Appendix M
EI Comparison and Trend Analysis for the AER:
1999- 2012

Emissions Inventory Comparison and Trend Analysis for the Austin-Round Rock MSA: 1999, 2002, 2005, 2007, & 2012

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

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Executive Summary

This report satisfies the requirement outlined in the Austin-Round Rock MSA Early Action Compact (EAC, December 18, 2002) Memorandum of Agreement section II A.1 Milestones, *Emissions Inventory Comparison and Trend Analysis for the Austin-Round Rock MSA: 1999, 2002, 2005, 2007 & 2012;* December 31, 2003. Emissions inventories were developed and forecasted for five counties within the study area and were classified by EPA approved emission source categories. The emissions are presented in the following categories: Non-road mobile source, area source, point source, biogenic source, and on-road mobile source. Volatile organic compounds (VOC), nitric oxides (NOx), and carbon monoxide (CO) emissions are the three main pollutants that impact ozone in the region; thus, they are the pollutants accounted for in the emission inventories. This report identifies emission levels for the above sources for the years 1999 through 2012 and compares them for historical trend analysis to evaluate whether or not the emission levels are increasing or decreasing over time.

Using growth and control strategy projections we have accounted for as many of the important variables that affect future year emissions as possible. The trend analysis provides an insight into the historical and future emissions levels that occur in the Austin-Round Rock MSA (MSA), while accounting for the impacts of population and economic changes on the air quality in the area. These projections will provide a basis for developing control strategies for the area Clean Air Action Plan, conducting attainment analyses, and tracking progress towards meeting air quality standards.

Several regulations and control measures designed to minimize ozone in the MSA are currently implemented in the region. There are already regulations designated by federal or state governments. The emissions from biogenic sources for the year 2012 were assumed to be at the same level as those of 1999. While the emissions from area sources and non-road are expected to increase, the on-road mobile and point source emissions are projected to decrease significantly and compensate for emission increases from all other sources. As a result, the overall emission trend in the region through the year 2012 is downward.

1 Introduction

The Early Action Compact Task Force (EACTF), an ad hoc organization comprised primarily of government staff representing the various signatories of the EAC, has been charged with oversight and coordination of the development of the Clean Air Plan for the Austin - Round Rock MSA (MSA). An inventory of emissions, as a requirement of Early Action Compact, must be done to provide for trend analysis in emission sources over time. The purpose of this trend line analysis is to demonstrate maintenance of the 8-hr ozone National Ambient Air Quality Standards (NAAQS) through analysis of past and current emissions trends along with projected emissions growth through the year 2012.

The Clean Air Plan is designed to be a working document providing comprehensive planning for reduction of ozone levels in Bastrop, Caldwell, Hays, Travis, and Williamson counties, which constitute the MSA. The counties are displayed in figure 1.1.

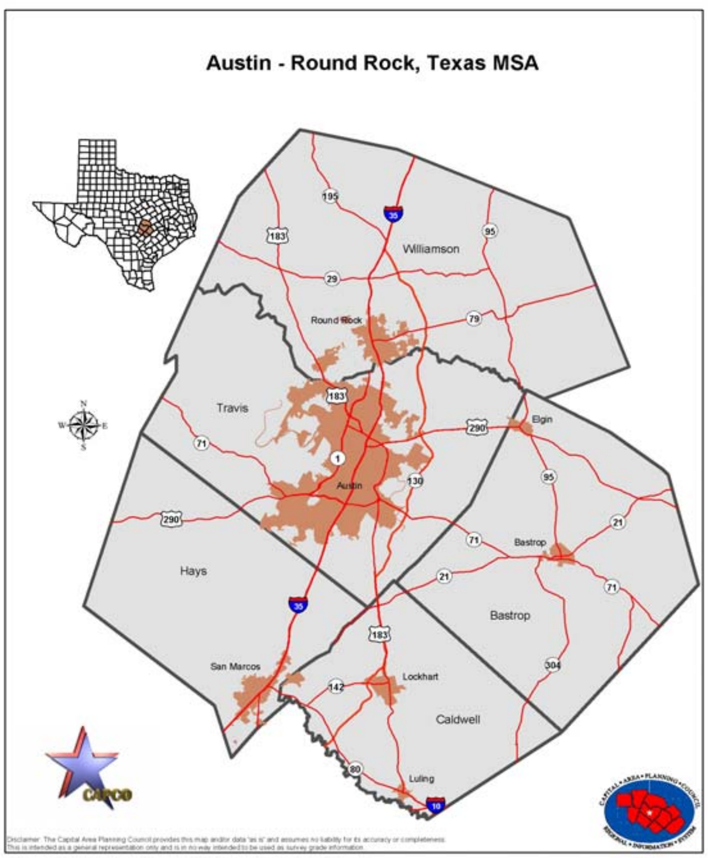

Figure 1.1 The Austin – Round Rock Metropolitan Statistical Area

2 Projection Methods

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.

2.1 Growth Projections

The data used to project activity growth depend on the sector of analysis. Area and point source projections are based on the Regional Economic Models, Inc. (REMI) data, as well as data from the Capital Area Metropolitan Planning Organization. On-road mobile projections use Vehicle Miles Traveled (VMT) data in conjunction with MOBILE6 emission factors. Nonroad mobile source projections were developed using EPA's NONROAD model (version 2002a). VMT data was developed from the Travel Demand Model analysis for the projected year.

Future changes in activity level will be the result of complex interactions between human population growth, changes in national and local economic factors, and changes in the markets for the sector being examined and the products it produces. Developing projections from these data sets can be accomplished in many ways. The most common and simplistic method is through the use of extrapolations of collected historic data. Historic extrapolations to project economic activity should be carried out using accepted statistical and economic techniques, such as multiple regression analysis, moving averages or autoregression.

The base case used in projections of 2002, 2005, 2007, and 2012 emission data came from the 1999 Emissions Inventory. Described below, several different methods were employed in the development of these projections.

2.1.1 Population Table

Population growth was used for several Area Source categories such as Bakeries, Breweries, and Personal Care Products. The CAPCO *Regional Forecast 2000 to 2030* was done for area planning (Envision Central Texas Project) and utilized for air quality projections.

