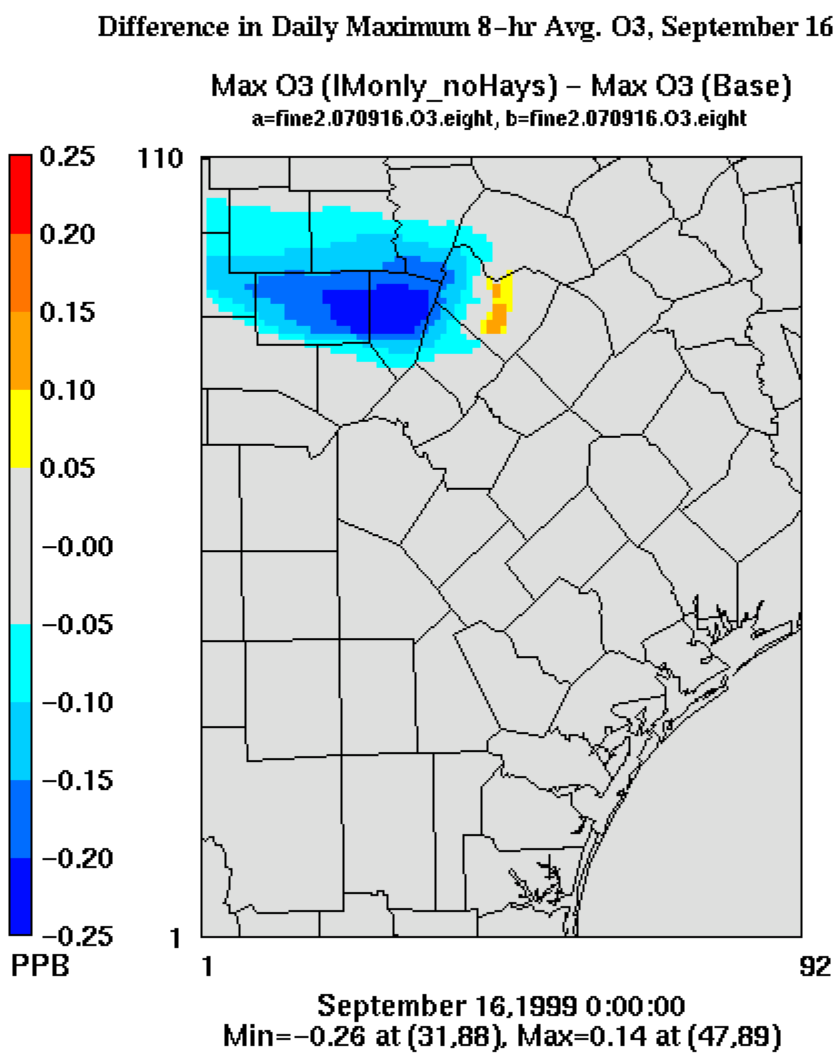


Figure A.3. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with I&M programs in Travis and Williamson Counties.

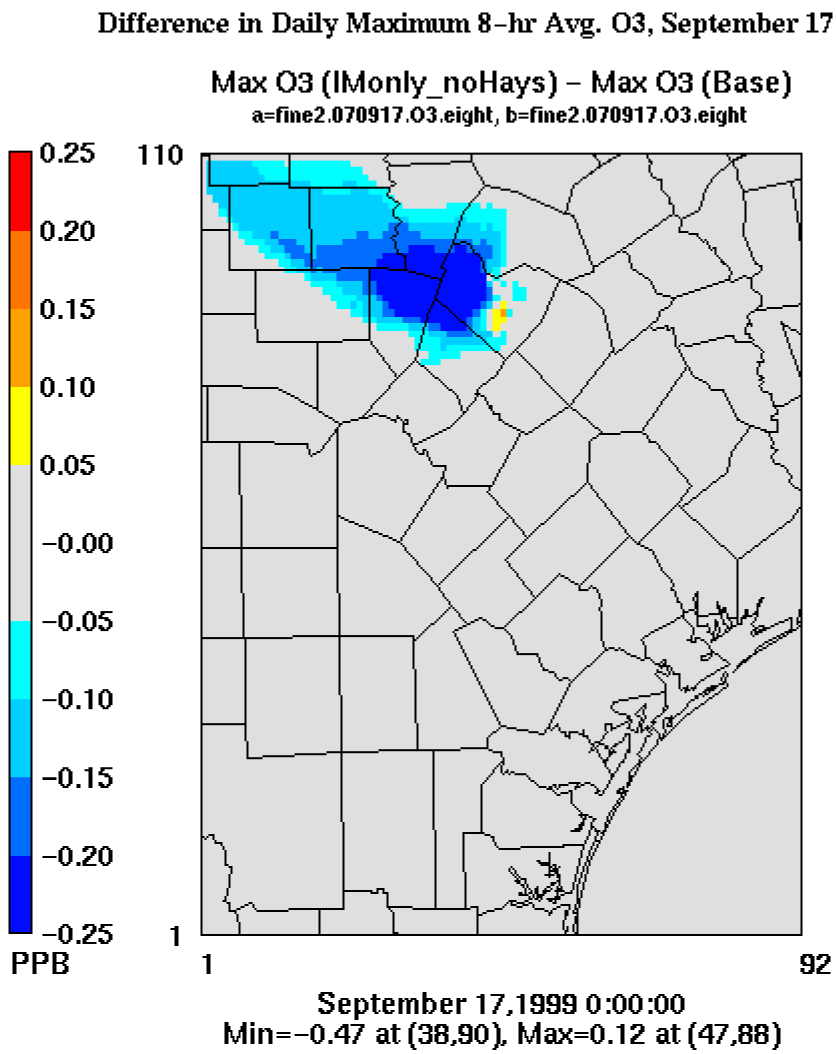


Figure A.4. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with I&M programs in Travis and Williamson Counties.

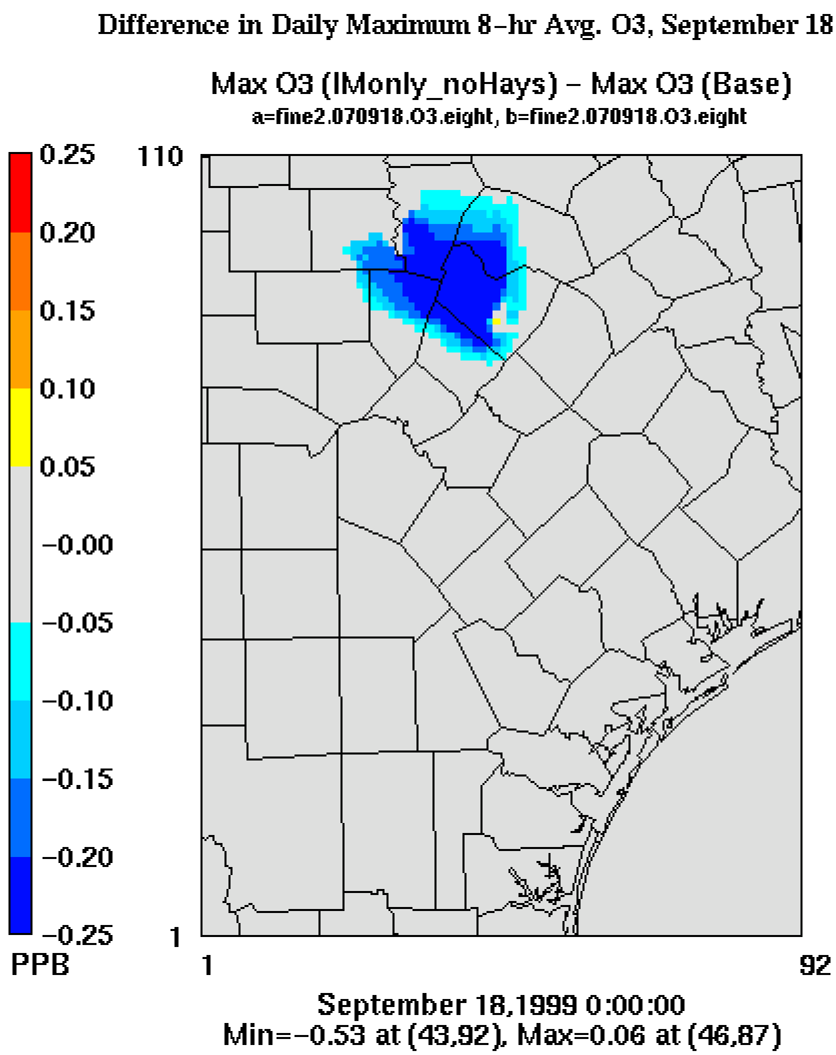


Figure A.5. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with I&M programs in Travis and Williamson Counties.

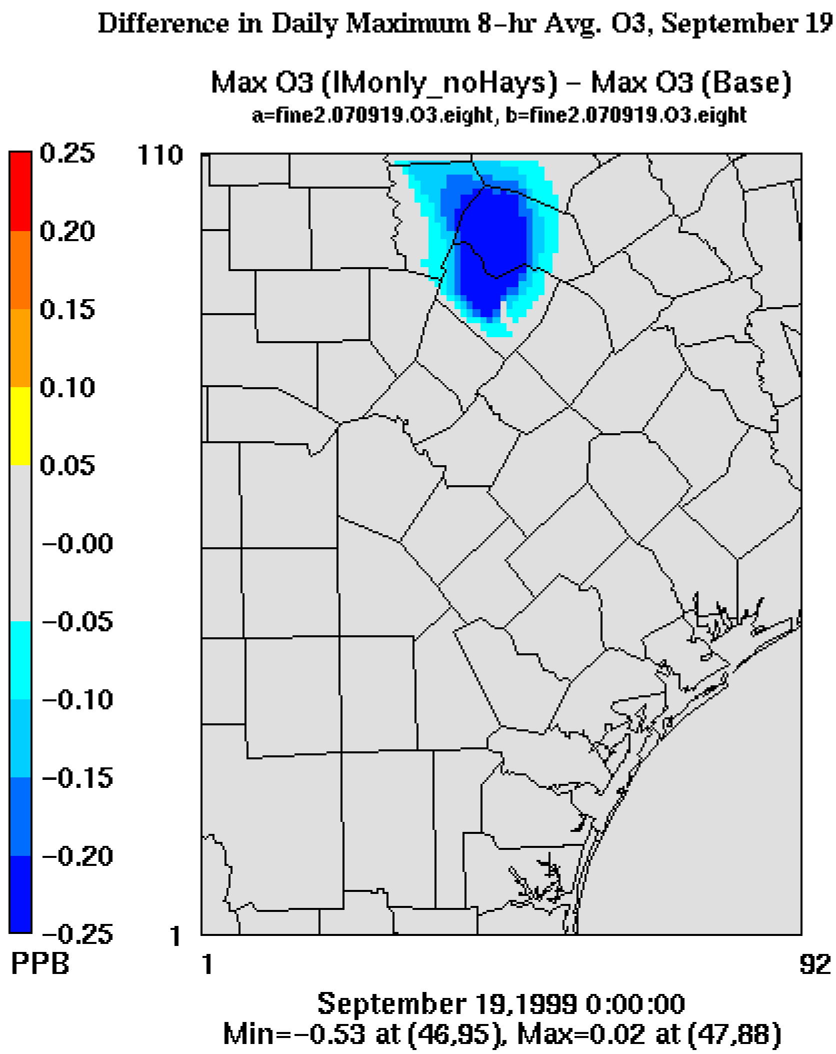


Figure A.6. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with I&M programs in Travis and Williamson Counties.

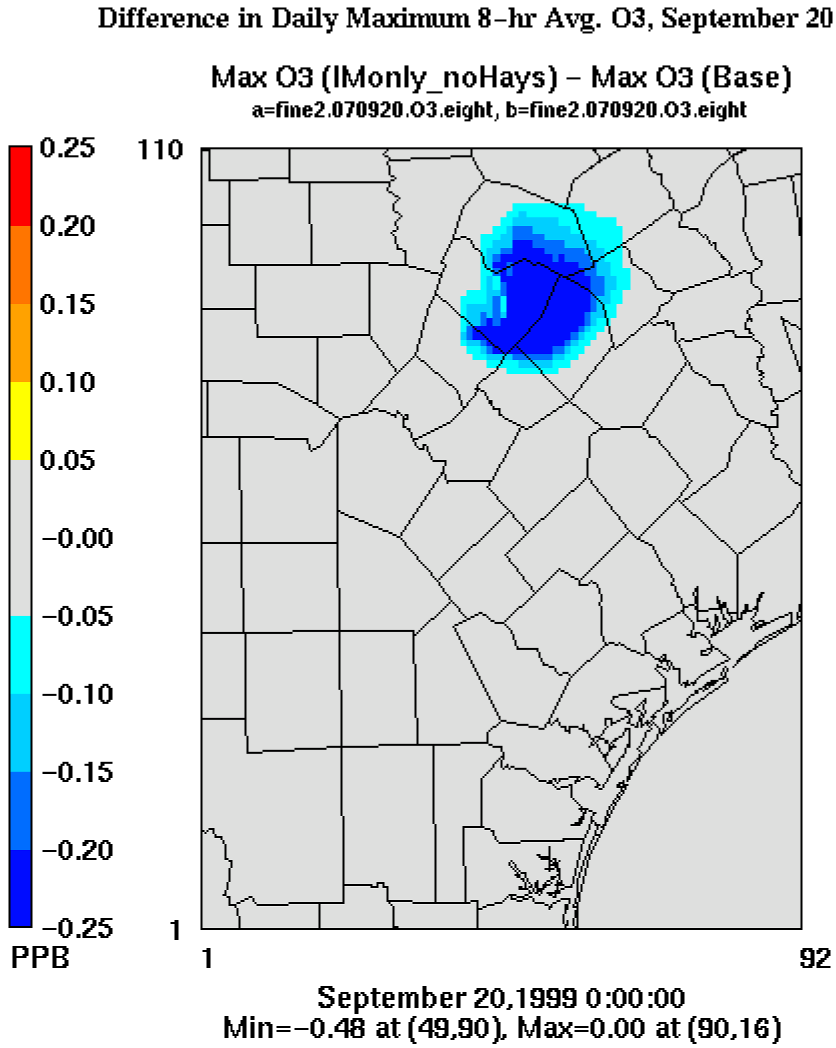


Figure A.7. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with voluntary point source reductions in the Austin area.

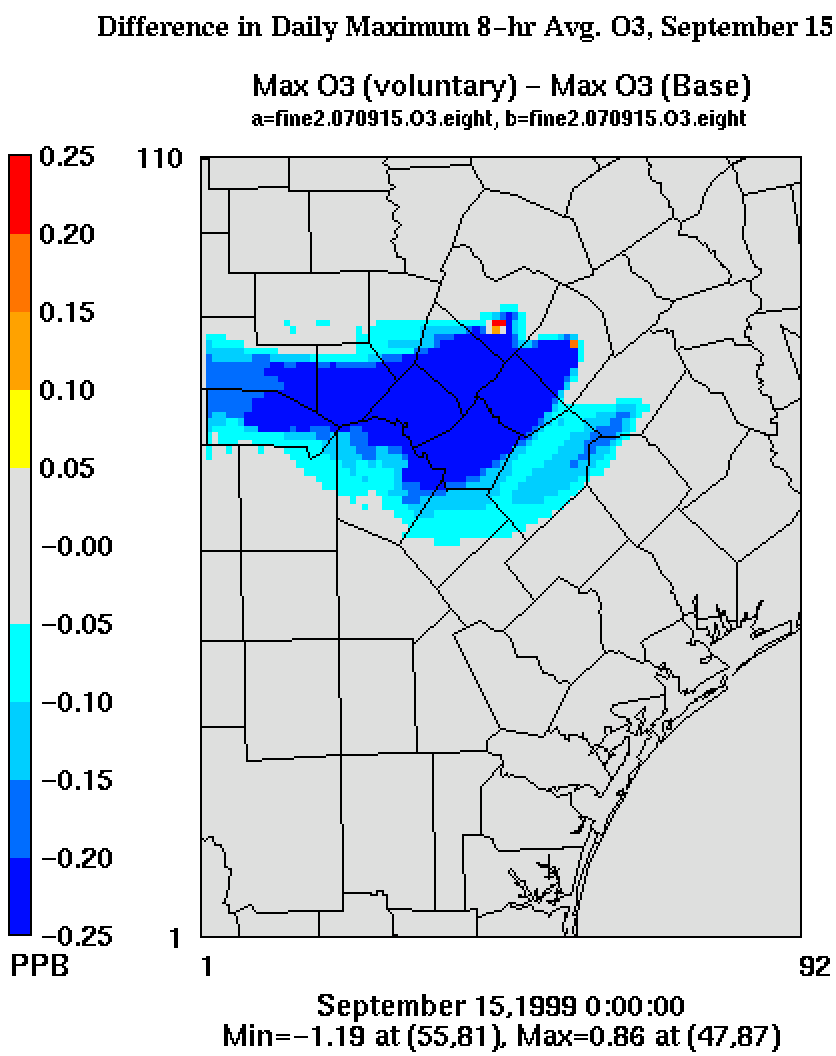


Figure A.8. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with voluntary point source reductions in the Austin area.

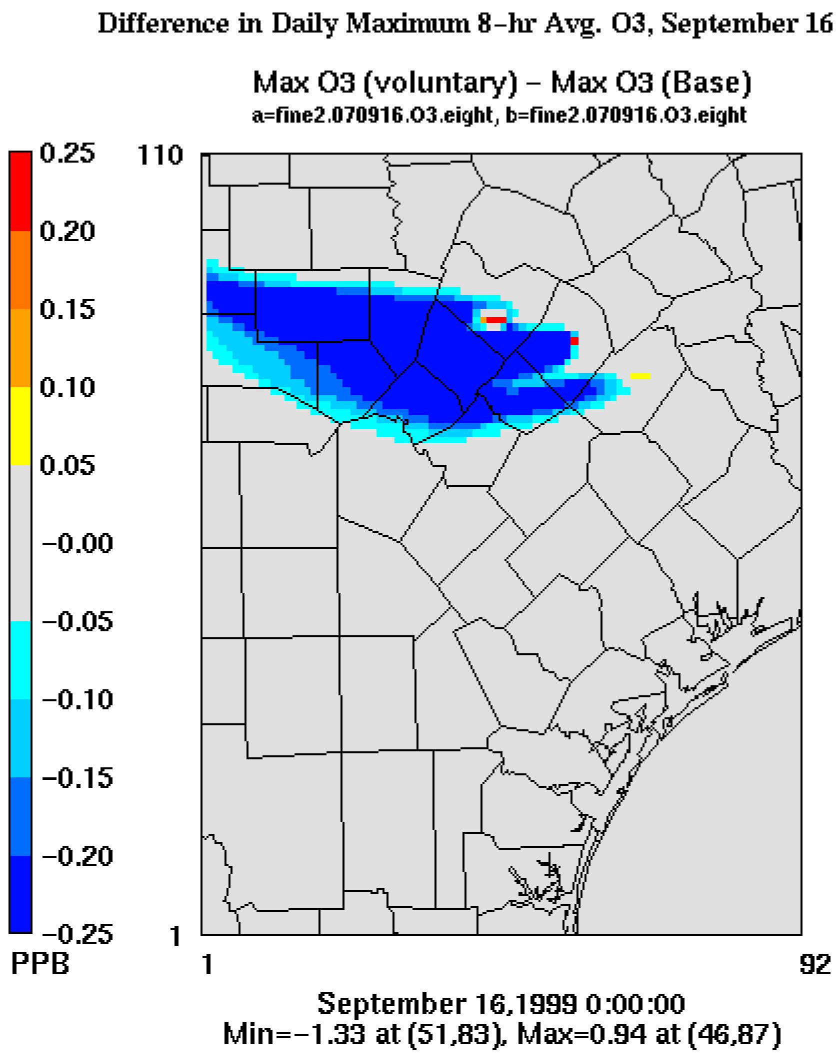


Figure A.9. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with voluntary point source reductions in the Austin area.