	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 2.1 Population Growths (CAPCO Regional Forecast 2000 to 2030, REMI, 2003)

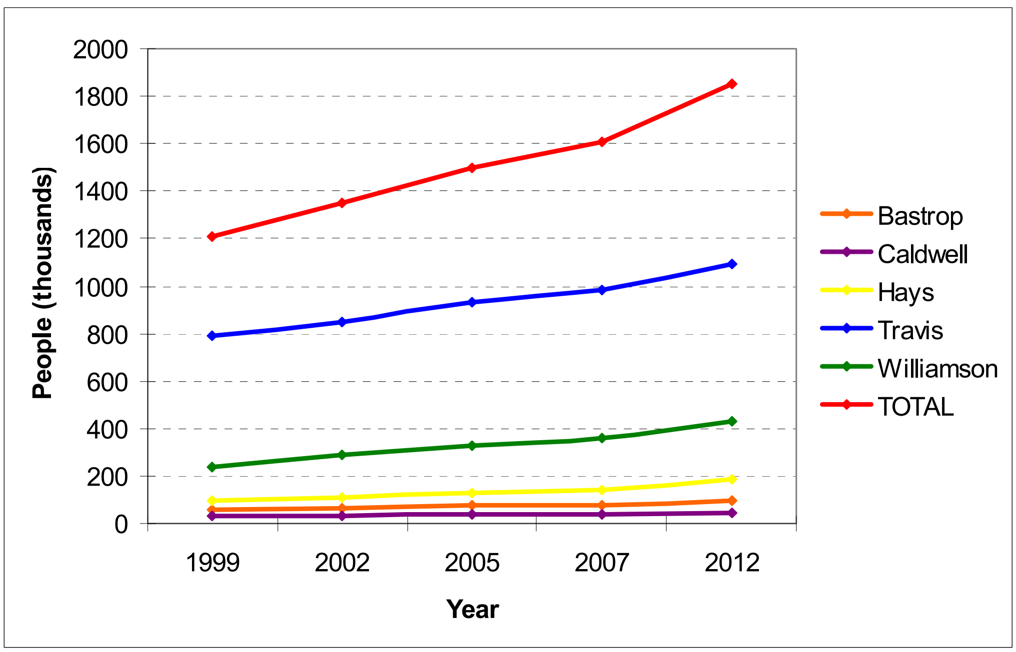

Figure 2.1 Population Trend

2.1.2 Economic Forecast

The most direct indicator of future emissions activity is product output, a direct measure of the amount of product being produced. Manufacturing employment can be used as a surrogate for projecting product output.

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

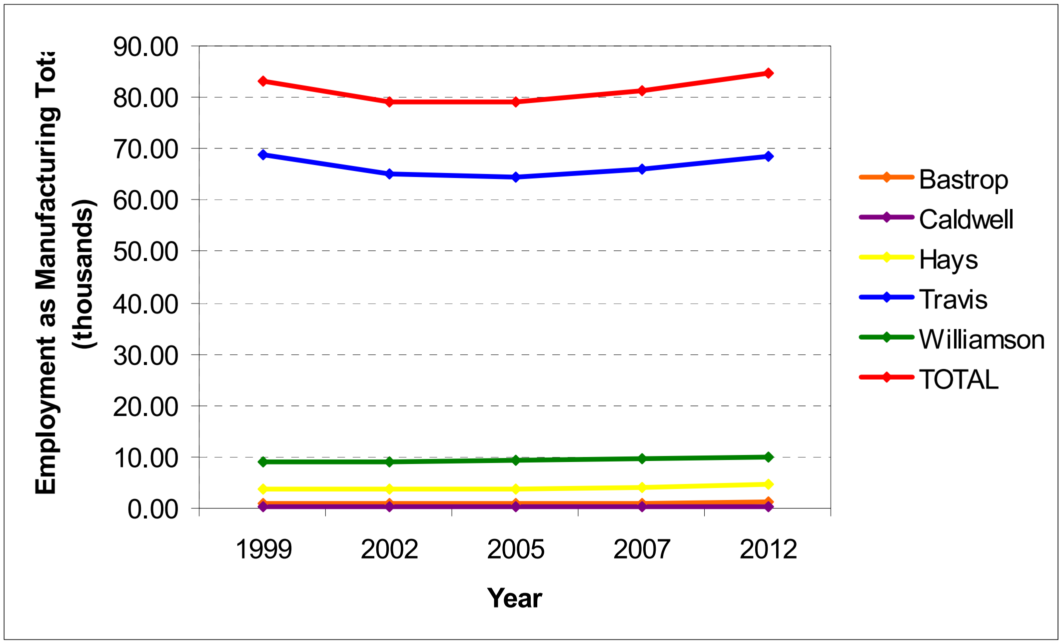

Figure 2.2 Manufacturing Trend

2.1.3 Vehicle Miles Traveled

Vehicle miles of travel (VMT) are key data for highway planning and management, and a common measure of roadway use. Along with other data, VMT are often used in estimating congestion, air quality, and potential gas-tax revenues, and can provide a general measure of the level of the nation's economic activity.

	VMT (thousands)				
County	**1999**	**2002**	**2005**	**2007**	**2012**
Bastrop	1,696	1,734	1,883	2,036	2,389
Caldwell	871	882	941	996	1,118
Hays	3,355	3,560	3,778	3,930	4,468
Travis	20,808	23,344	26,190	28,278	33,987
Williamson	5,774	6,895	8,234	9,268	11,882
TOTAL	32,504	36,415	41,026	44,508	53,844

Table 2.3 Vehicle Miles Traveled (TTI, 2003)

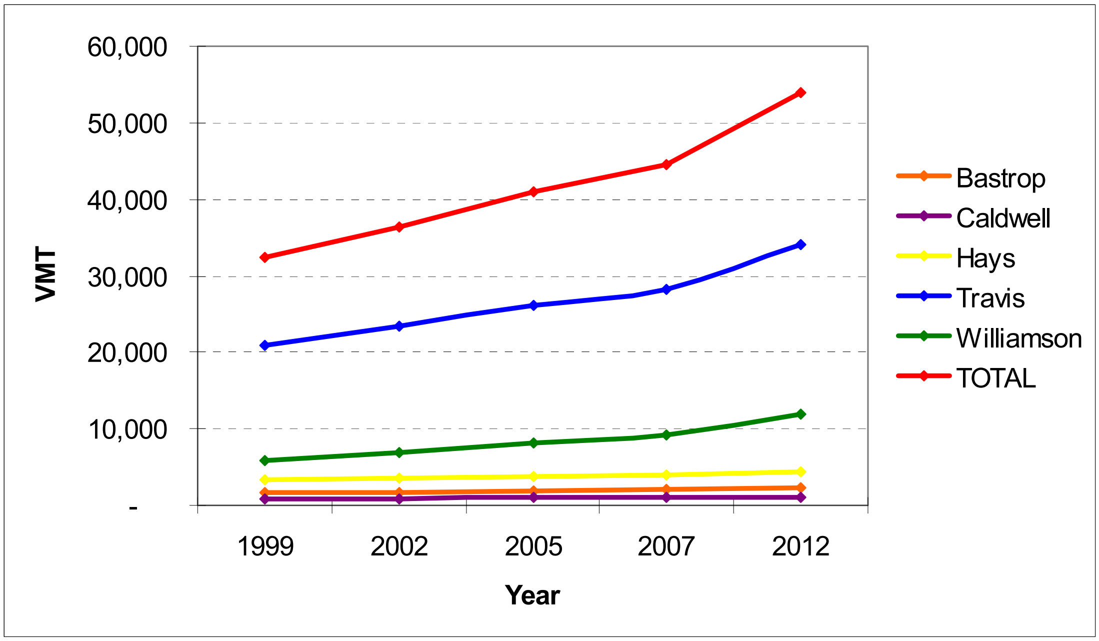

Figure 2.3 Vehicle Miles Traveled Trend

2.1.4 New Source Permits

New sources in the Austin – Round Rock MSA are listed in table 2.4. These emissions will be additional to the current inventory through 2012.