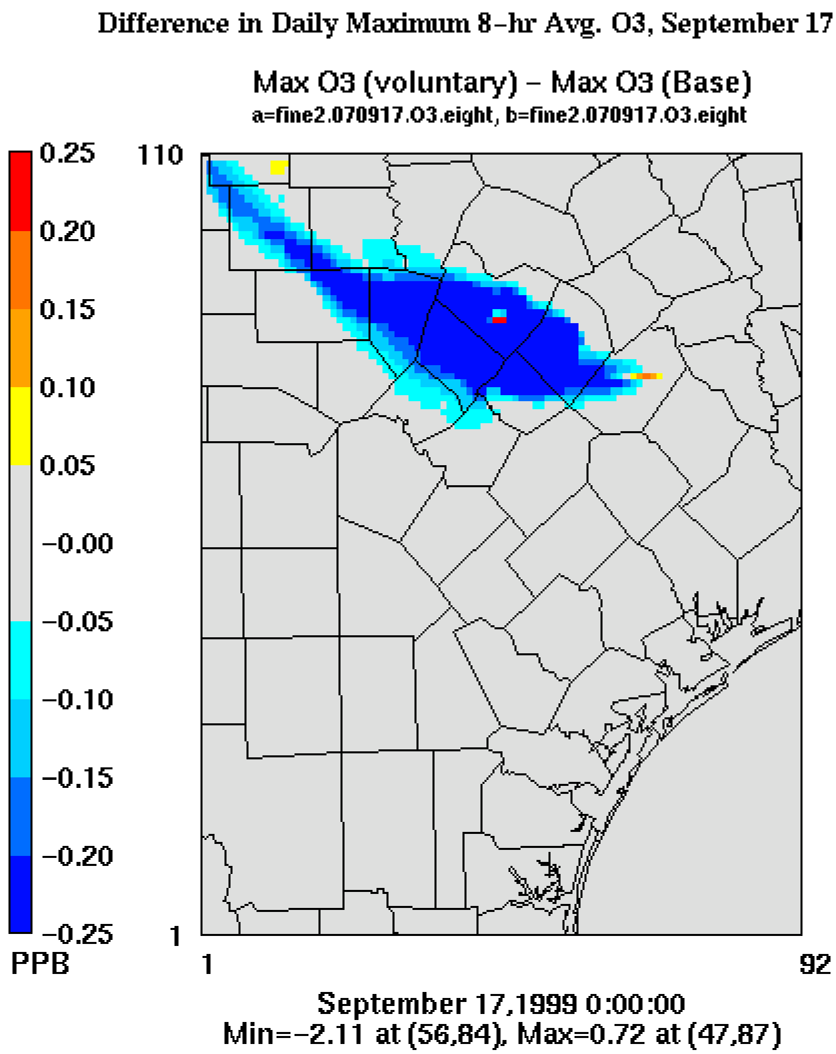


Figure A.10. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with voluntary point source reductions in the Austin area.

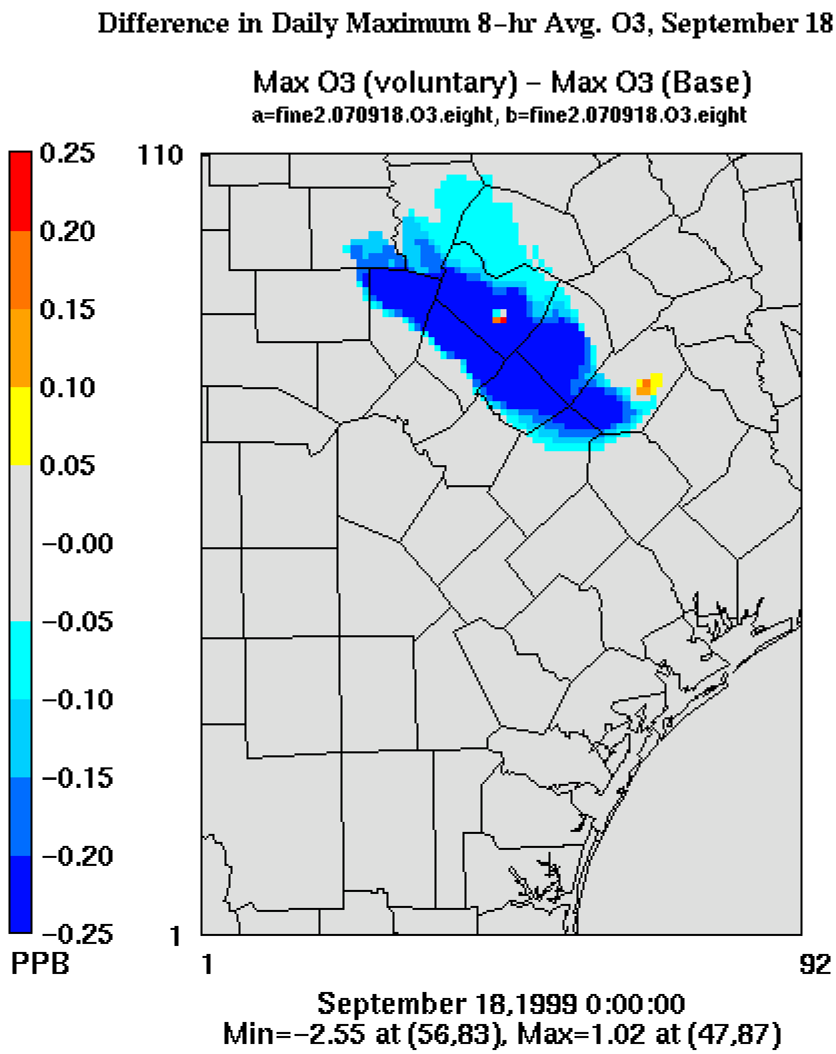


Figure A.11. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with voluntary point source reductions in the Austin area.

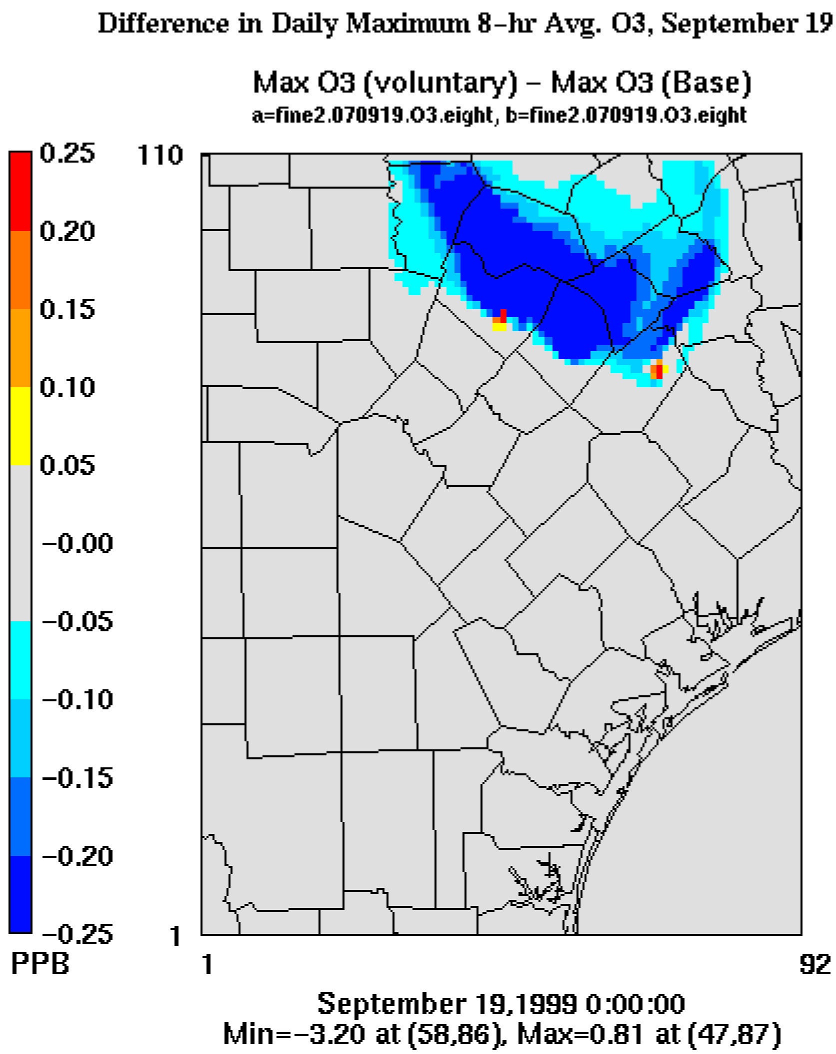


Figure A.12. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with voluntary point source reductions in the Austin area.

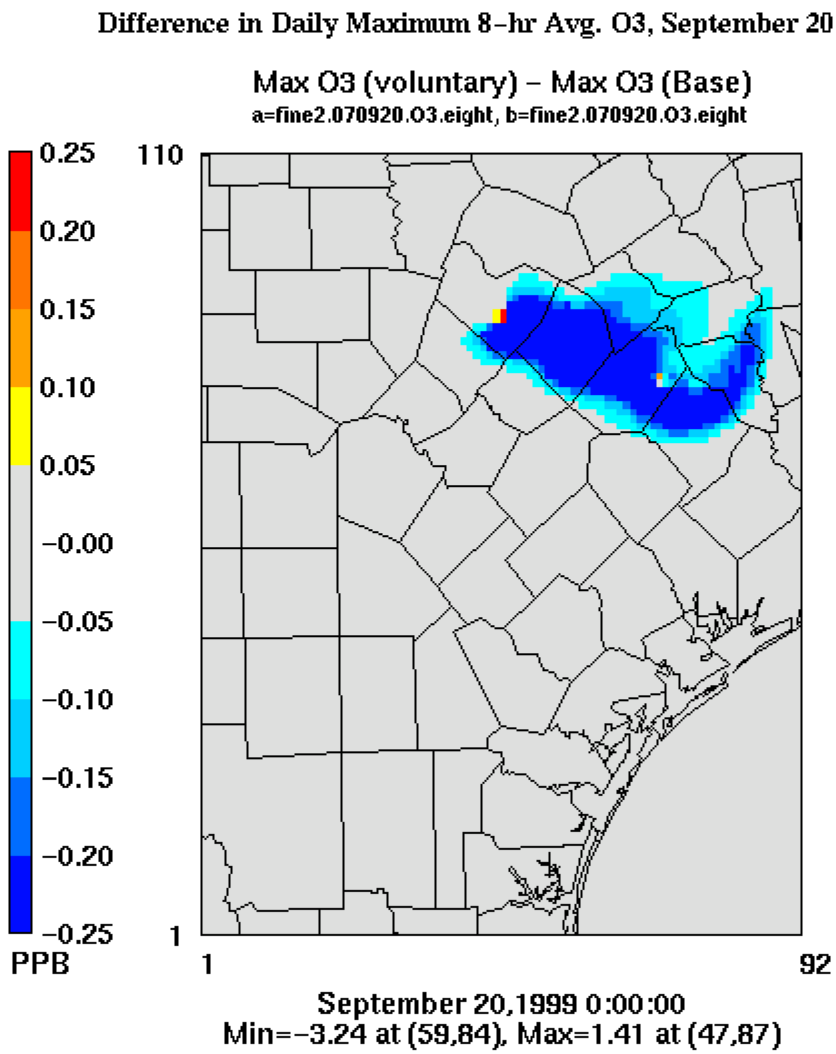


Figure A.13. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with the TERP program in the Austin area.

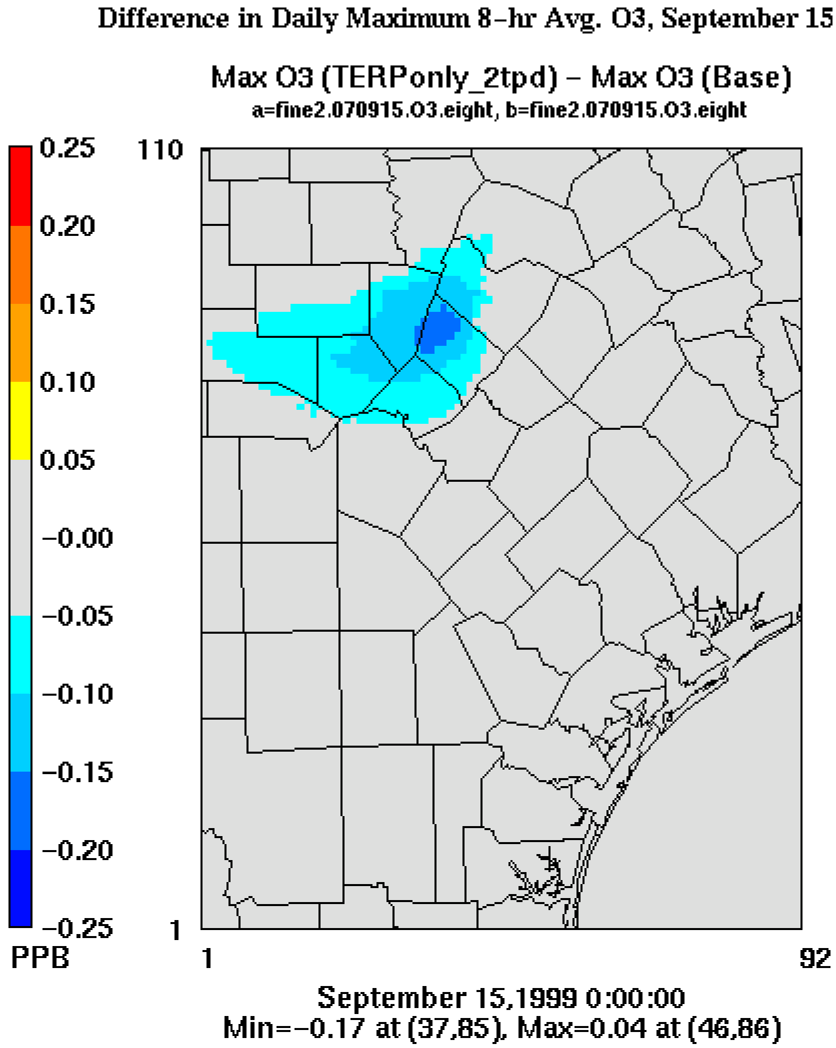


Figure A.14. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with the TERP program in the Austin area.

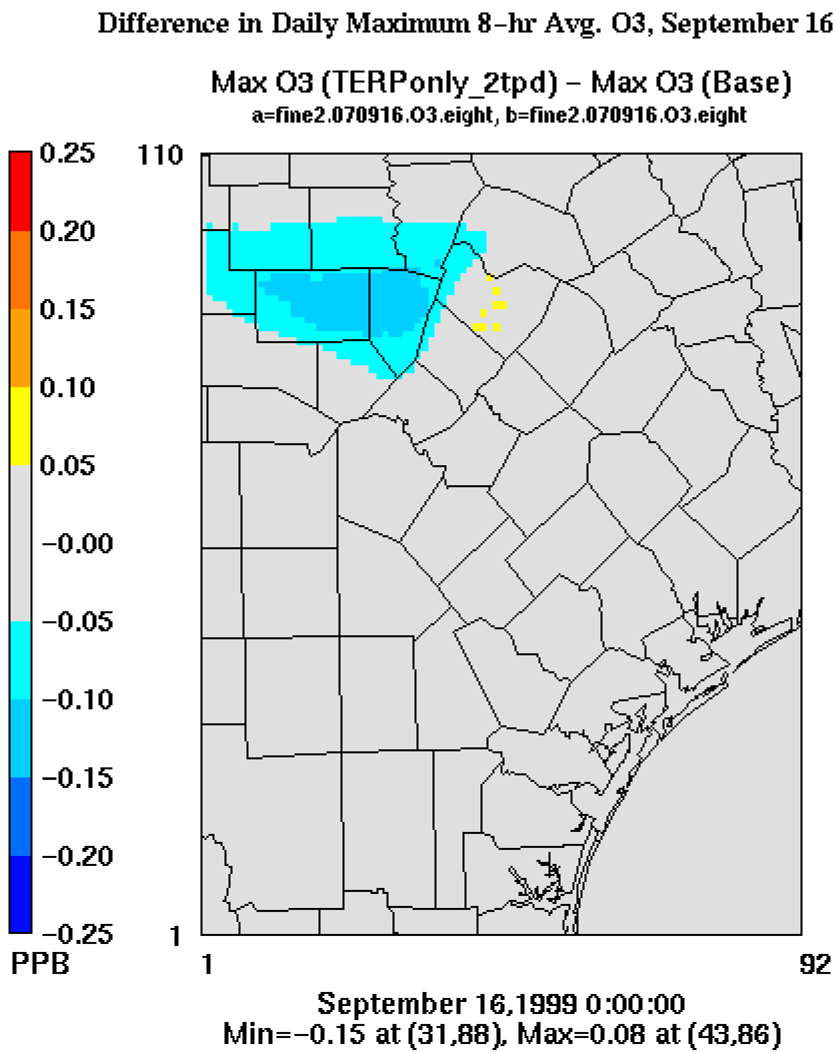


Figure A.15. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with the TERP program in the Austin area.