2007 Major Point Source Emissions (tpd) in the MSA and Surrounding Area			
County	**Facility Name**	**NOx**	**VOC**
Bastrop	Lost Pines 1 Power Plant	1.50	0.23
Bastrop	Bastrop Clean Energy Center	2.21	0.12
Hays	Hays Energy Facility	3.70	0.96
Travis	Sand Hills	1.03	0.20

Table 2.4 New Point Source Emissions

2.2 Control Strategy Projections

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.

2.2.1 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.

2.2.1.1 Senate Bill 7

The electric utility deregulation bill requires reductions in emissions levels of nitrogen oxides and sulfur dioxide from grand-fathered electric utility units. The NOx rate, in pounds of NOx per MM Btu (lbs NOx/MM Btu) is specified by SB 7 and is based on the location of the EGU.[1] This applies only to grand-fathered EGU's and is blank for permitted EGUs. The NOx allowances that will be allocated under the SB 7 program are equal to the SB 7 NOx rate times the 1997 heat input divided by 2000. It is estimated to save 8.8 tons per day in the Austin MSA through 2007.

2.2.1.2 Senate Bill 766

Senate Bill 766 has two major parts. The first part redefines the current permitting hierarchy according to the significance of emissions into De Minimis, Exemptions, Permits by Rule, Standard Permits and regular permits. The second part created three new types of permits: Voluntary Emission Reduction Permit (VERP), Multiplant Permit, and Grandfather Utility Permit. Senate Bill 7 provides additional guidance to the TNRCC regarding the issuance of Grand-fathered Utility Permits.[2] This does not directly decrease emissions in the area, but has an indirect effect of providing incentives for implementing more efficient control equipment.

2.2.2 Technology Changes

Many industries have become proactive in researching and implementing emissions reduction measures. Presented below are a few examples of how technology changes affect emission trends.

2.2.2.1 Auto Body

The use of high-volume low-pressure spray guns has been shown to reduce emissions and save money by decreasing coating use, hazardous waste generation and spray booth maintenance

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[1] The SB 7 NOx rates and NOx allowances for central and eastern Texas power plants can be found at: http://www.tnrcc.state.tx.us/grandfathered/sb7data.html
[2] Available online: http://www.tnrcc.state.tx.us/grandfathered/#background

costs. It is estimated that emissions can be reduced 20 to 40 percent by using transfer efficient spray equipment.

2.2.2.2 Graphic Arts

The graphic arts printing source category contains several different printing technologies or methodologies (e.g., rotogravure, offset lithography, flexography, letterpress, screen, etc.) several different printing substrate forms (paper, film, plastic, fabric and sheet fed versus web fed), and employs hundreds of different combinations of inks, washes, and process solutions to accomplish the desired printing application. It contains predominantly small facilities operating without emission controls. Because of the large number of small sources that exist and the highly diverse operations and materials they use, it has historically been difficult to develop accurate emission inventories for the category. A study prepared in 2001 for the Texas Commission on Environmental Quality by the Eastern Research Group developed an emission estimation methodology for VOC and HAP emissions based on 1999 data.

Since 1999 the industry has undergone a major technology shift as well as entering a nationwide graphic arts recession in 2000. This has had a dramatic impact on the number of firms in the industry. In 1999 there were 124 companies in the Travis, Hays, Williamson, and Bastrop counties; in 2003 the number has dropped to 90.

2.2.2.3 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.

3 Emission Trend Analysis

Data from National Emissions Trends (NET) emissions inventories and projected NET emissions inventories were used in the development of air quality trends within the MSA. Volatile organic compounds (VOC), nitric oxides (NOx), and carbon monoxide (CO) emissions are the three main pollutants that impact ozone in the region; thus, they are the pollutants measured in the emission inventories. These emissions are presented in the following categories: area source, Non-road mobile source, point source, biogenic source, and on-road mobile source.

3.1 Area Source

The purpose of this section is to describe the methodologies used to develop area source emission trends data for 1999 through 2012. The starting point for identifying the data sources and methodologies for estimating emission trends data for most of the area source categories was the 1999 inventory.

Emission projections for area sources depend upon the change in source level activity and changes in the emission factor applicable to the source. There are two approaches used. One was to use the Regional Economic Model (REMI) model to estimate trends in emission activity. The other was to utilize emissions activity data that have been identified as directly related to the level of uncontrolled emissions for a particular process.

The Area Sources inventory for Austin-Round Rock MSA region was generated by utilizing factors for several growth indicators generated by the REMI model. The growth factors and growth indicators are presented in Figure 3.1.

BASTROP	1999	2002	2005	2007	2010	2012
Population (Thous)	1.00	1.13	1.34	1.38	1.73	1.73
EMPLOYMENT (Thous)						
Printing	1.00	0.96	1.05	1.11	1.19	1.26
Manufacturing Total	1.00	1.04	1.10	1.14	1.18	1.21
Electronics/Electrical	1.00	1.02	1.12	1.19	1.26	1.30
Auto Repair, Parking, Services	1.00	1.08	1.13	1.19	1.33	1.35
Agri. Chemicals	1.00	1.00	1.00	1.00	1.00	1.00
Paint	1.00	1.00	1.00	1.00	1.00	1.00
Farm	1.00	0.99	0.97	0.95	0.93	0.91
OUTPUT (fixed Bil 96$)						
Soap Output	1.00	1.00	1.00	1.00	1.00	1.00
Oil/Gas Mining	1.00	1.04	1.11	1.18	1.29	1.36
CALDWELL	**1999**	**2002**	**2005**	**2007**	**2010**	**2012**
Population (Thous)	1.00	1.10	1.19	1.27	1.40	1.48
EMPLOYMENT (Thous)						
Printing	1.00	1.12	1.24	1.29	1.35	1.41
Manufacturing Total	1.00	0.95	0.99	1.02	1.05	1.07
Electronics/Electrical	1.00	1.12	1.09	1.09	1.09	1.06
Auto Repair, Parking, Services	1.00	0.97	1.01	1.07	1.16	1.21
Agri. Chemicals	1.00	1.00	1.00	1.00	1.00	1.00
Paint	1.00	1.00	1.00	1.00	1.00	1.00
Farm	1.00	0.99	0.97	0.95	0.93	0.91
OUTPUT (fixed Bil 96$)						
Soap Output	1.00	1.00	1.00	1.00	1.00	1.00
Oil/Gas Mining	1.00	1.09	1.05	1.08	1.19	1.19
HAYS	**1999**	**2002**	**2005**	**2007**	**2010**	**2012**
Population (Thous)	1.00	1.17	1.37	1.54	1.80	1.97
EMPLOYMENT (Thous)						
Printing	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing Total	1.00	0.93	1.01	1.06	1.14	1.19
Electronics/Electrical	1.00	0.98	1.09	1.18	1.30	1.38
Auto Repair, Parking, Services	1.00	1.06	1.16	1.27	1.45	1.53
Agri. Chemicals	1.00	1.00	1.00	1.00	1.00	1.00
Paint	1.00	1.00	1.00	1.00	1.00	1.00
Farm	1.00	1.00	0.98	0.96	0.94	0.92
OUTPUT (fixed Bil 96$)						
Soap Output	1.00	1.00	1.00	1.00	1.00	1.00
Oil/Gas Mining	1.00	1.08	1.04	1.08	1.21	1.21
TRAVIS	**1999**	**2002**	**2005**	**2007**	**2010**	**2012**
Population (Thous)	1.00	1.08	1.18	1.25	1.35	1.39
EMPLOYMENT (Thous)						
Printing	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing Total	1.00	0.95	0.93	0.96	0.99	0.99
Electronics/Electrical	1.00	1.02	1.00	1.00	0.98	0.96
Auto Repair, Parking, Services	1.00	0.88	0.91	0.97	1.06	1.09
Agri. Chemicals	1.00	1.00	1.00	1.00	1.00	1.00
Paint	1.00	1.00	1.00	1.00	1.00	1.00
Farm	1.00	0.99	0.97	0.95	0.93	0.91
OUTPUT (fixed Bil 96$)						
Soap Output	1.00	1.00	1.22	1.33	1.56	1.67
Oil/Gas Mining	1.00	1.10	1.04	1.05	1.17	1.16
WILLIAMSON	**1999**	**2002**	**2005**	**2007**	**2010**	**2012**
Population (Thous)	1.00	1.23	1.39	1.52	1.70	1.81
EMPLOYMENT (Thous)						
Printing	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing Total	1.00	1.00	1.03	1.06	1.10	1.11
Electronics/Electrical	1.00	0.95	0.93	0.93	0.92	0.90
Auto Repair, Parking, Services	1.00	0.94	0.93	0.96	1.03	1.04
Agri. Chemicals	1.00	0.50	0.50	0.50	0.50	0.50
Paint	1.00	1.00	1.00	1.00	1.00	1.00
Farm	1.00	0.99	0.97	0.95	0.93	0.91
OUTPUT (fixed Bil 96$)						
Soap Output	1.00	0.86	0.95	1.09	1.23	1.32
Oil/Gas Mining	1.00	1.16	1.12	1.15	1.26	1.26