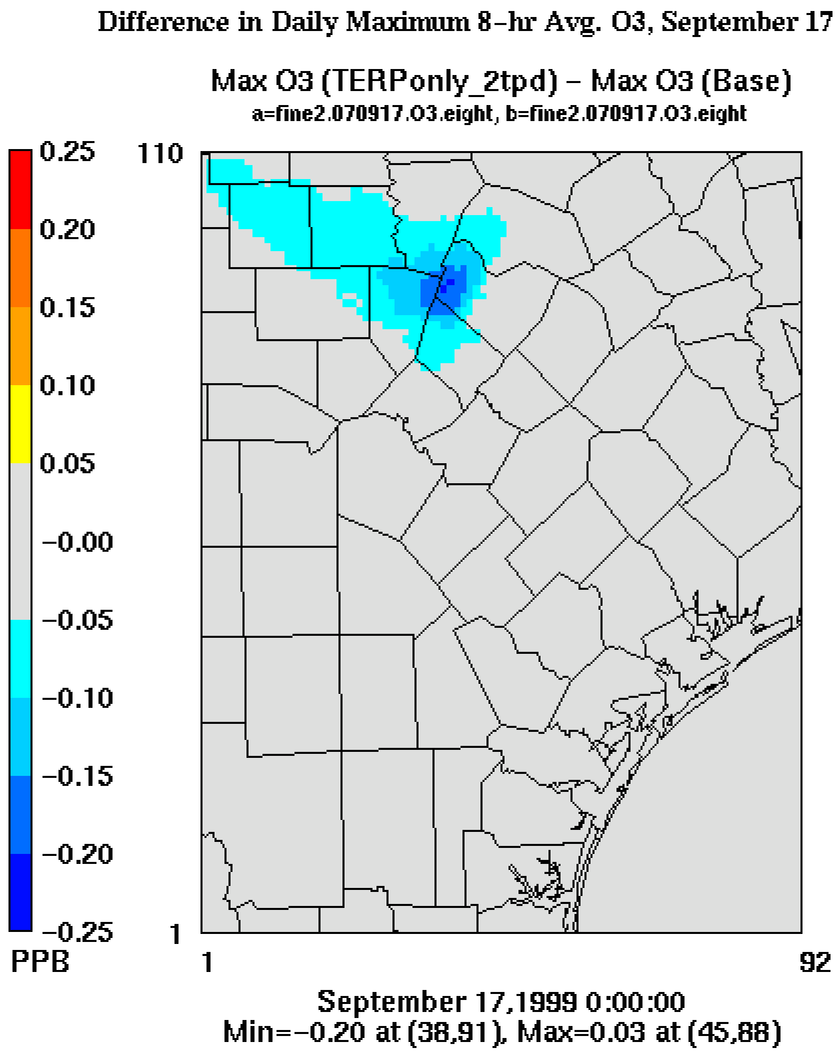


Figure A.16. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with the TERP program in the Austin area.

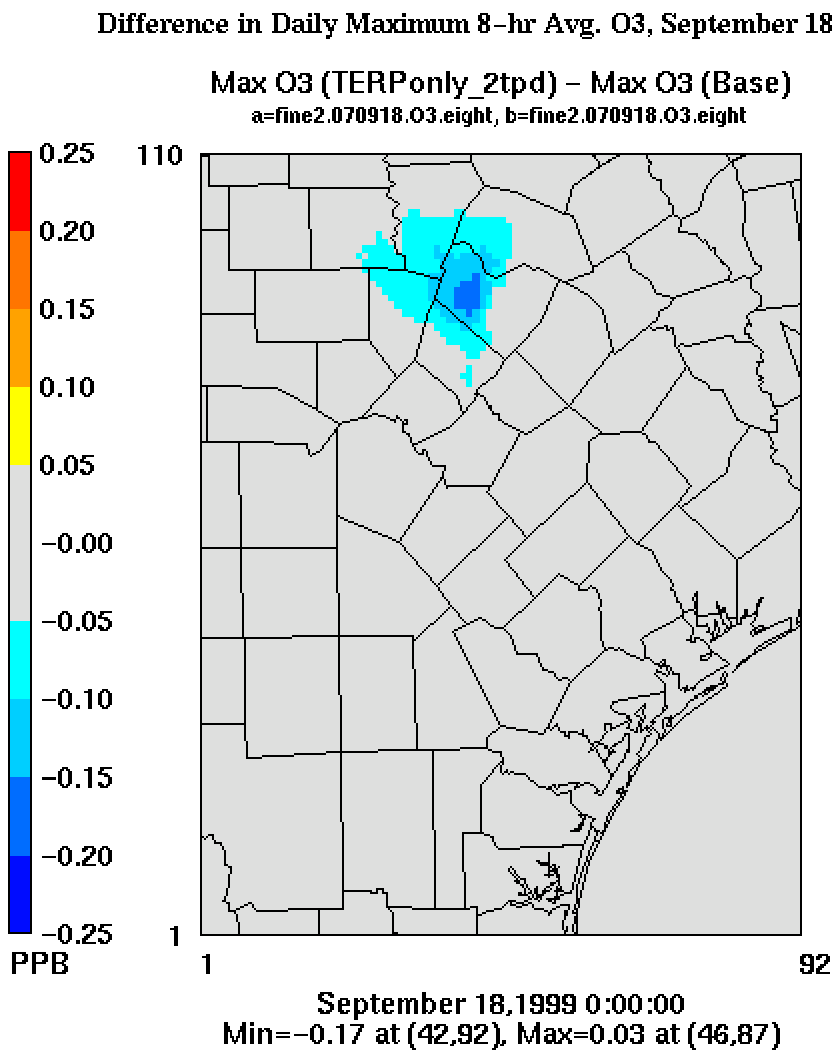


Figure A.17. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with the TERP program in the Austin area.

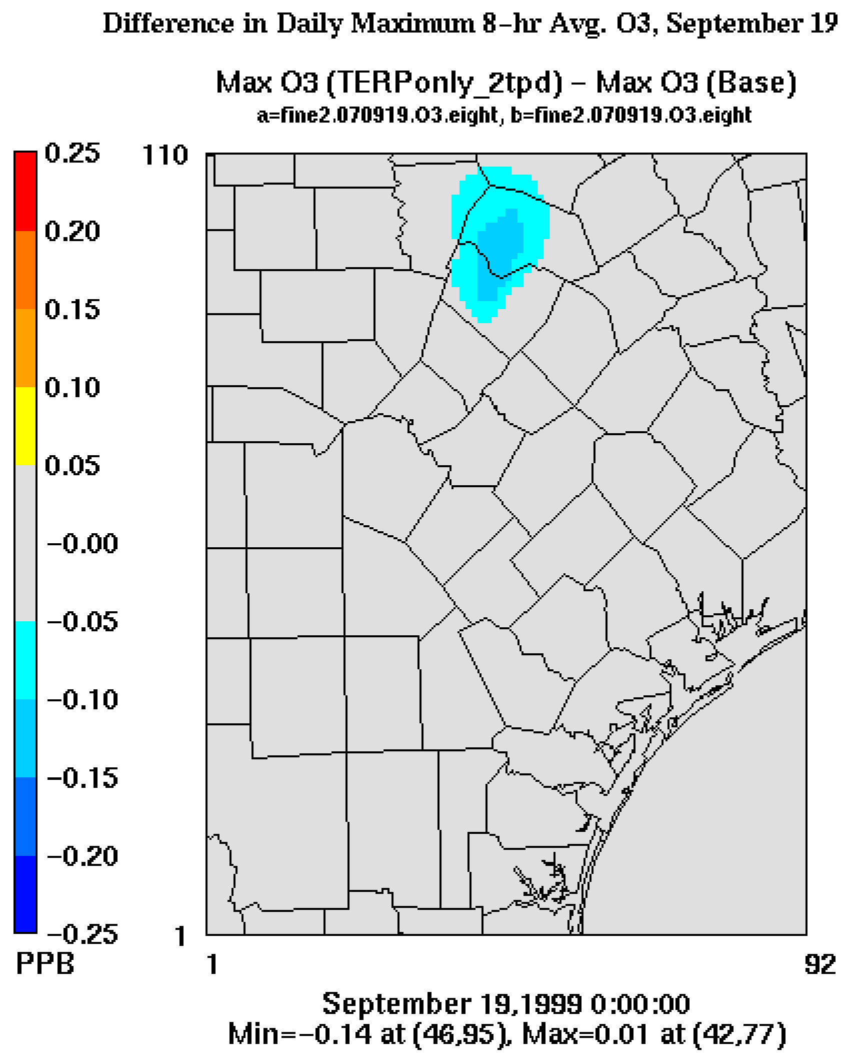


Figure A.18. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with the TERP program in the Austin area.

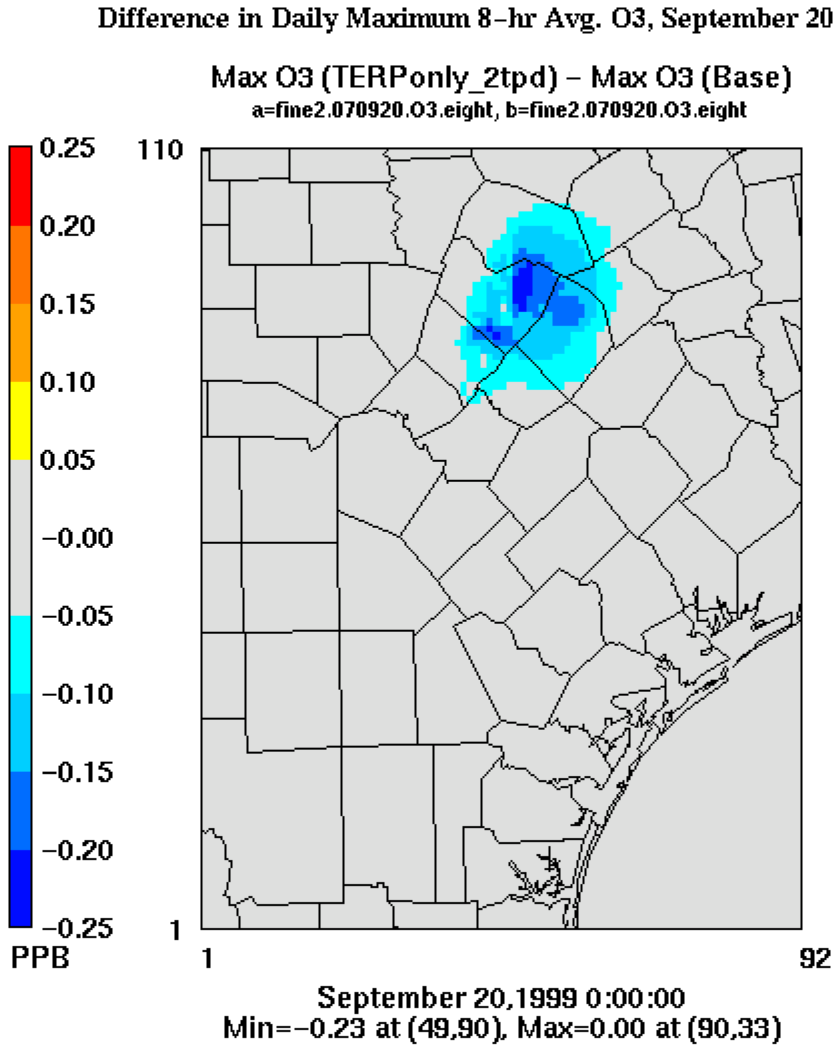


Figure A.19. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with area source VOC reductions in the Austin area.

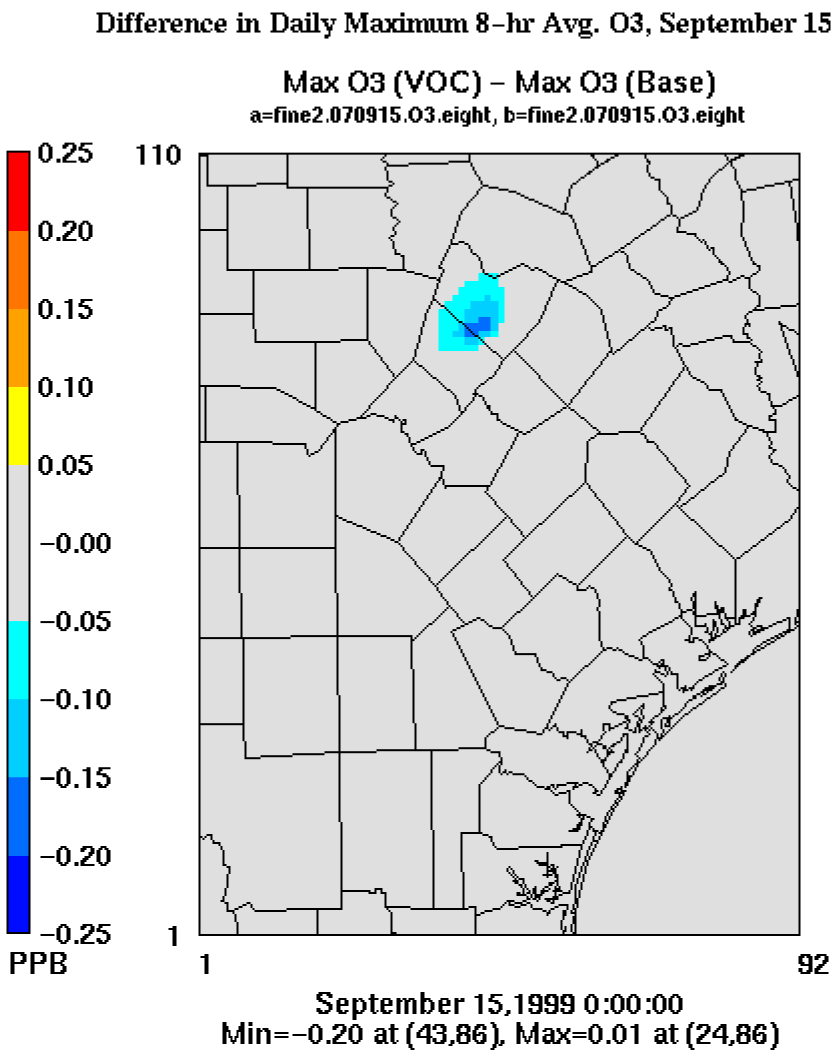


Figure A.20. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with area source VOC reductions in the Austin area.

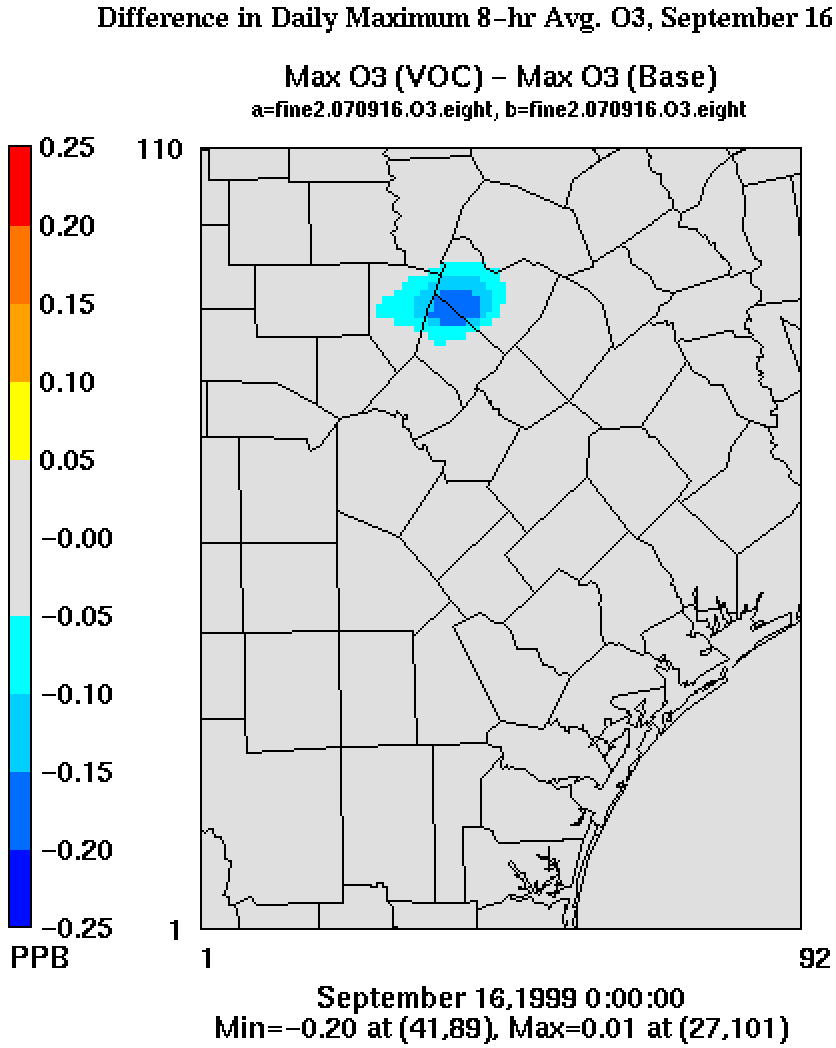


Figure A.21. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with area source VOC reductions in the Austin area.

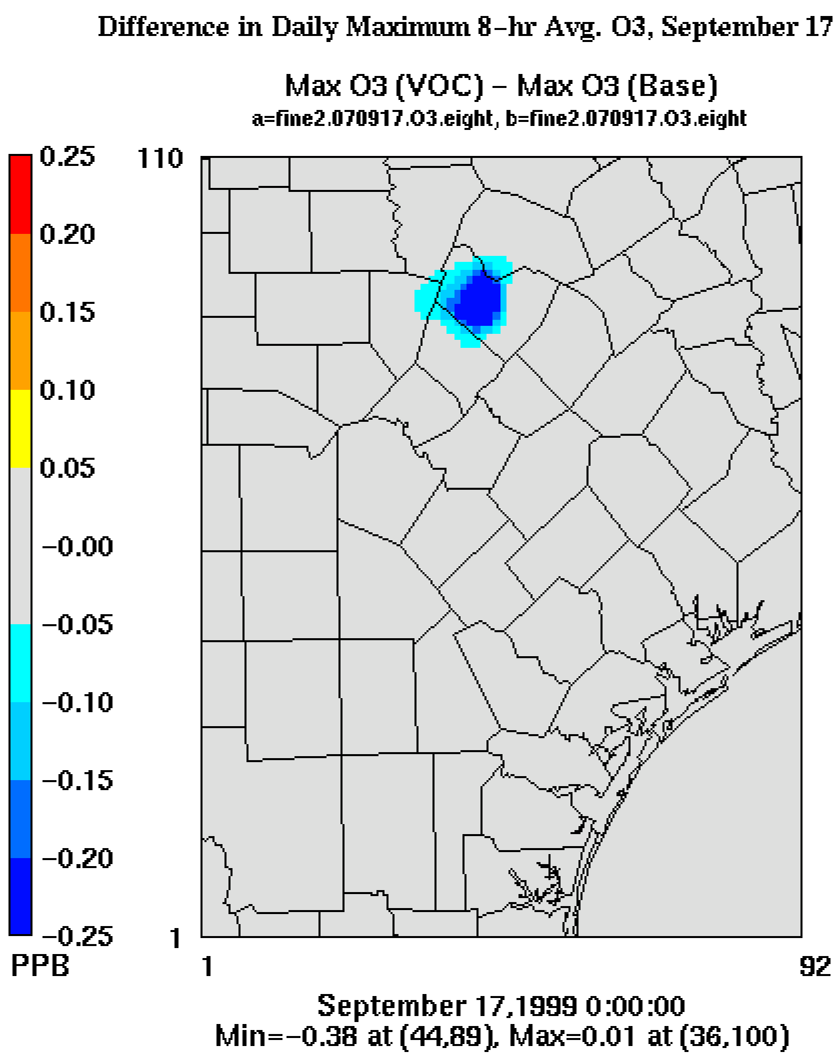


Figure A.22. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with area source VOC reductions in the Austin area.

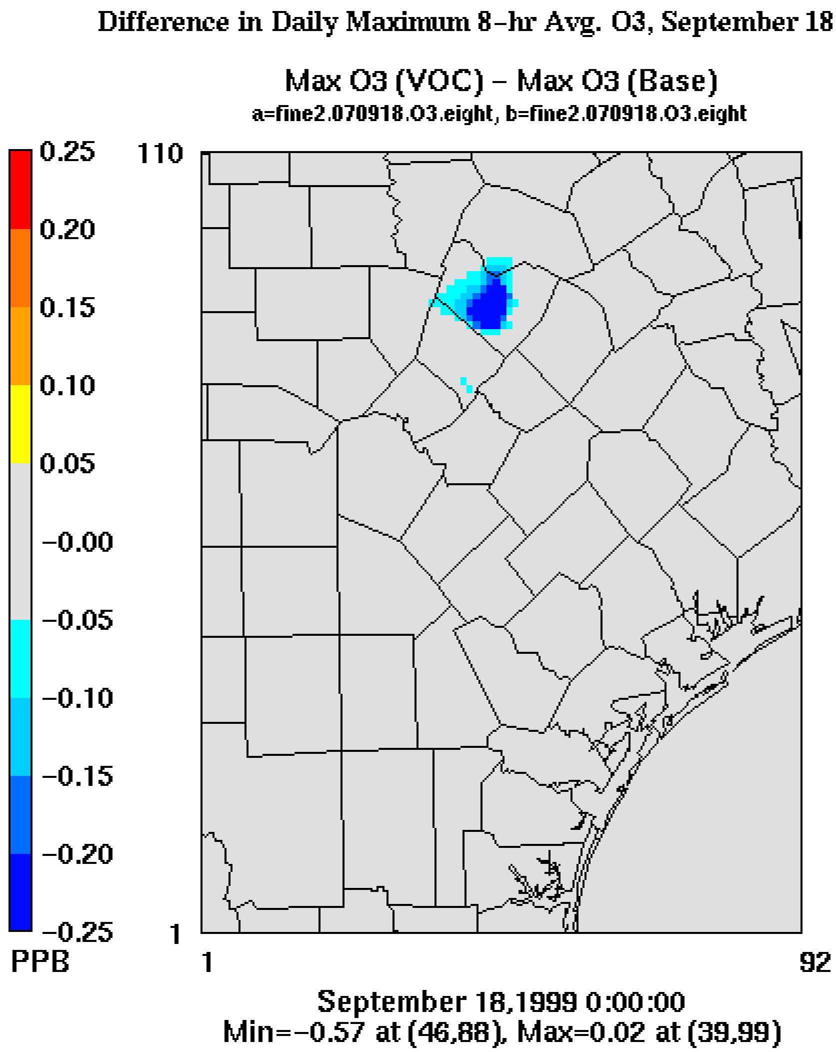


Figure A.23. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with area source VOC reductions in the Austin area.

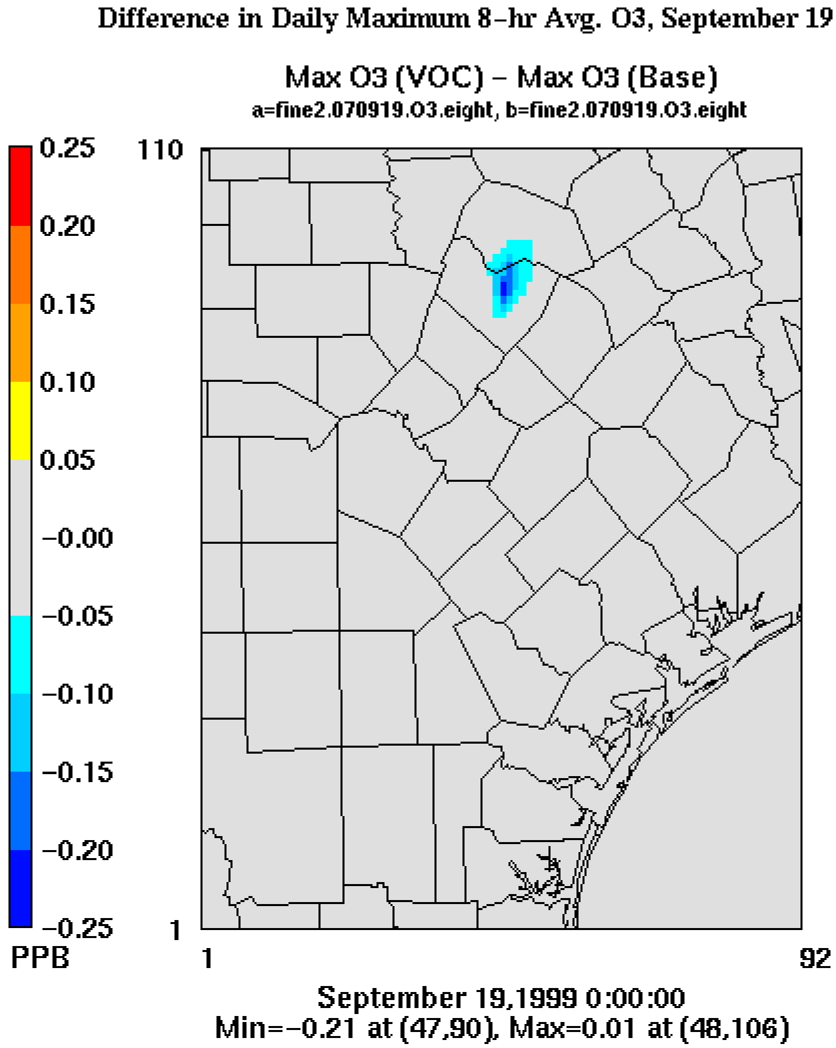


Figure A.24. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with area source VOC reductions in the Austin area.

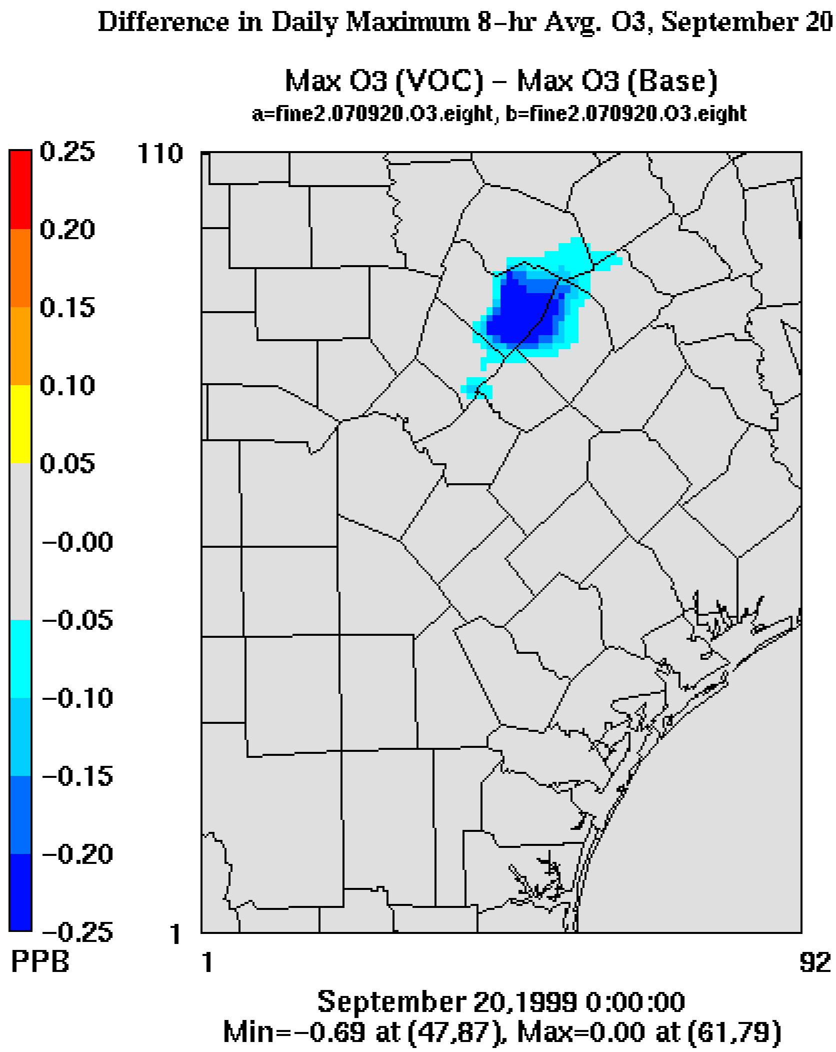


Figure A.25. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County.

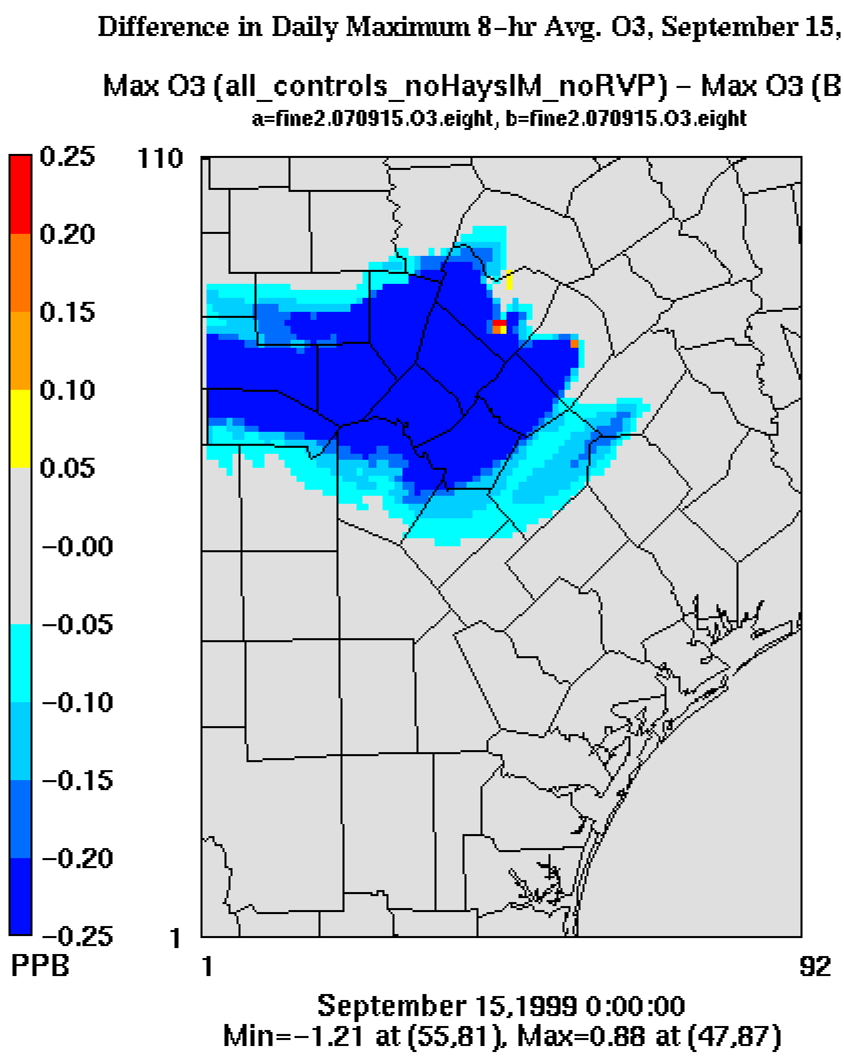


Figure A.26. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County.

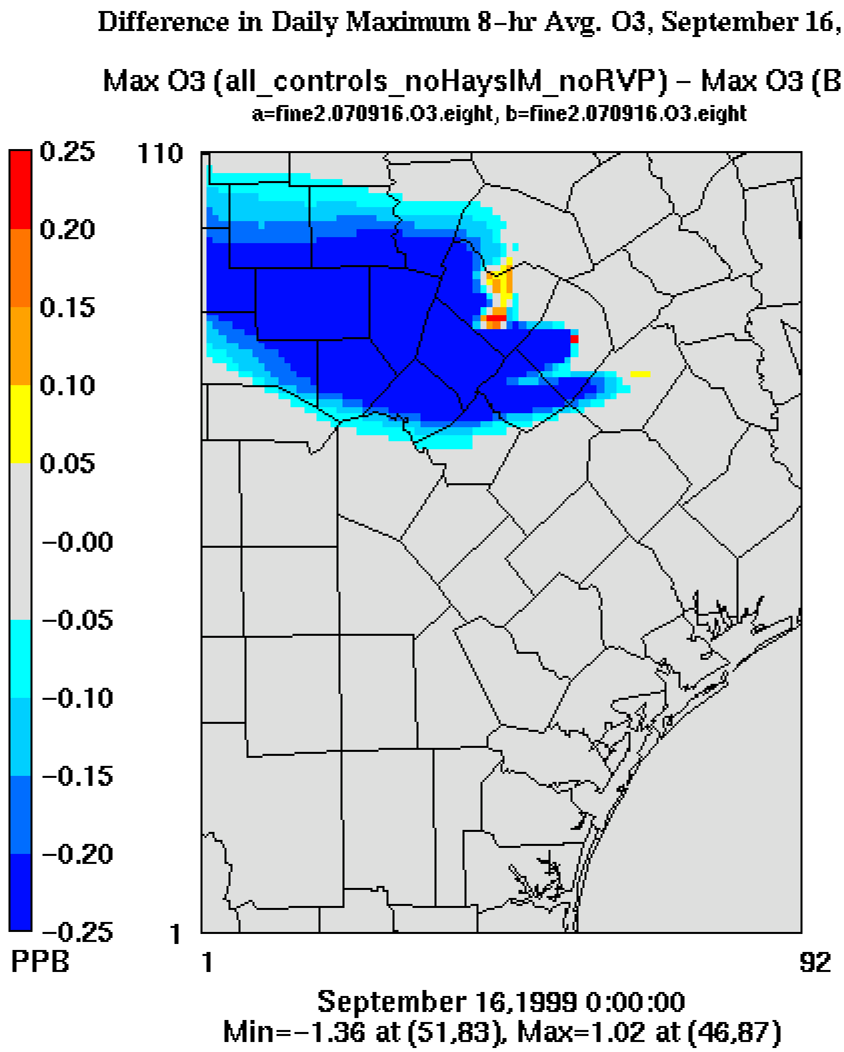


Figure A.27. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County.

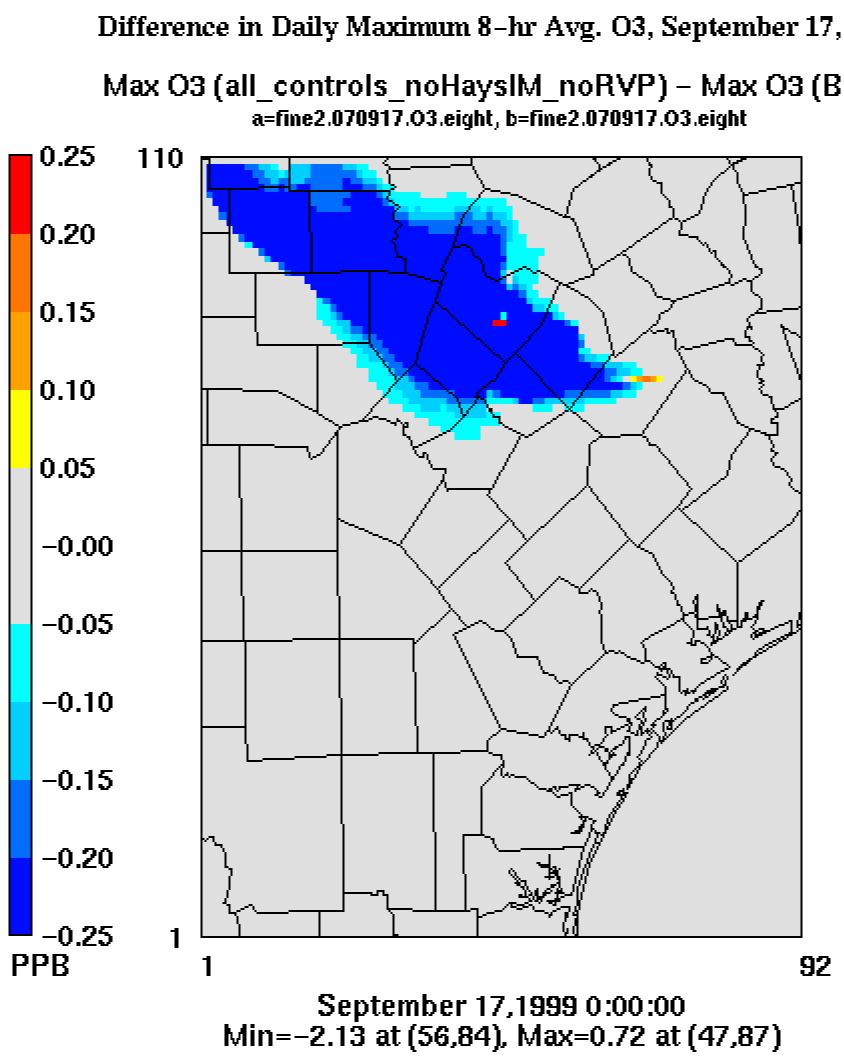


Figure A.28. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County.