Figure 3.1 Growth Factors used to estimate Area source trends

The following formula was used in order to estimate area source emissions:

$$(Area\ source\ Category)_{Year\ X\ Emissions} = (Area\ source\ Category)_{1999\ Emissions}\ x\ G\ x\ C$$

C is the Control factor and G is the growth factor presented in Figure 3.1. Each of the area source categories was multiplied with a corresponding growth factor. Note that each county has a different set of growth factors. The exception to this process was the area source category "Industrial Processes (Oil&Gas Production)". A zero growth (growth factor = 1) was assumed for that category due to the declining economy.

As with point sources, area source projections can be made using local studies or surveys or through surrogate growth indicators. The most commonly used surrogate growth indicators are population, housing, land use, and employment. Area sources rarely have detailed information based on surveys of individual emitters. Generally surrogate growth rates, as characterized by source type, were used. While surrogate growth indicators such as GSP, employment, and population are reasonable estimators of future air pollution generating activity for traditional area source emitters (manufacturing, population-based activities), other indicators may be more appropriate for non-traditional emitters. Policy changes, which may lead to increased or decreased activity in a category, must also be considered. Table 3.1 lists the emission totals for the five counties within the MSA.

Area Sources Emission Trend					
	1999	2002	2005	2007	2012
BASTROP					
CO	1.23	1.37	1.61	1.86	2.30
NOx	0.60	0.62	0.65	0.76	0.82
VOC	4.52	4.71	5.17	5.53	6.16
CALDWELL					
CO	0.75	0.82	0.87	0.95	1.04
NOx	0.54	0.55	0.54	0.67	0.68
VOC	15.29	16.52	16.09	15.75	17.17
HAYS					
CO	1.25	1.44	1.66	1.88	2.17
NOx	0.58	0.62	0.67	0.79	0.85
VOC	5.47	5.89	6.48	7.67	8.21
TRAVIS					
CO	7.57	8.16	8.89	9.58	10.30
NOx	3.21	3.41	3.65	4.05	4.28
VOC	50.60	50.51	52.90	57.04	57.58
WILLIAMSON					
CO	2.99	3.49	3.83	4.27	4.64
NOx	3.00	3.11	3.14	3.84	3.86
VOC	14.68	15.67	16.63	20.44	21.25
MSA					
CO	13.79	15.28	16.87	18.55	20.46
NOx	7.93	8.31	8.66	10.12	10.50
VOC	90.56	93.29	97.27	106.42	110.37

Table 3.1 Area Source Emission Trends Break Down (Tons per Day)

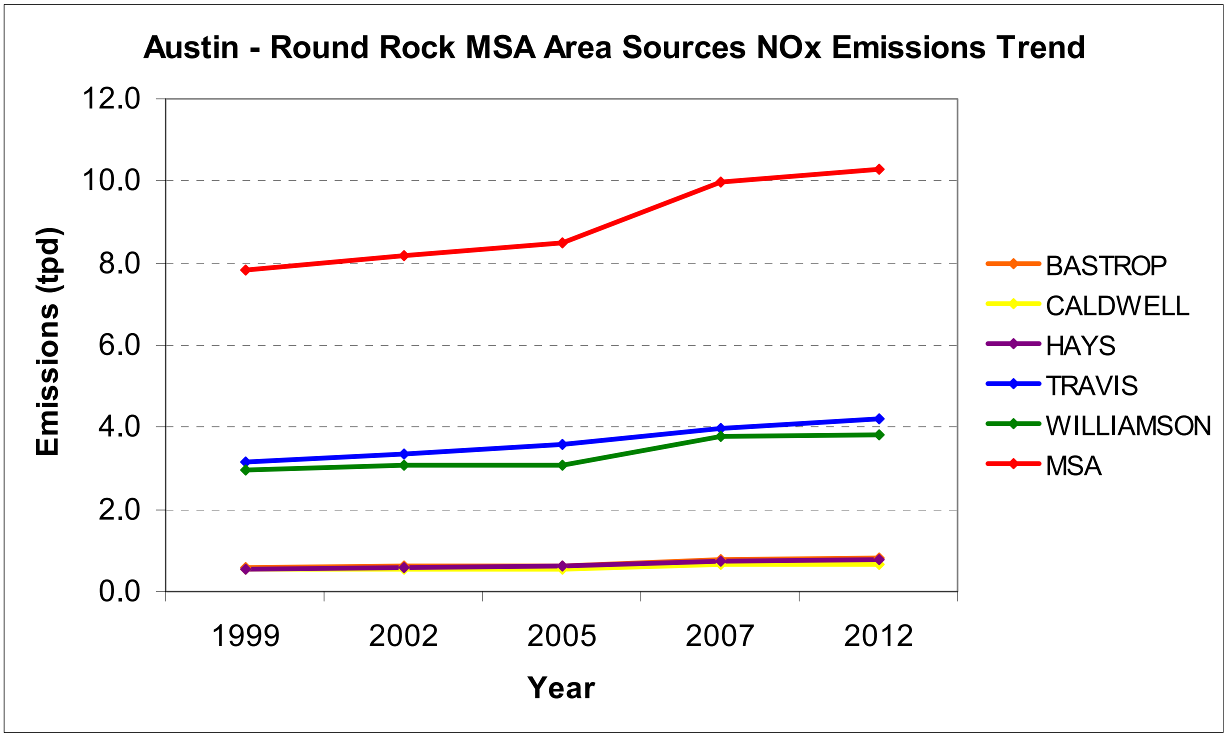


Figure 3.2 Area Source NOx Emission Trend

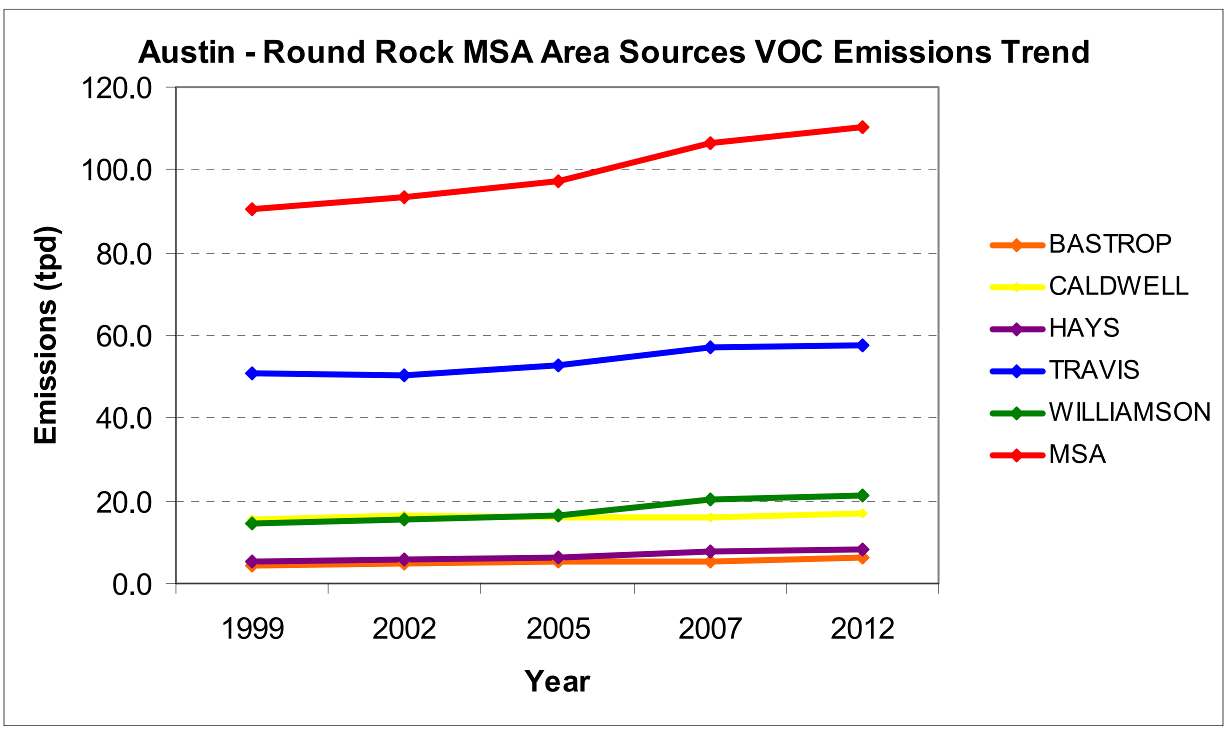


Figure 3.3 Area Source VOC Emission Trend

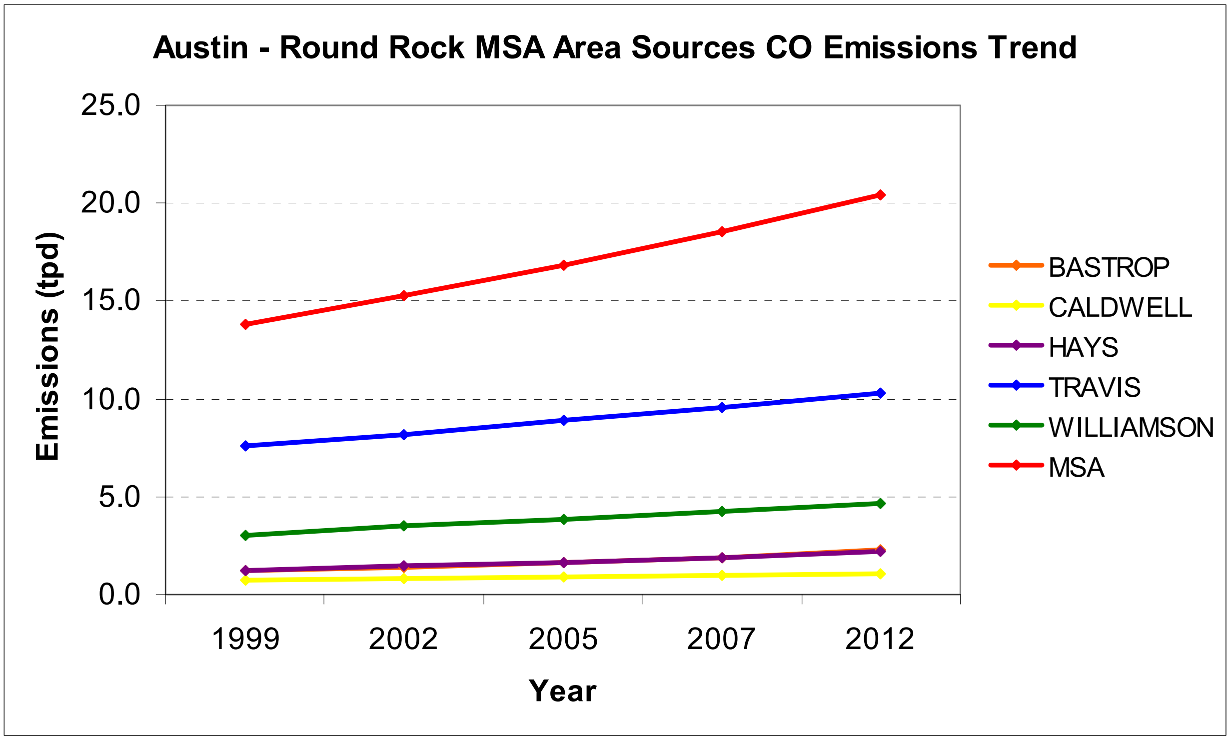


Figure 3.4 Area Source CO Emission Trend

There were minimal changes to the methodologies used for calculating area source emissions totals. Due to population and economic growth in the MSA, the VOC, NOx, and CO emission levels from area sources demonstrate an upward trend. This is shown in Figures 3.2, 3.3, and 3.4.