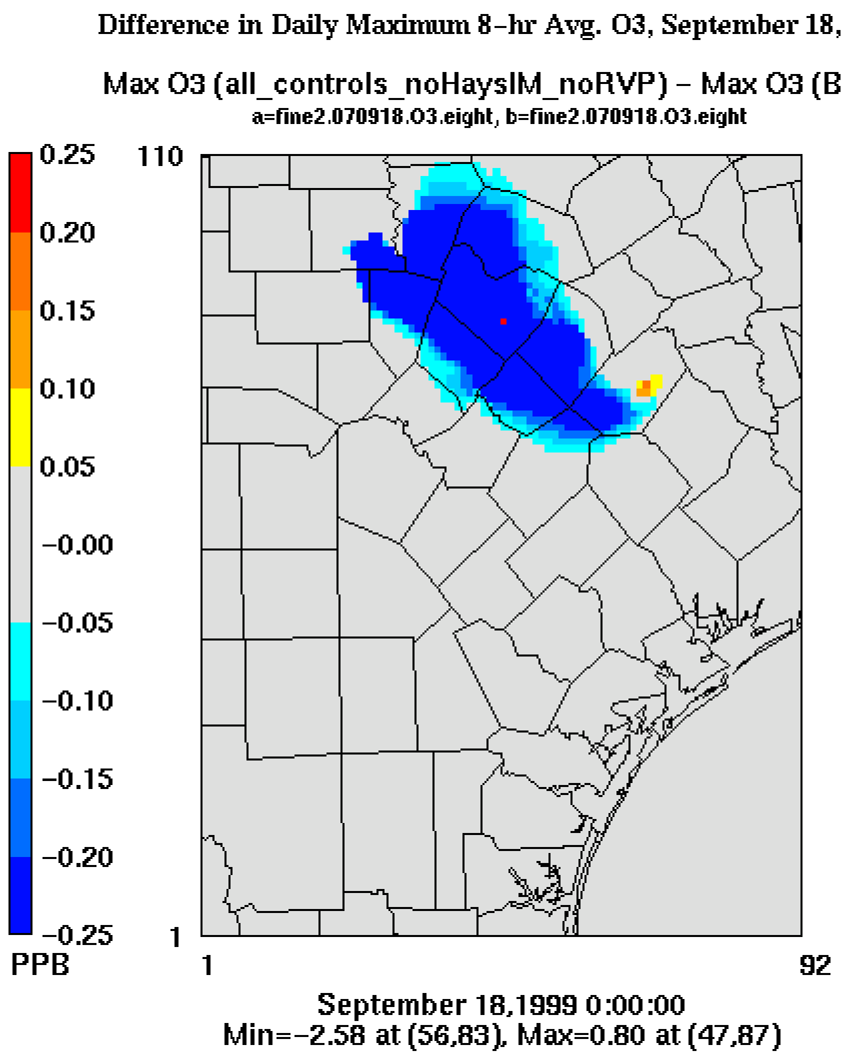


Figure A.29. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County.

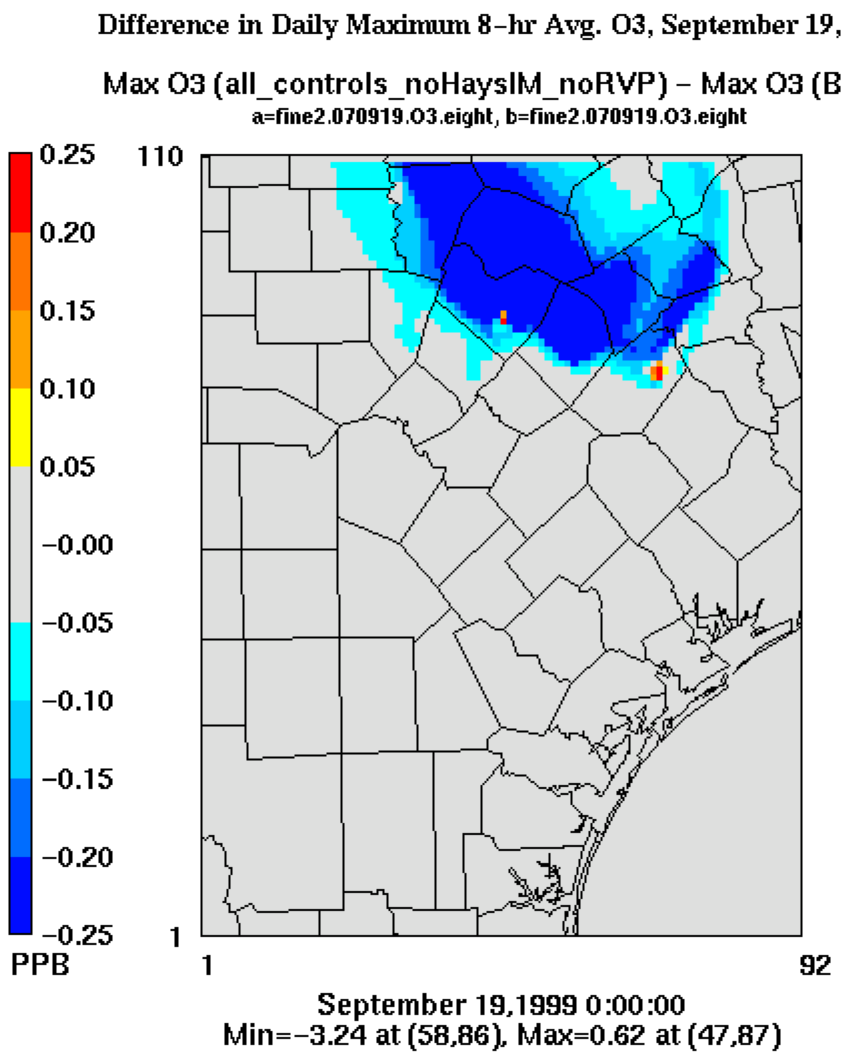


Figure A.30. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County.

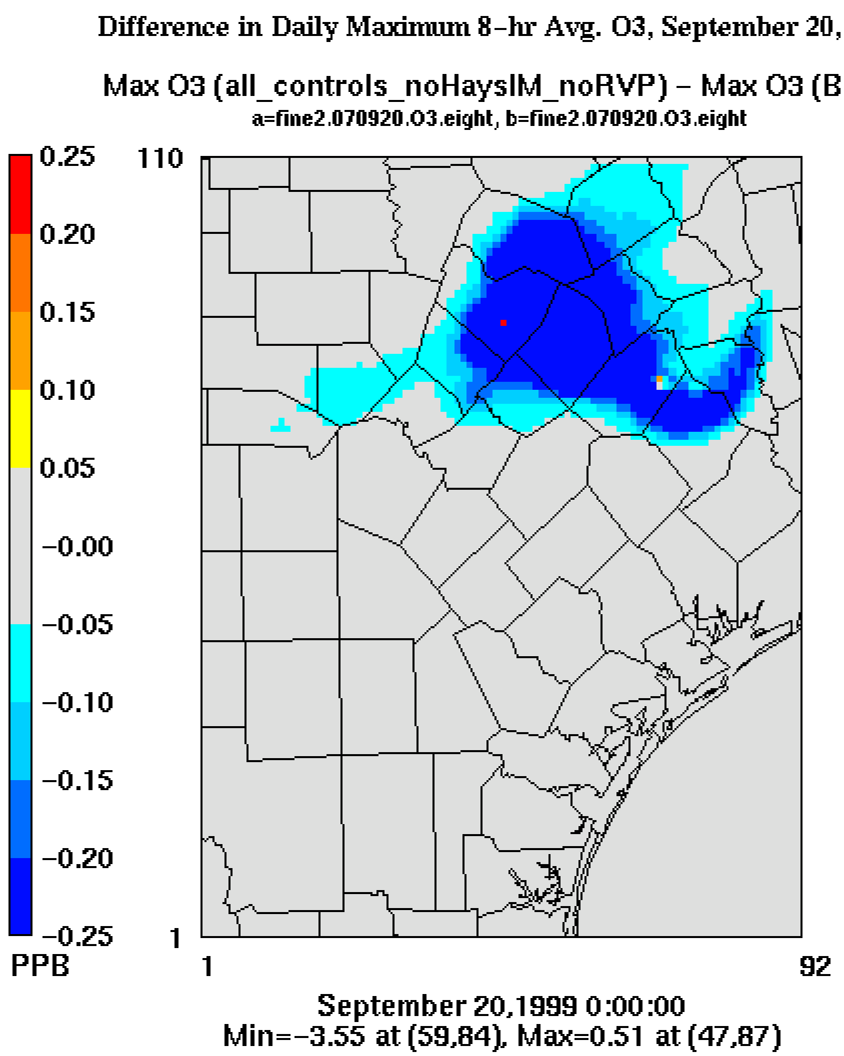


Figure A.31. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County, and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd.

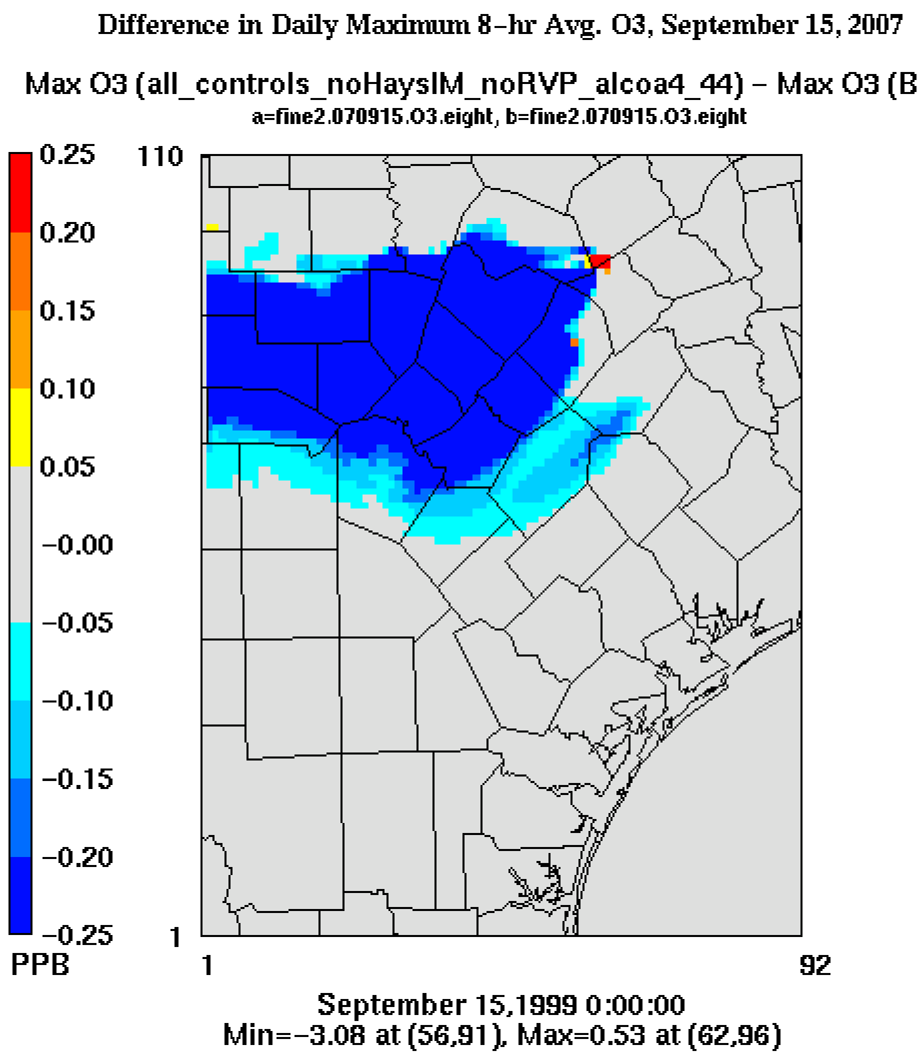


Figure A.32. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd.

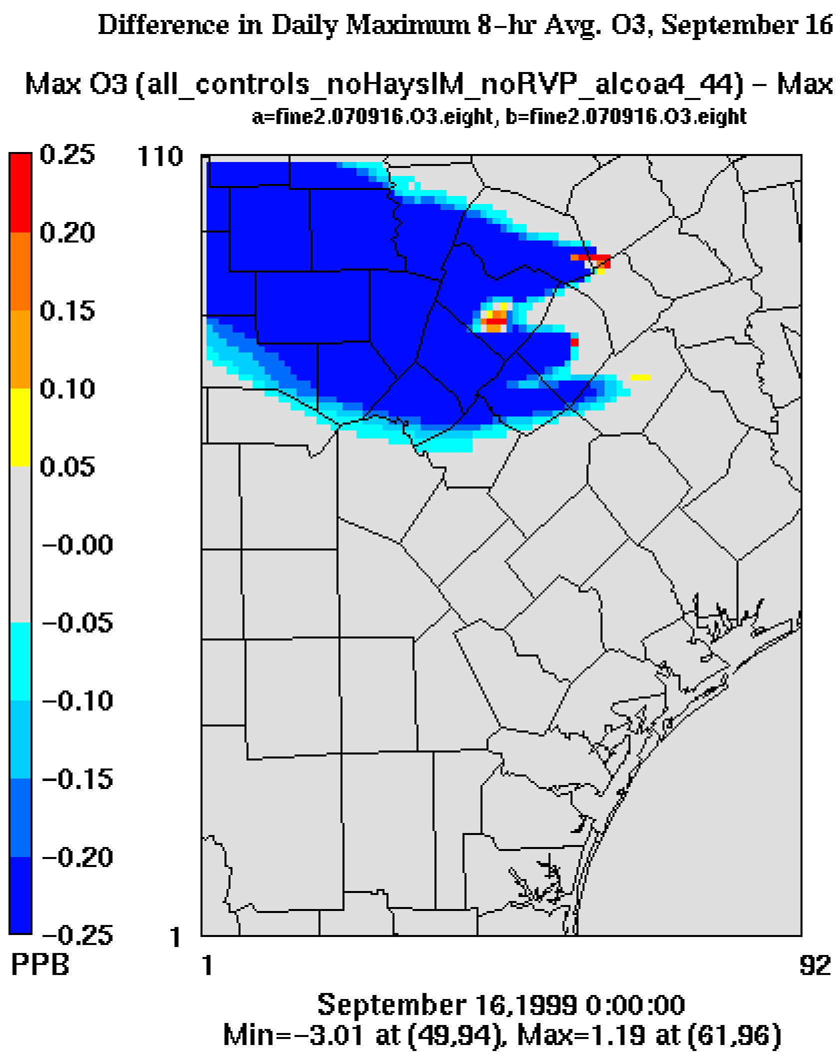


Figure A.33. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd.

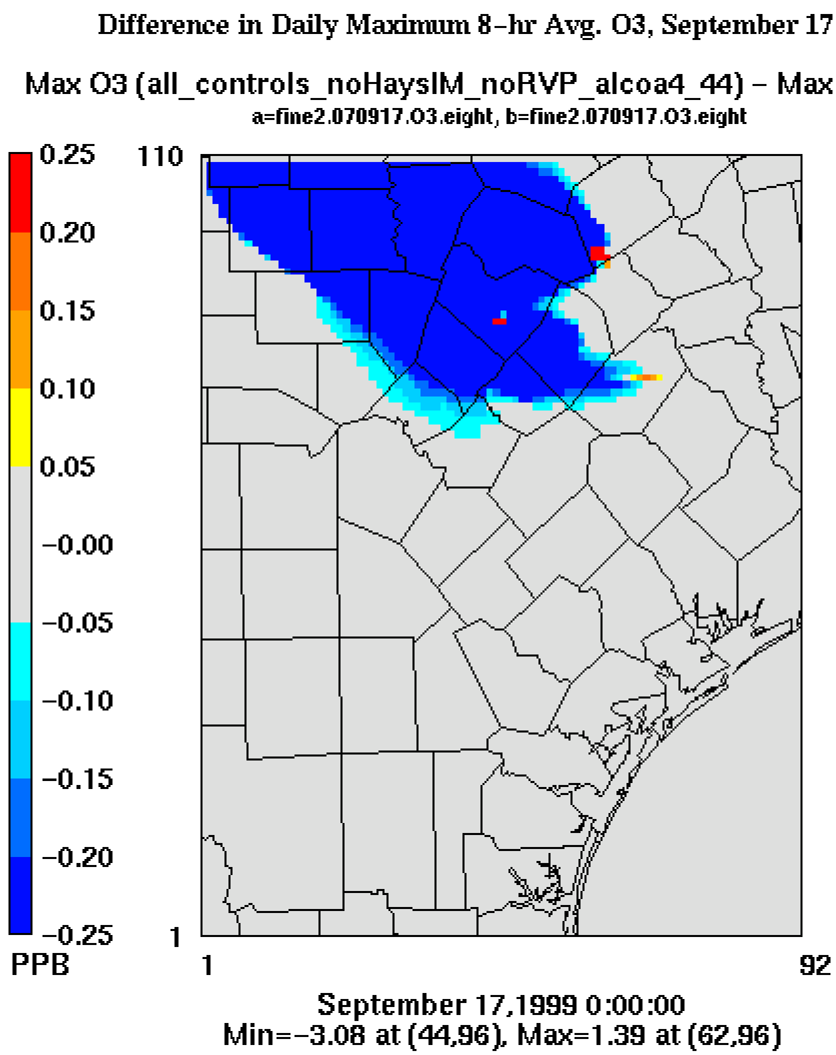


Figure A.34. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County, and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd.

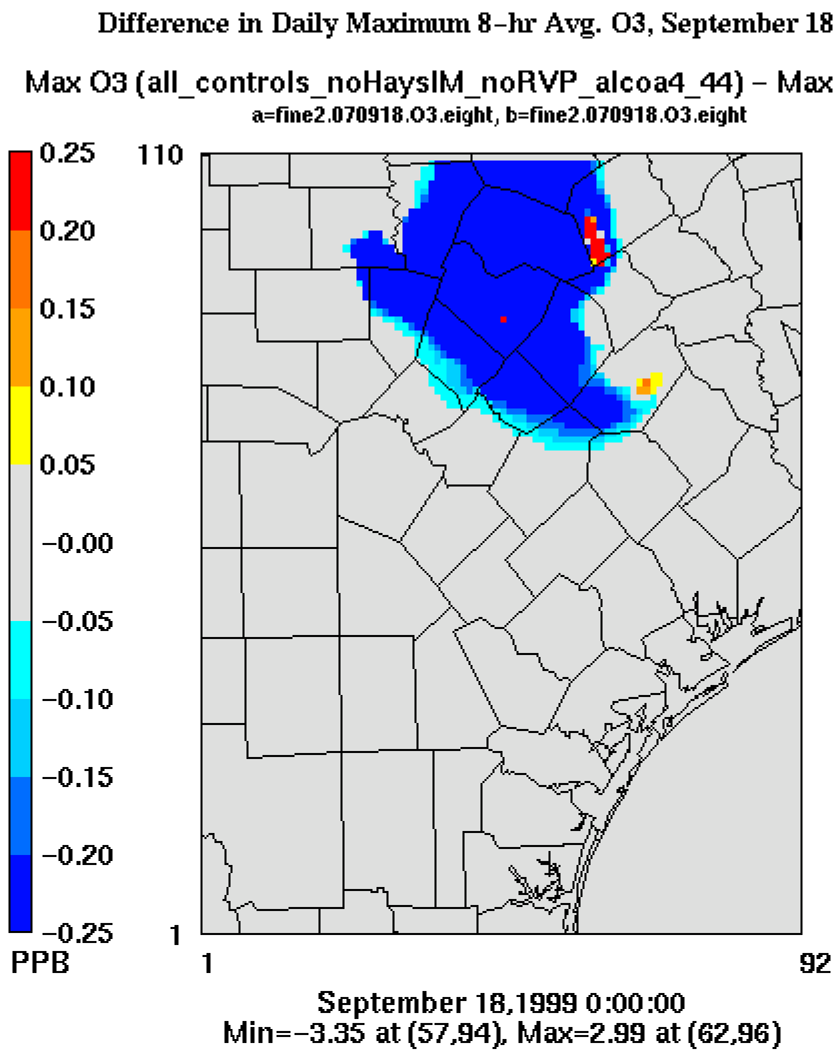


Figure A.35. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County, and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd.