3.2 On-Road Mobile Source

This section describes in detail the tools, data, and approach used to obtain county-level on-road mobile source emissions for each calendar year from 1999 to 2012, both annual total and ozone season average daily. Emissions were estimated as products of emission factors (expressed in grams/mile) and associated vehicle miles traveled (VMT). US EPA's emission factor models were used to obtain the required emission factors. In particular, the current draft MOBILE6 model was utilized for VOC, CO and NOx emission factors. The on-road mobile source emissions for the Austin-Round Rock area were provided by the Texas Transportation Institute.

3.2.1 MOBILE6

Created by the EPA, the MOBILE6 model estimates ozone precursors, as well as other pollutants, and emission factors for diesel and gasoline fueled vehicles. The emission factors were utilized to calculate the amount of emissions from various on-road mobile emission categories. MOBILE 6 emission factors for future years reflect the improved emissions controls required by federal regulations.

		On-road Emissions (tpd)			
Year	County	VMT	VOC	CO	NOx
1999	Bastrop	1,696,371	2.54	34.12	3.95
	Caldwell	871,369	1.30	17.78	2.32
	Hays	3,355,567	4.85	70.52	11.44
	Travis	20,808,059	32.61	409.47	63.06
	Williamson	57,744,481	8.89	118.21	17.09
2002	Bastrop	1,734,862	2.16	31.94	3.65
	Caldwell	882,269	1.09	16.52	2.06
	Hays	3,560,413	4.30	68.89	9.95
	Travis	23,344,708	31.11	418.89	58.33
	Williamson	6,895,568	9.19	129.72	17.26
2005	Bastrop	1,883,141	1.64	24.18	2.85
	Caldwell	940,823	0.81	12.30	1.56
	Hays	3,777,735	3.16	51.18	7.16
	Travis	26,190,389	23.69	332.00	44.81
	Williamson	8,234,243	7.13	108.17	14.29
2007	Bastrop	2,036,006	1.50	20.95	2.45
	Caldwell	995,501	0.73	10.43	1.31
	Hays	3,929,957	2.78	42.48	5.86
	Travis	28,277,855	21.95	287.59	38.23
	Williamson	9,268,192	6.83	97.25	12.68
2012	Bastrop	2,389,855	1.17	18.56	1.54
	Caldwell	1,118,452	0.54	8.86	0.77
	Hays	4,468,052	2.12	35.88	3.21
	Travis	339,855,780	17.27	260.30	23.48
	Williamson	11,881,719	5.86	92.59	8.14

Table 3.2 Austin-Round Rock MSA On-Road Mobile Source VMT and Emissions Tonnage

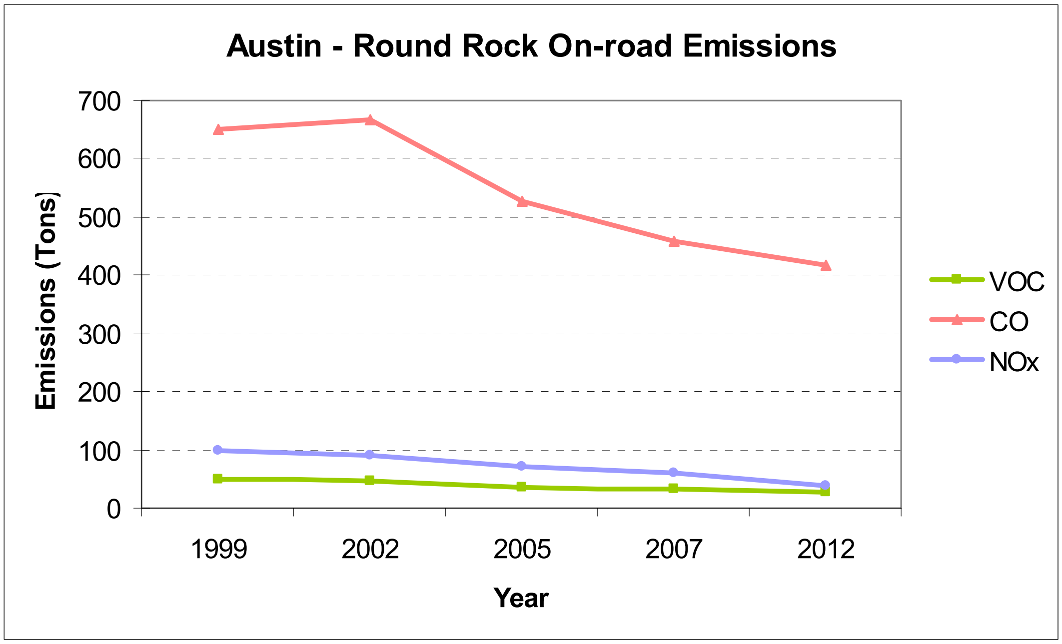


Figure 3.5 On-Road Mobile Emissions Trend for the MSA

3.2.2 Trend

On-road mobile source emissions reflected a decreasing trend through the 1999-2012 time period. The decrease can be attributed to the emission control systems in vehicles as well as other emission reduction measures such as low sulfur gasoline aimed at reducing vehicle emissions. This decrease can be observed in figure 3.5.

3.3 Non-Road Mobile Source

This section describes the methodologies and procedures used to develop county-level 1999 – 2012 emissions estimates for all 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:

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

3.3.1 EPA's Non-Road Mobile Emission Inventory Model

The NONROAD model calculates tonnage of emissions in tons for all non-road mobile equipment categories except commercial marine, locomotives, and aircraft. The model accounts for the different fuel types, such as gasoline, diesel, compressed natural gas, and liquefied petroleum and accounts for future technology and fuel requirements. The model estimates emissions from exhaust and evaporative hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NOx), particulate matter (PM), sulfur oxides (SOx), carbon dioxide (CO2). [3] Commercial marine is not applicable in this MSA. Locomotives and aircraft were taken from 1999 emissions inventory with no growth assumed. Additionally, federal rules were applied to locomotives.

Table 3.3 Non-Road Mobile Source VOC Emissions (tons per day), Austin-Round Rock MSA

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 3.4 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 3.5 Non-Road Mobile Source CO Emissions (tons per day), Austin-Round Rock MSA

Non-Road CO Emissions					
	1999	2002	2005	2007	2012
Bastrop	4.93	5.08	5.23	5.78	5.33
Caldwell	3.79	3.47	4.39	4.77	5.30
Hays	8.31	14.90	15.07	16.69	15.19
Travis	110.02	265.03	271.00	299.11	270.15
Williamson	26.73	59.01	60.34	66.26	60.52
Total	153.77	347.50	356.03	392.61	356.49

[3] Environmental Protection Agency, 2002. National Nonroad Emissions Model:2002a Drat Version. Ann Arbor, MI.