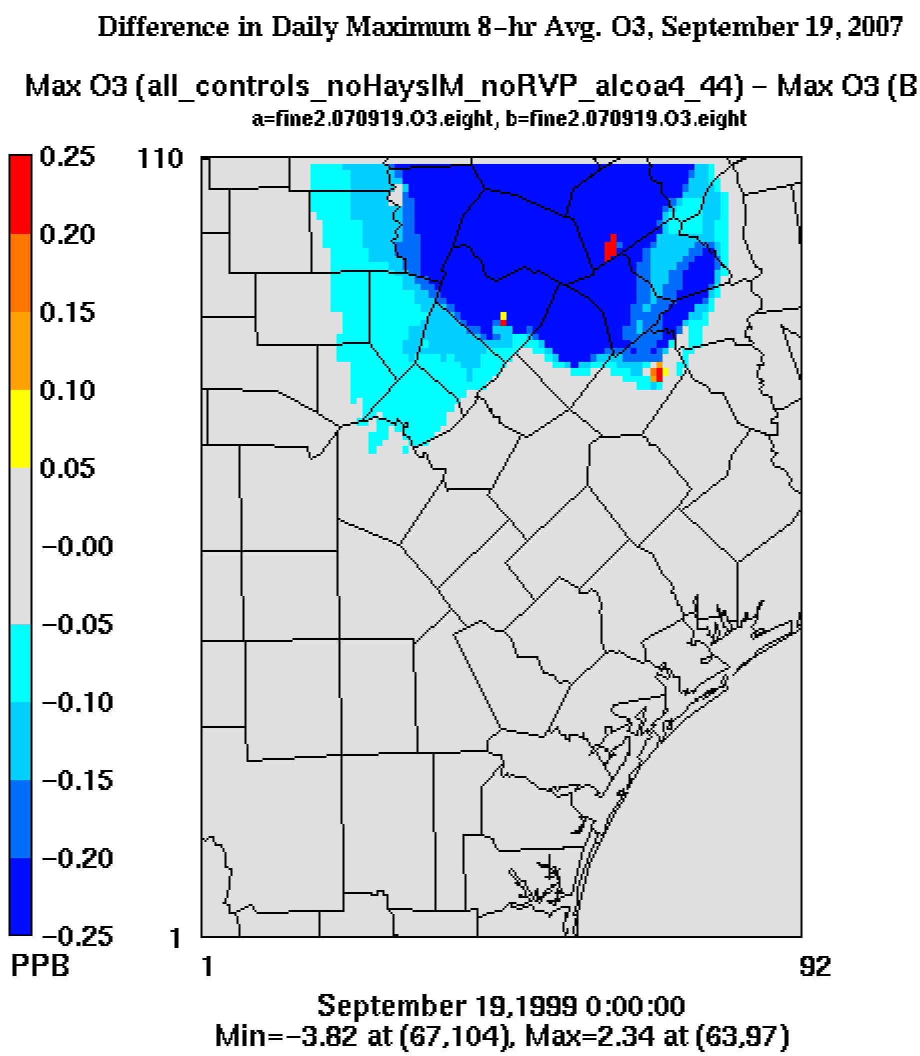


Figure A.36. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in Hays County, and with Alcoa emissions reduced from 26.7 tpd to 4.44 tpd.

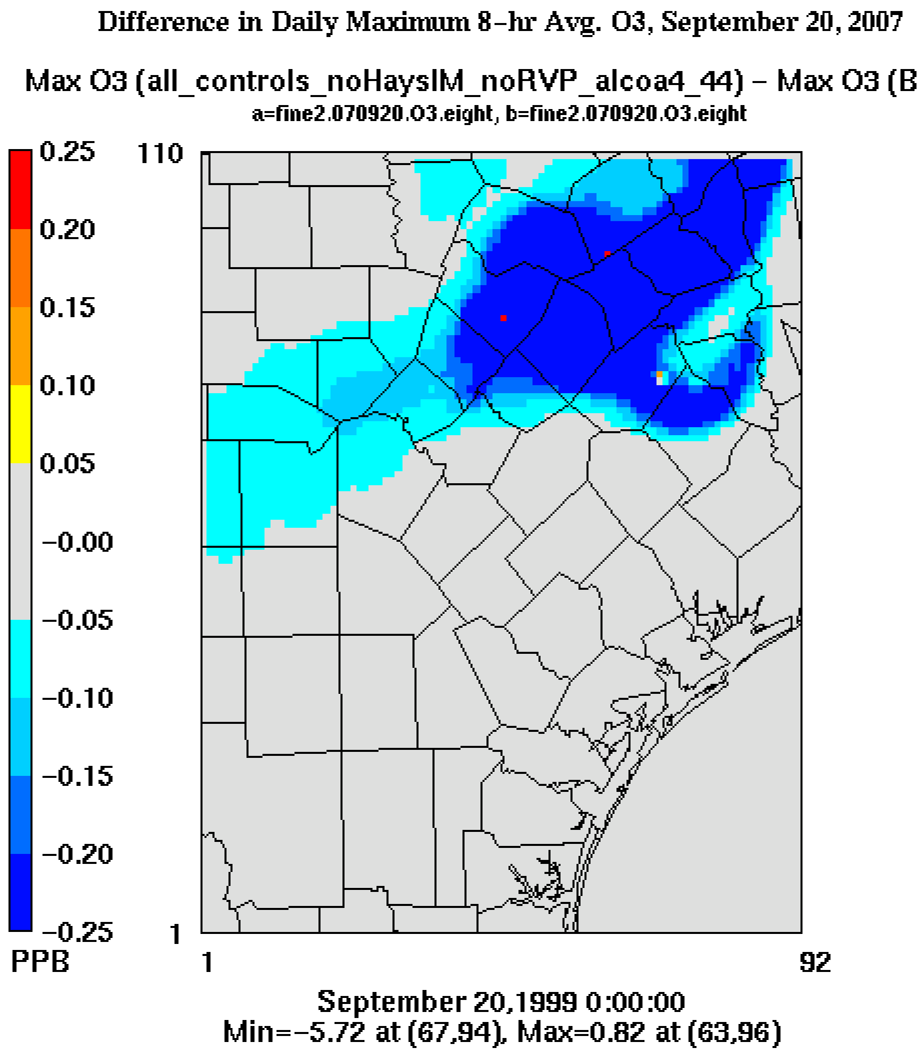


Figure A.37. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline, I&M in Hays County, and commute program reductions.

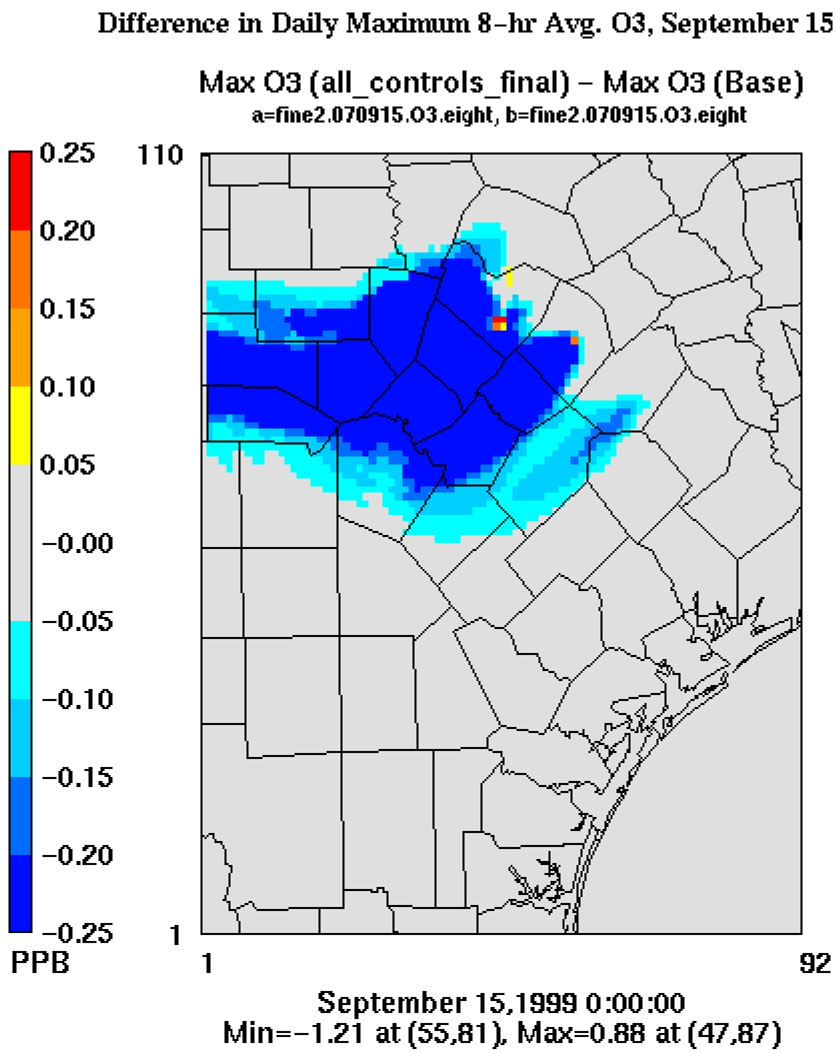


Figure A.38. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline, I&M in Hays County, and commute program reductions.

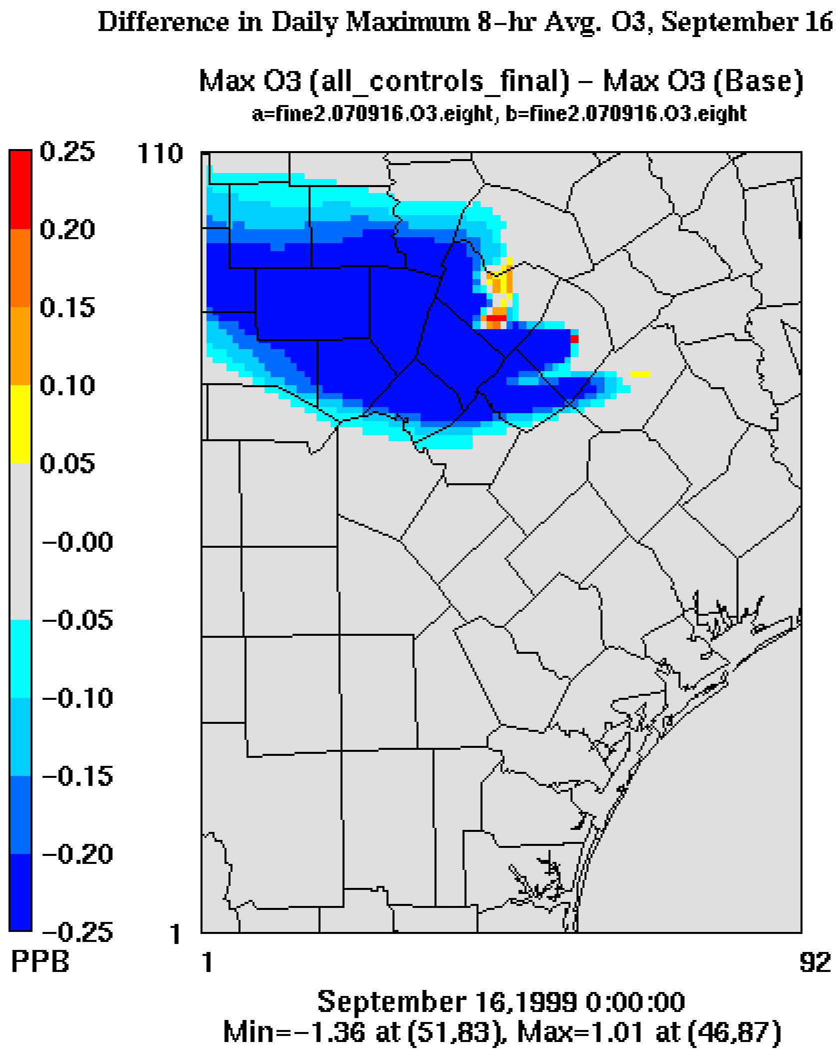


Figure A.39. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline, I&M in Hays County, and commute program reductions.

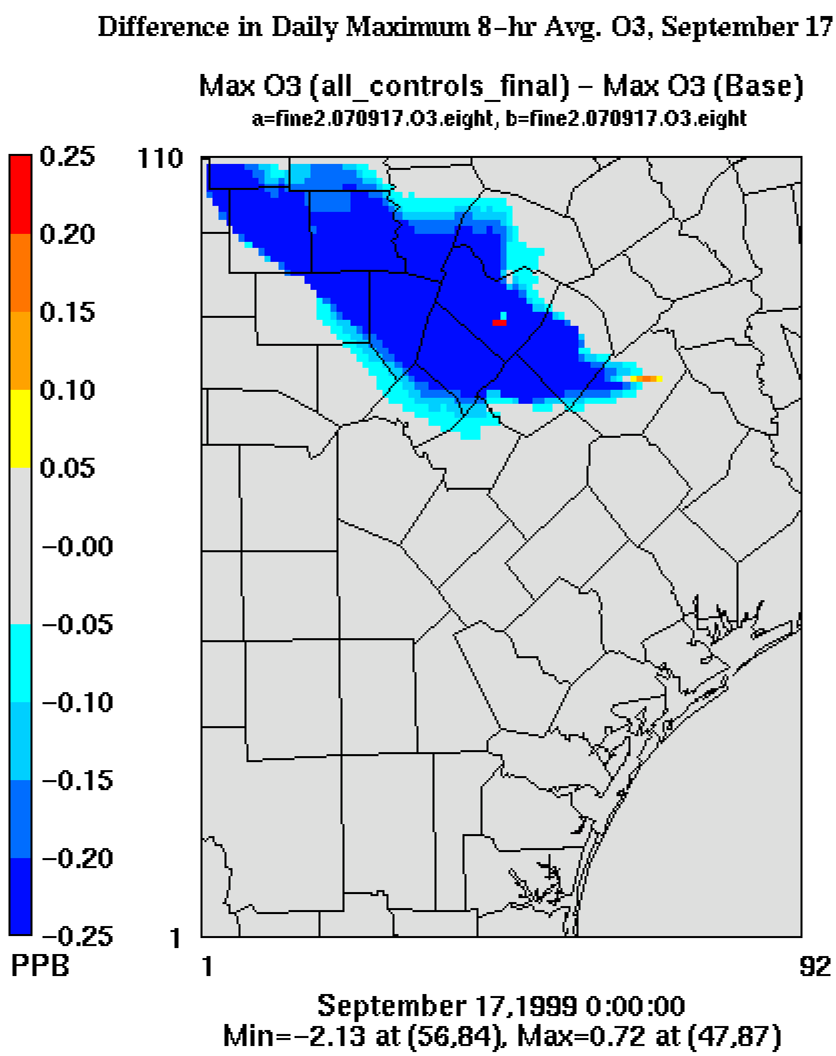


Figure A.40. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline, I&M in Hays County, and commute program reductions.

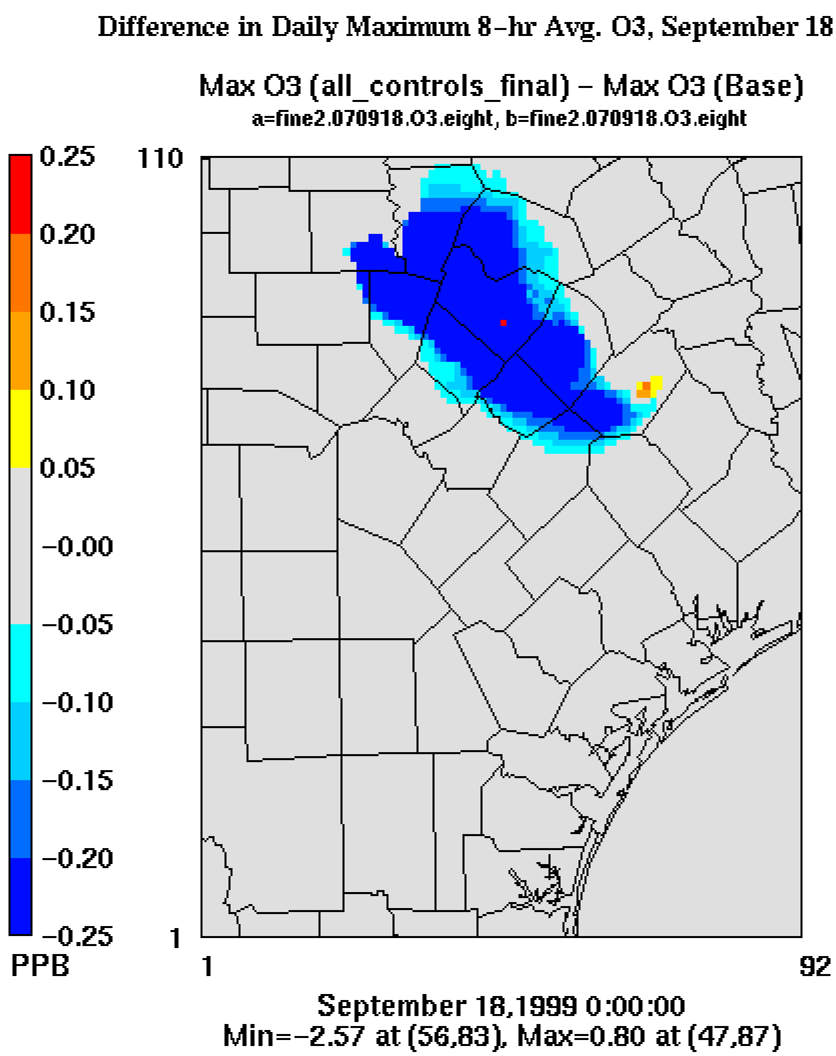


Figure A.41. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline, I&M in Hays County, and commute program reductions.

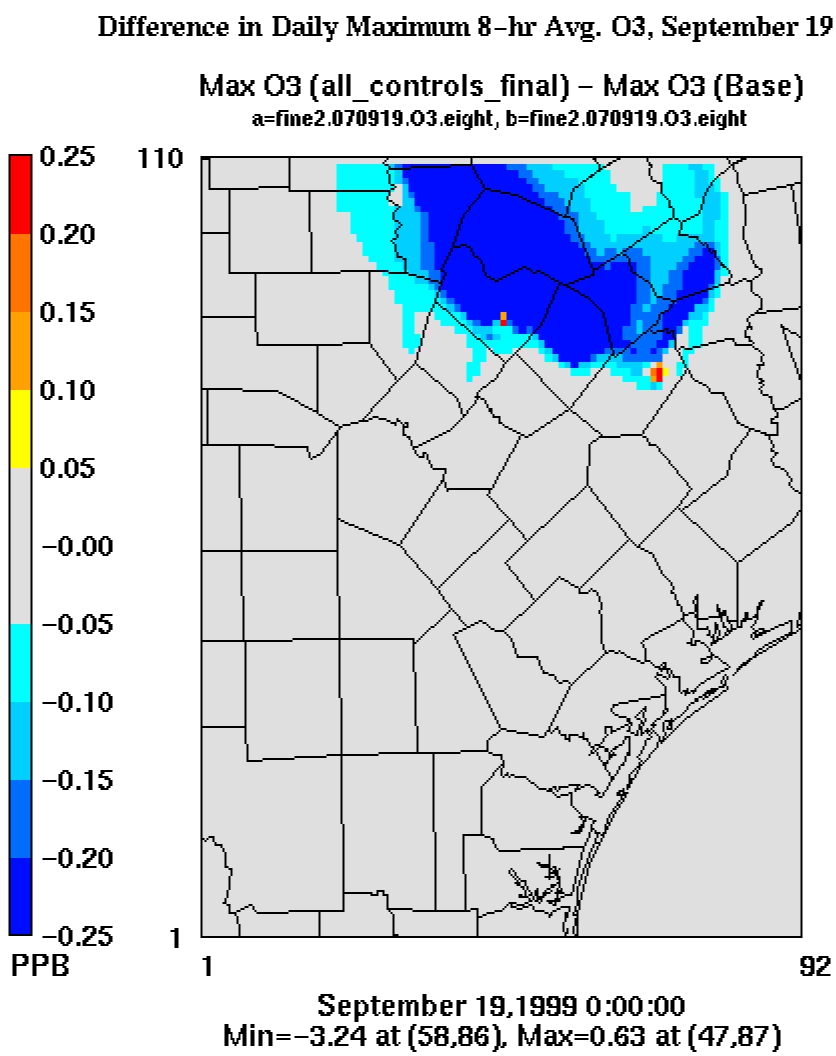


Figure A.42. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline, I&M in Hays County, and commute program reductions.

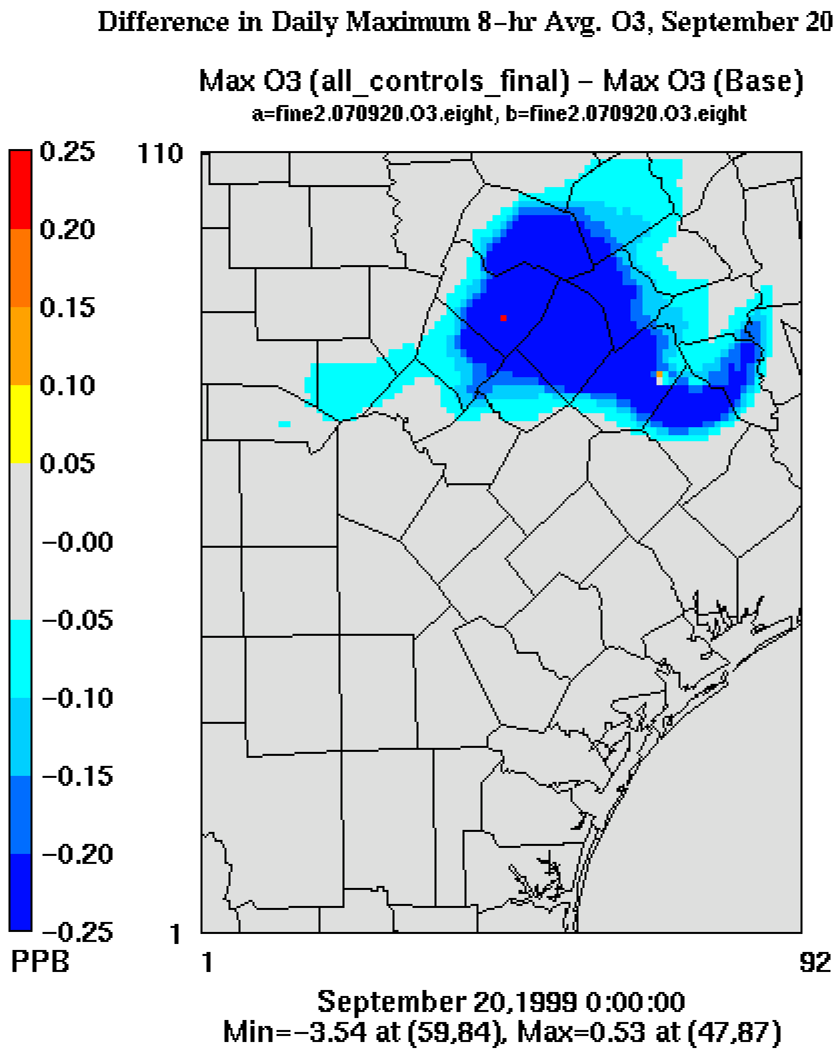


Figure A.43. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in all counties.

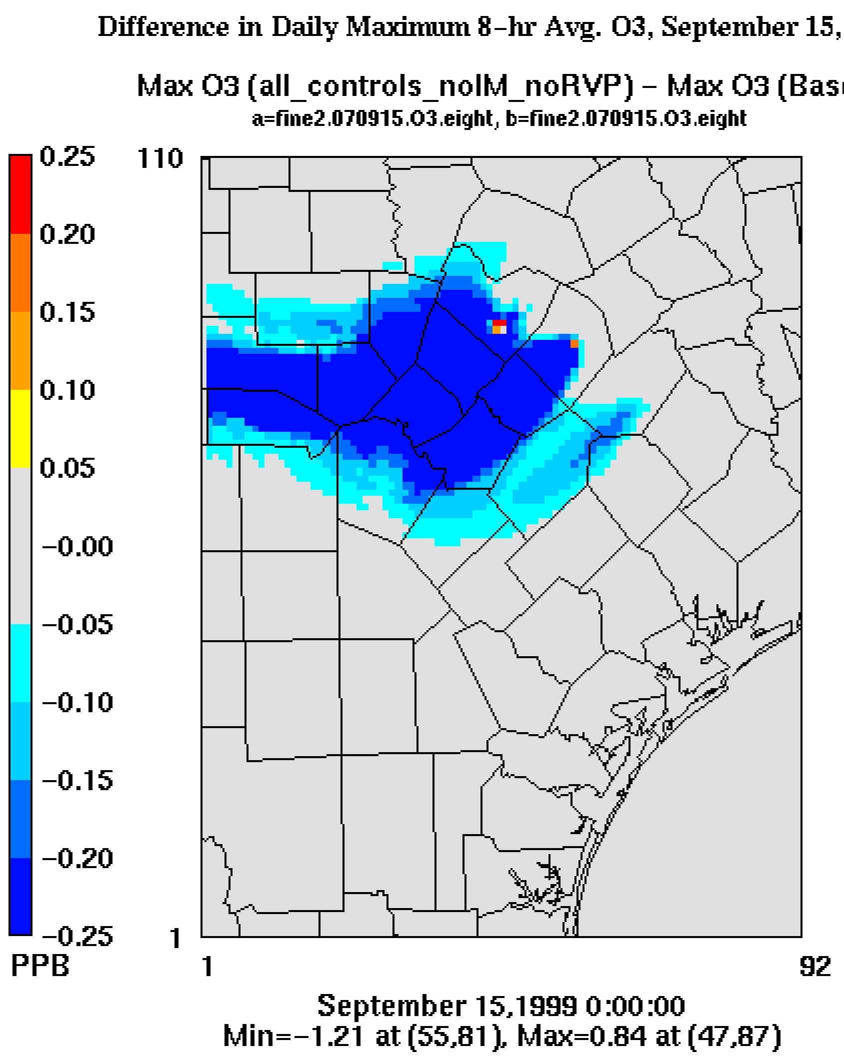


Figure A.44. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in all counties.

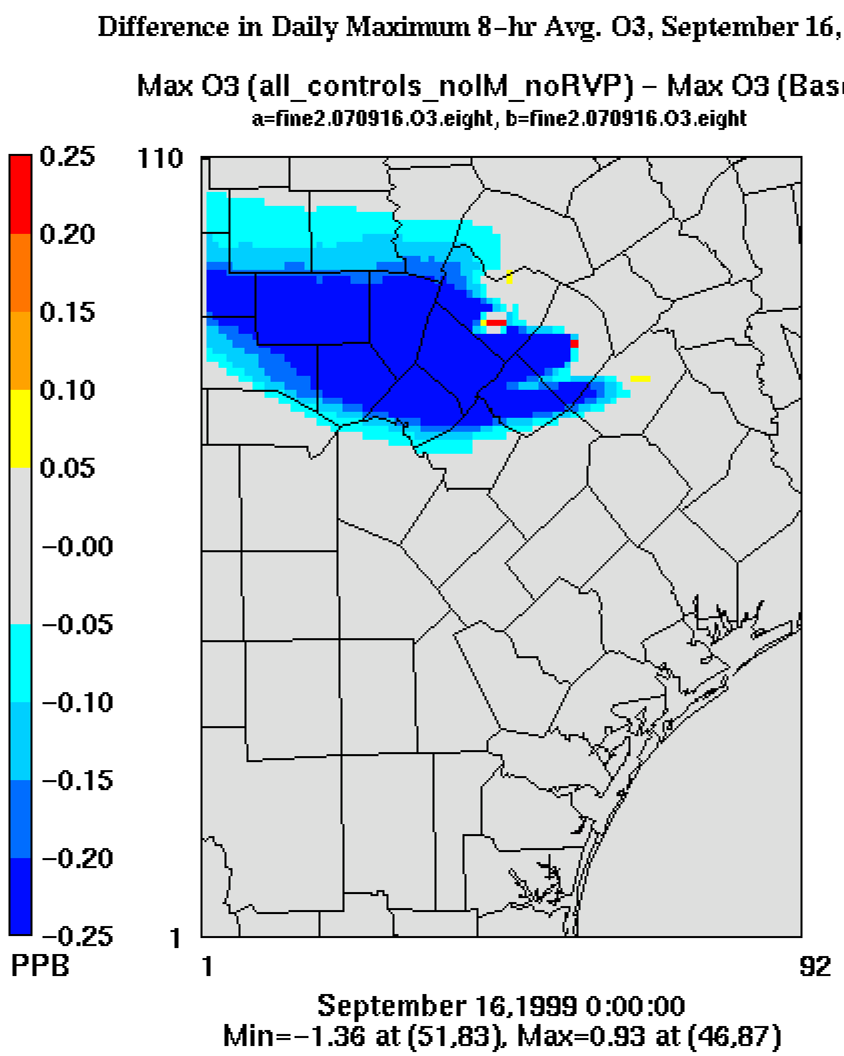


Figure A.45. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in all counties.

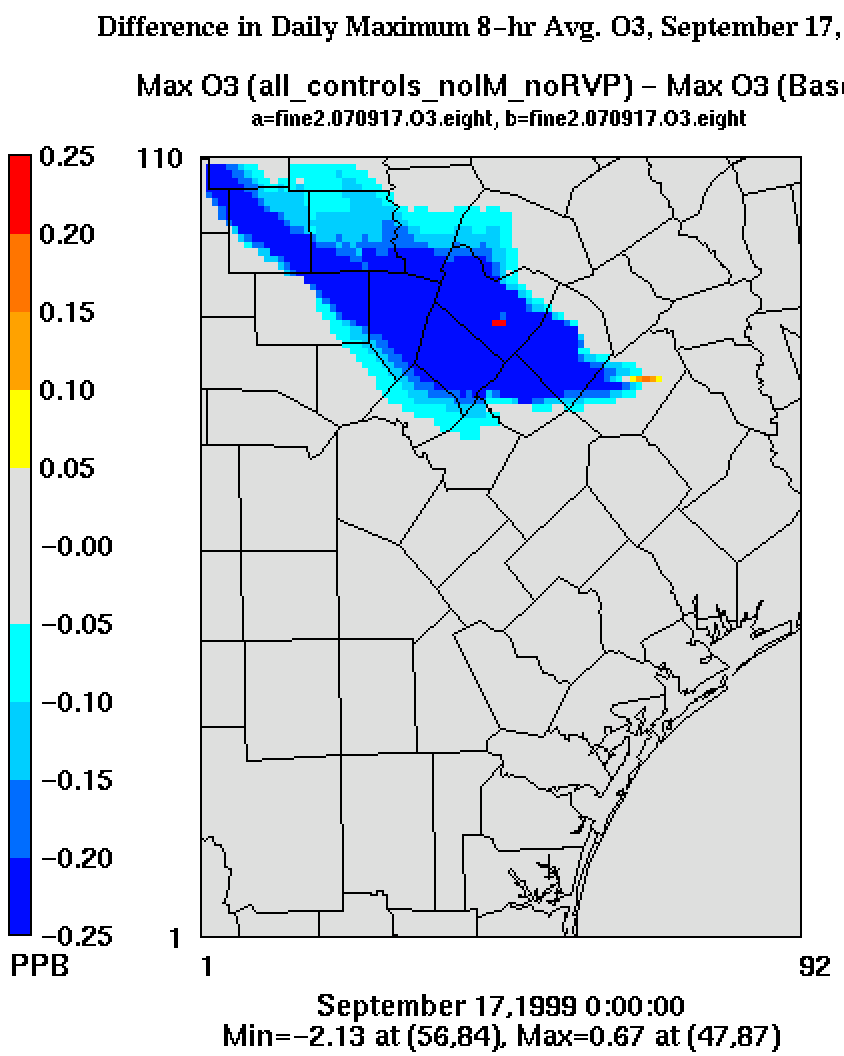


Figure A.46. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in all counties.

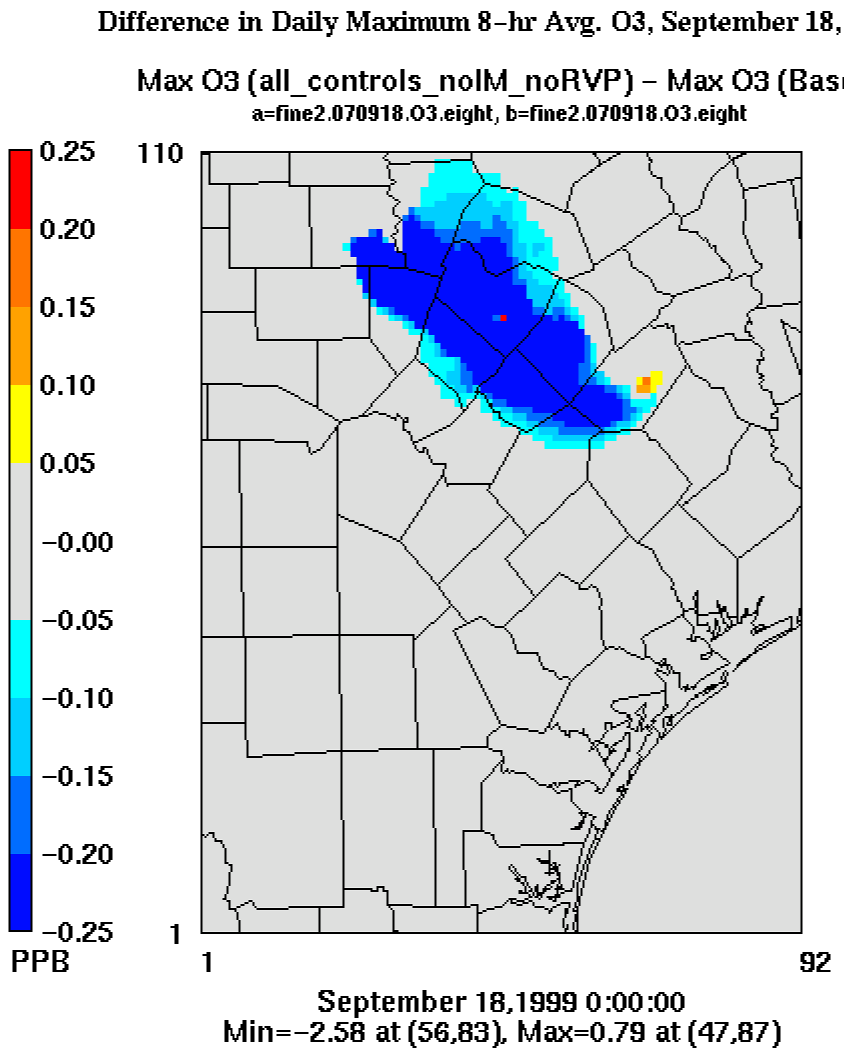


Figure A.47. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in all counties.

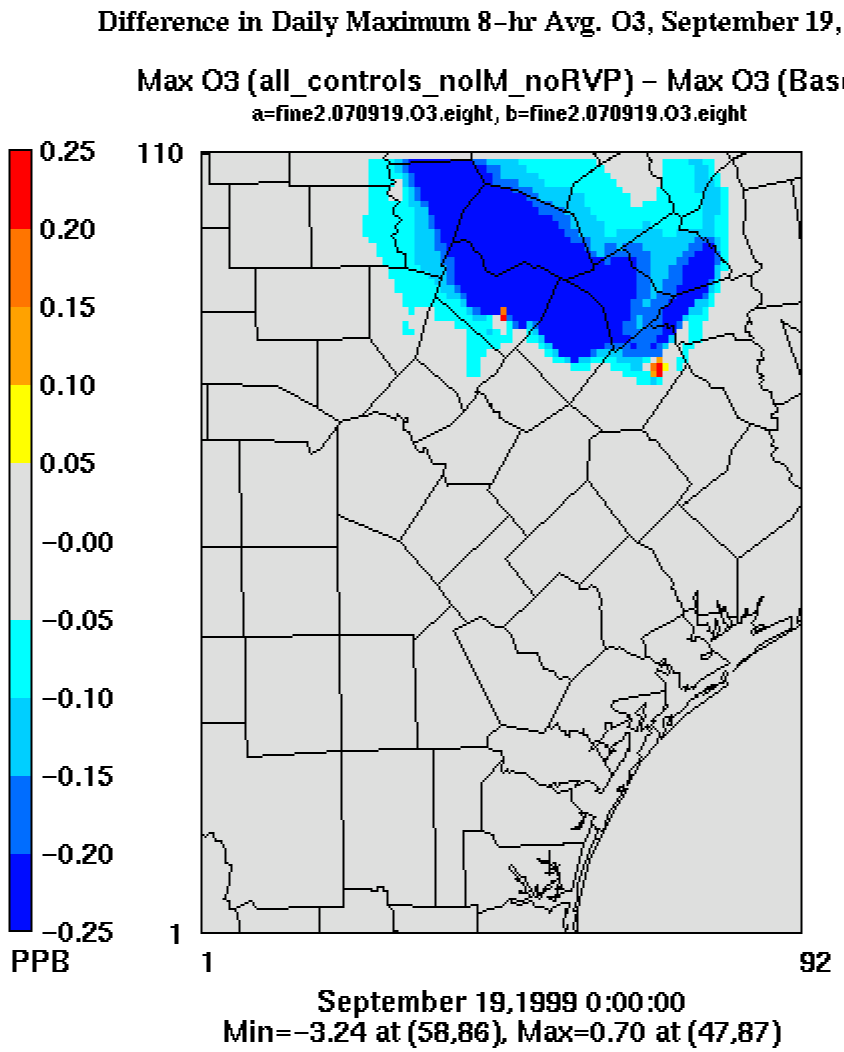


Figure A.48. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with all controls in the CAAP for the Austin area excluding low RVP gasoline and I&M in all counties.