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

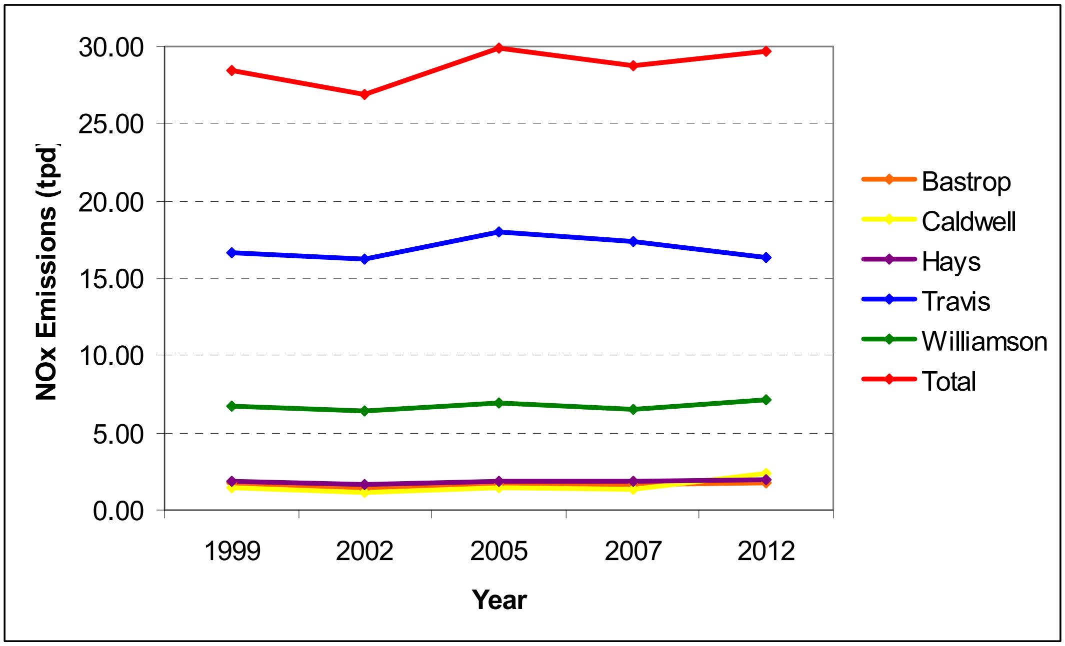


Figure 3.6 Non-Road Mobile NOx Emissions, Austin-Round Rock MSA

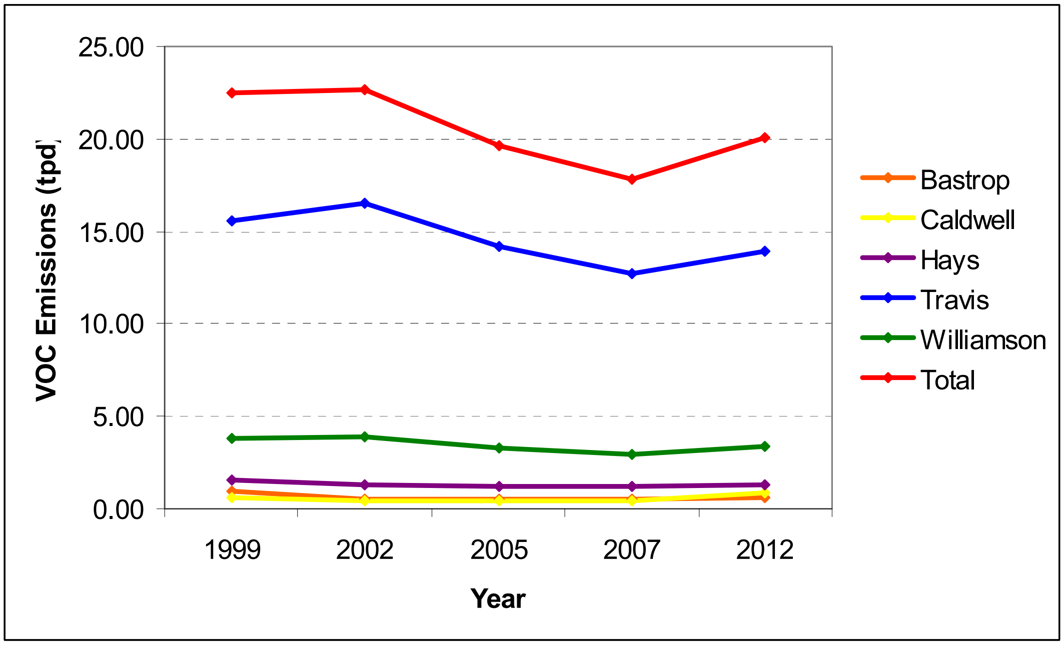


Figure 3.7 Non-Road Mobile VOC Emissions, Austin-Round Rock MSA

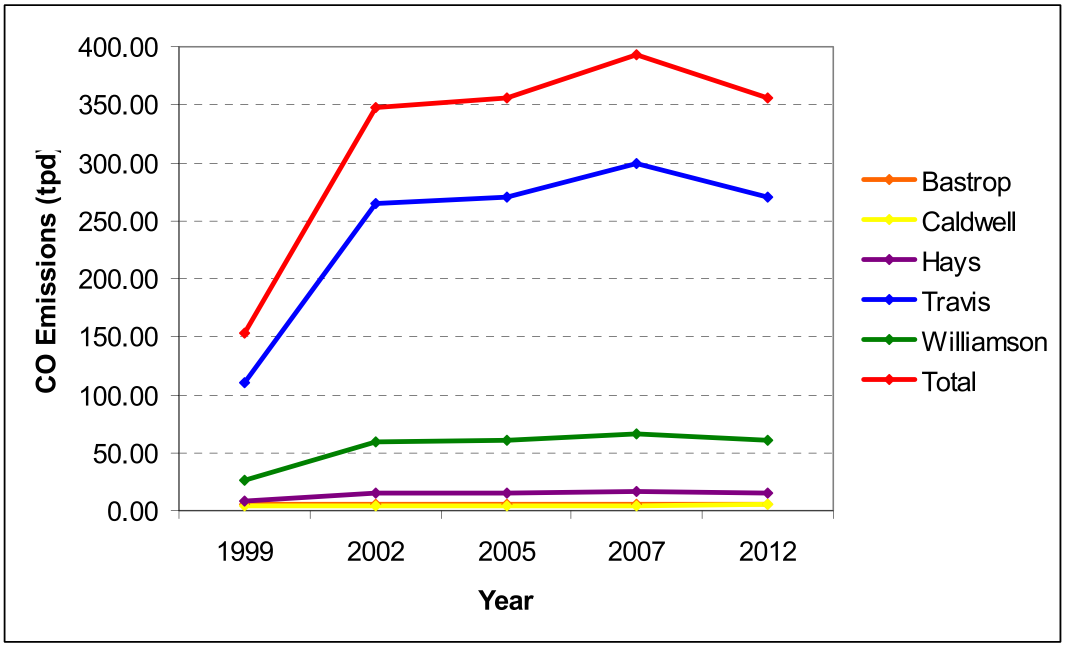


Figure 3.8 Non-Road Mobile CO Emissions, Austin-Round Rock MSA

3.3.2 Non-Road Mobile Trend

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 3.6. However, for VOC the continued population increases are shown from 2007 to 2012 (Figure 3.7).

3.4 Point Source

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 3.6 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 3.6 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 3.7 Point Source Emissions from major NEGU

Table 3.7 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 3.9 and 3.10 graphically illustrates the trend for major point source emissions for all counties in the Austin-Round Rock MSA.