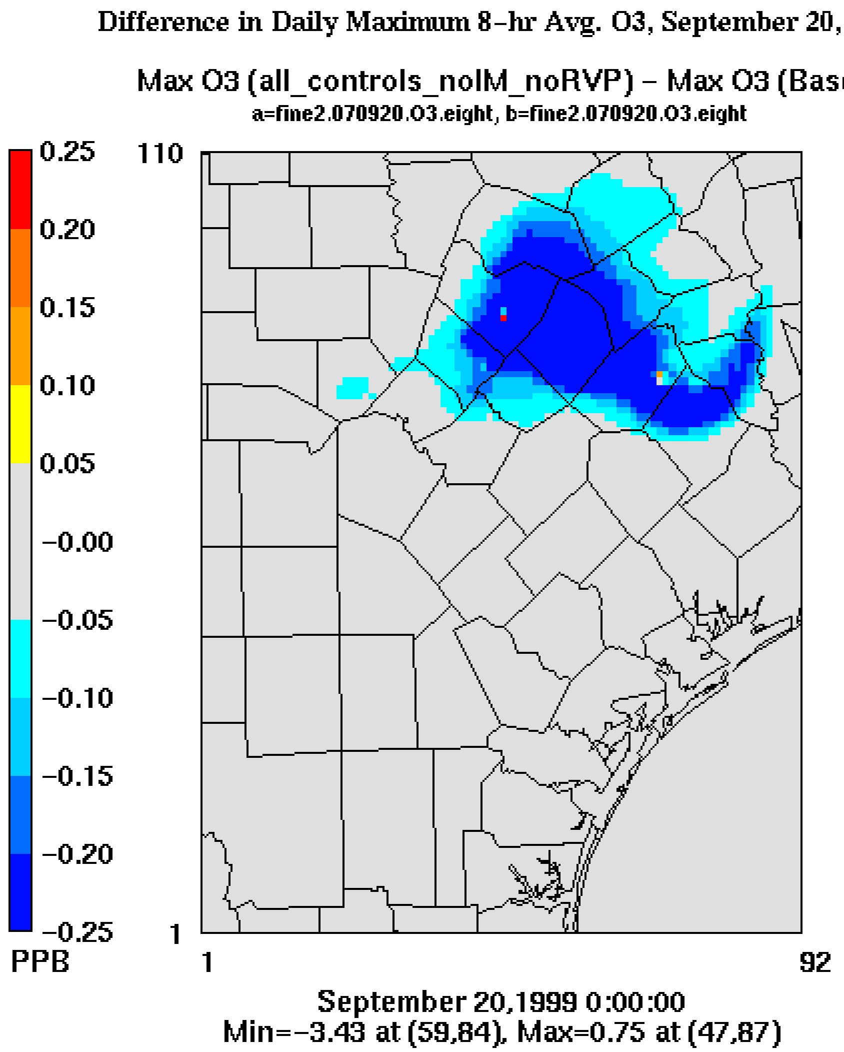


Figure A.49. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 15 between the 2007 Future Case with no local controls applied and with doubling point source VOC emissions in the Austin area.

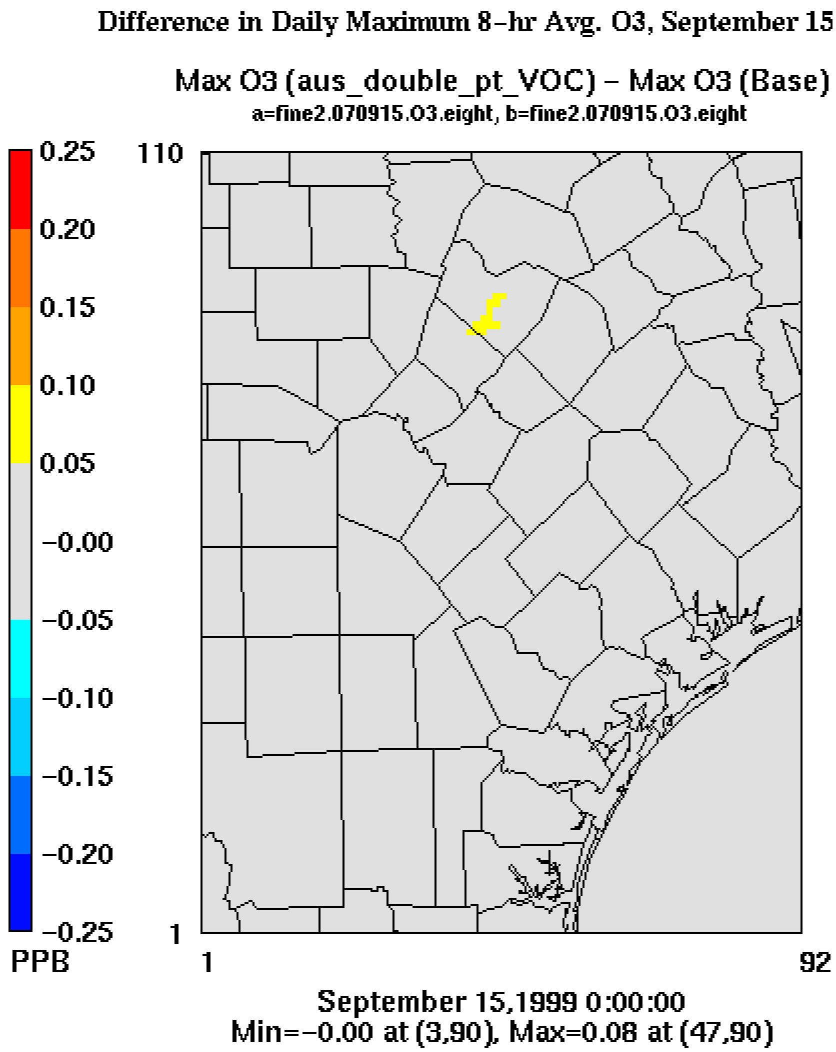


Figure A.50. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 16 between the 2007 Future Case with no local controls applied and with doubling point source VOC emissions in the Austin area.

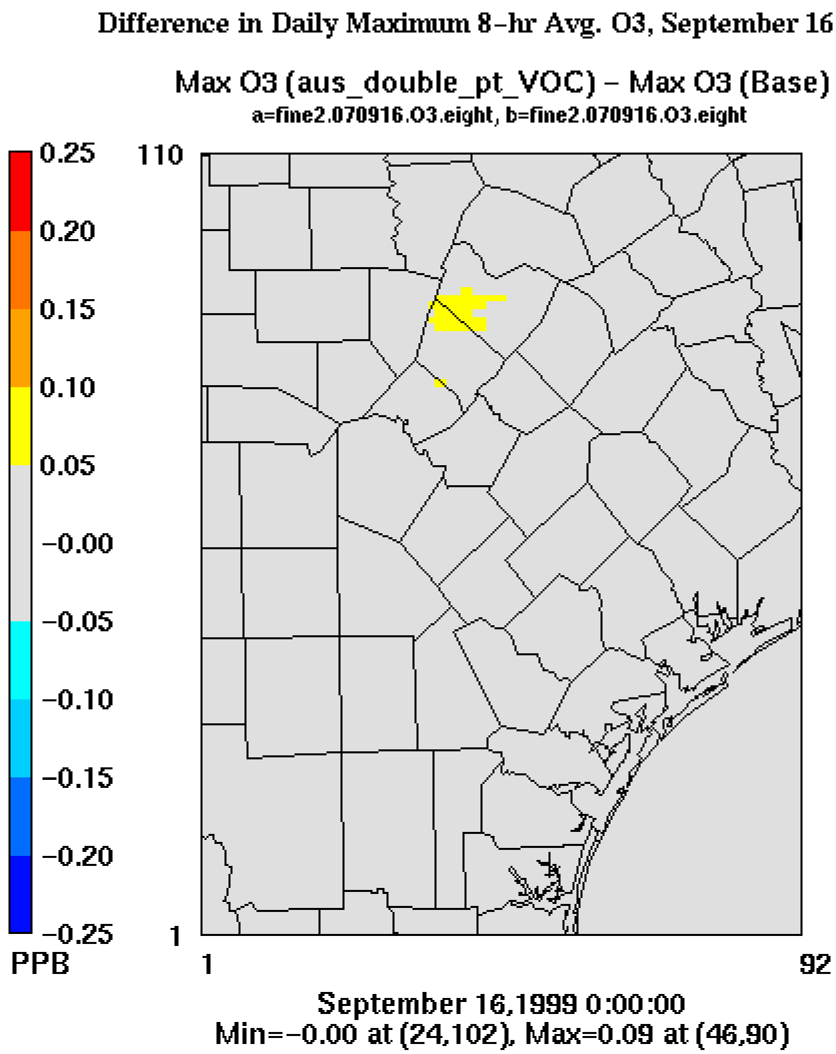


Figure A.51. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 17 between the 2007 Future Case with no local controls applied and with doubling point source VOC emissions in the Austin area.

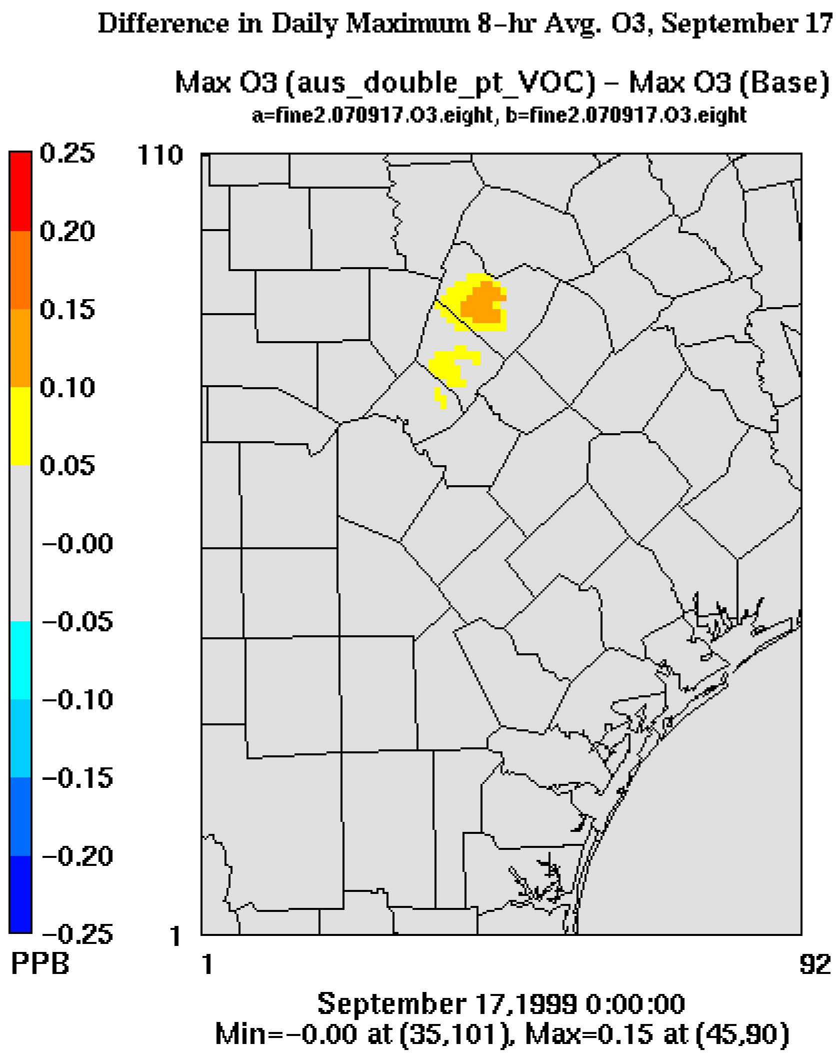


Figure A.52. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 18 between the 2007 Future Case with no local controls applied and with doubling point source VOC emissions in the Austin area.

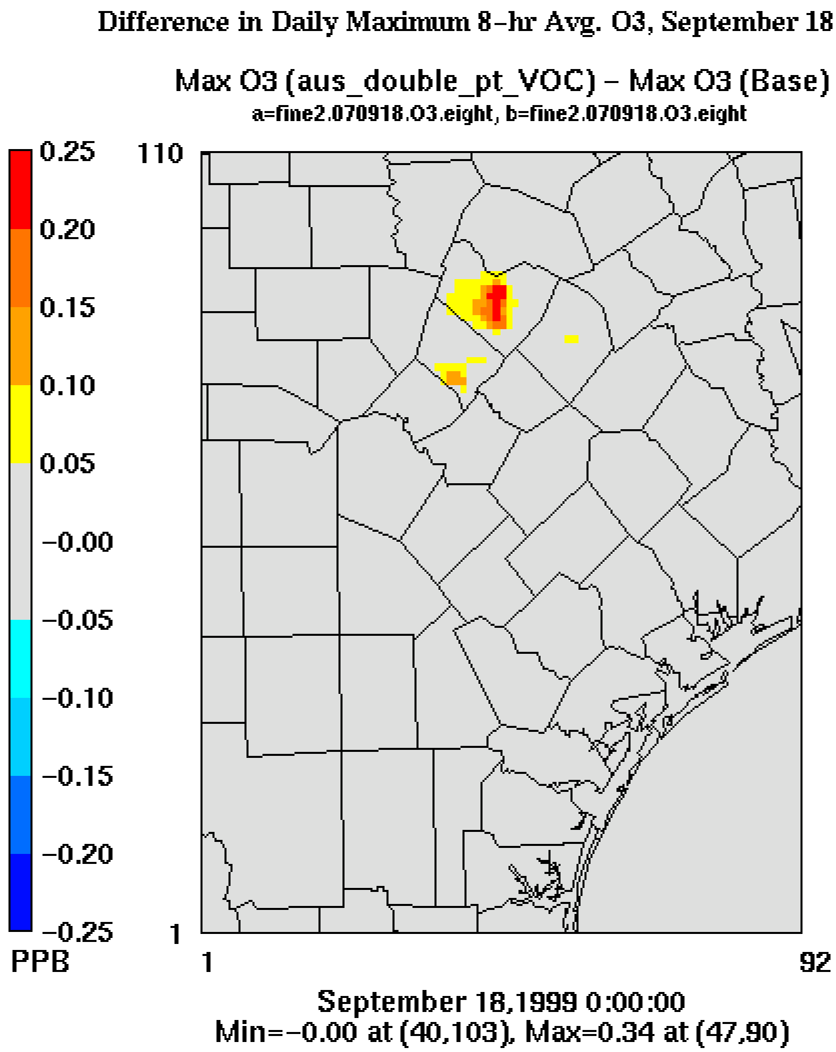


Figure A.53. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 19 between the 2007 Future Case with no local controls applied and with doubling point source VOC emissions in the Austin area.

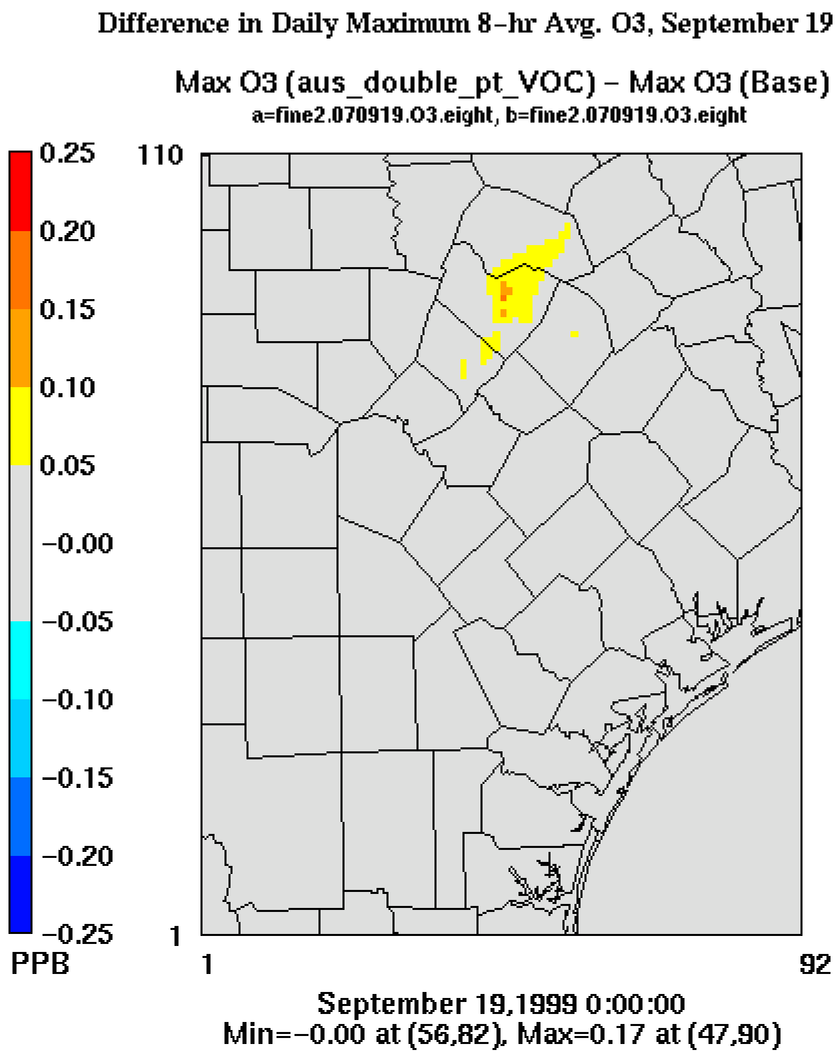


Figure A.54. Difference in predicted daily maximum 8-hour averaged ozone concentrations on September 20 between the 2007 Future Case with no local controls applied and with doubling point source VOC emissions in the Austin area.