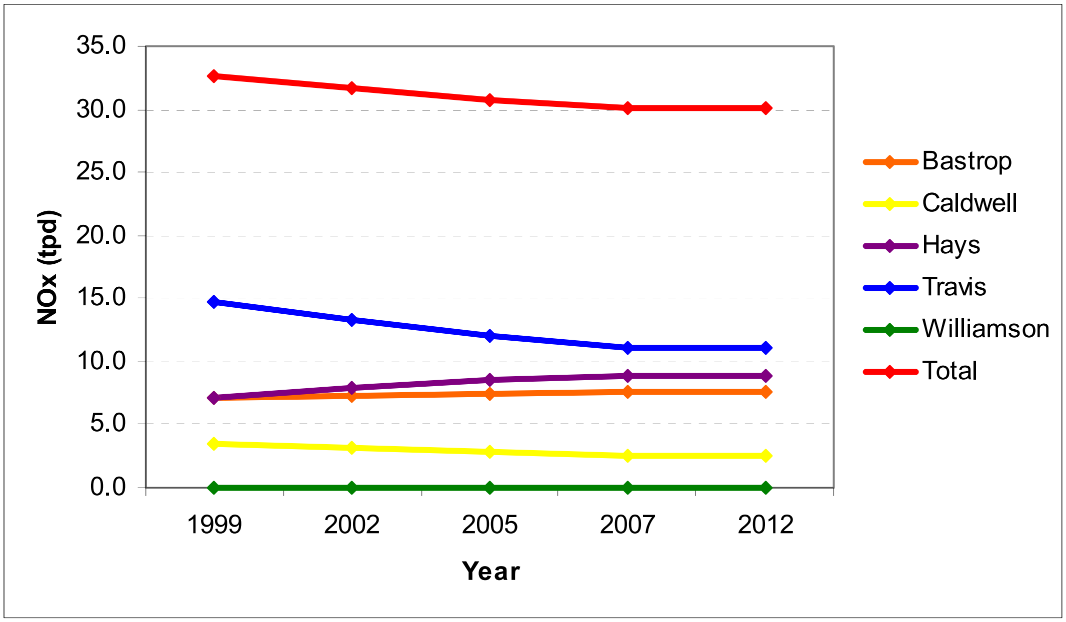


Figure 3.9 Point Source NOx Emissions Trend, Austin-Round Rock MSA

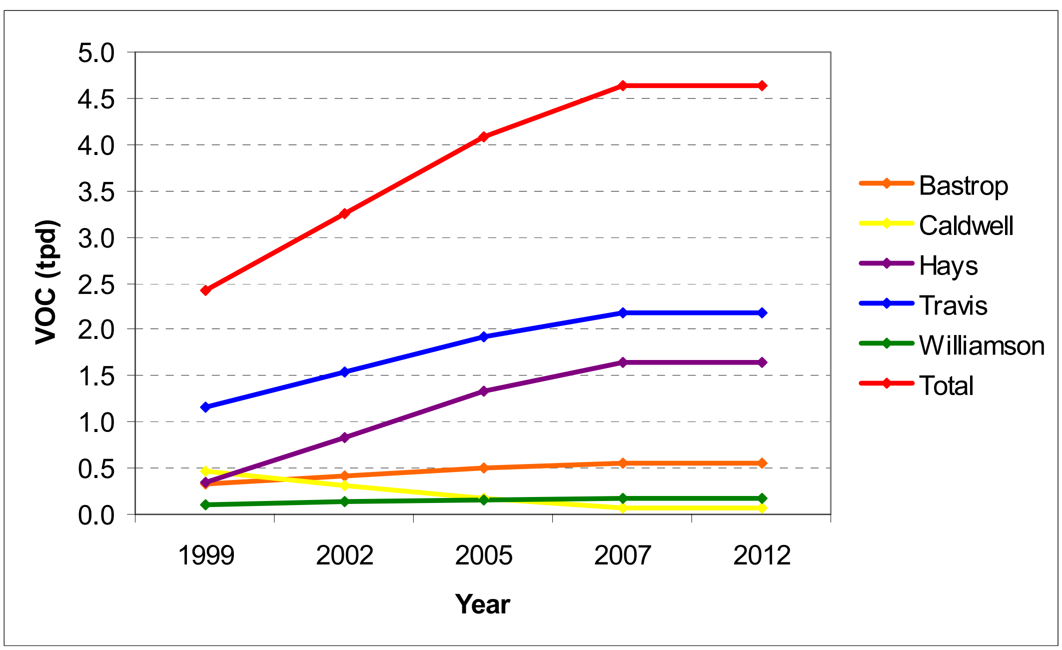


Figure 3.10 Point Source VOC Emissions Trend, Austin-Round Rock MSA

3.5 Biogenic Source

While biogenic emission sources are an important component of the inventory, the existing 1999 NEI database includes biogenic emissions developed through use of the PC-BEIS model. In support of TCEQ's current regional scale air quality modeling efforts, in 2001 ENVIRON developed an updated statewide county level biogenic emission inventory using the latest version of the GLOBEIS model (Yarwood et al, 2001).

Table 3.6 presents a summary of the Austin – Round Rock MSA biogenic VOC and NOx emissions in tons/day (tpd). These emissions are expected to remain unchanged through 2012. Expected land use increases would only decrease biogenic emissions.

	1999 Biogenic Emissions	
County	**VOC (tpd)**	**NOx (tpd)**
Bastrop	123.89	2.18
Caldwell	80.95	4.93
Hays	49.42	3.29
Travis	71.64	4.78
Williamson	68.20	9.75

Table 3.8 Biogenic Emissions for a Typical Summer Day

4 Conclusion

This report satisfies the requirement outlined in the Austin-Round Rock MSA Early Action Compact (December 18, 2002) Memorandum of Agreement section II A.1 Milestones, *Emissions Inventory Comparison and Trend Analysis for the Austin-Round Rock MSA: 1999, 2002, 2005, 2007 & 2012;* December 31, 2003. Using growth and control strategy projections we have accounted for as many of the important variables that affect future year emissions as possible. The trend analysis provides an insight into the historical and future emissions levels that occur in the Austin-Round Rock MSA, while accounting for the impacts of population and economic changes on the air quality in the area. These projections will provide a basis for developing control strategies for our Clean Air Action Plan, conducting attainment analyses, and tracking progress towards meeting air quality standards.

The results of our inventory and forecast modeling, listed in Table 4.1 and Table 4.2, indicate that the total levels of NOx and VOC emissions have a downward trend. The decline in NOx emissions for point and onroad mobile sources offsets the growth of area on nonroad mobile source emissions. Growth of the VOC emissions in area sources is offset by decline in nonroad and on road mobile source emissions. The year 2007 is of significant importance, because by this year all pollutants emissions levels must be within acceptable levels set by the NAAQS. For a typical weekday in the MSA in 2007, emission of 520.26 tons of VOC is forecasted, while NOx emissions will be about 153.07 tons. The projected totals for future year 2012 are 516.37 for VOC and 132.18 for NOx. These smaller numbers indicate a future downward trend for emission of ozone precursors. Calculations of these emissions totals take into account all governmental air quality regulations for this time period.

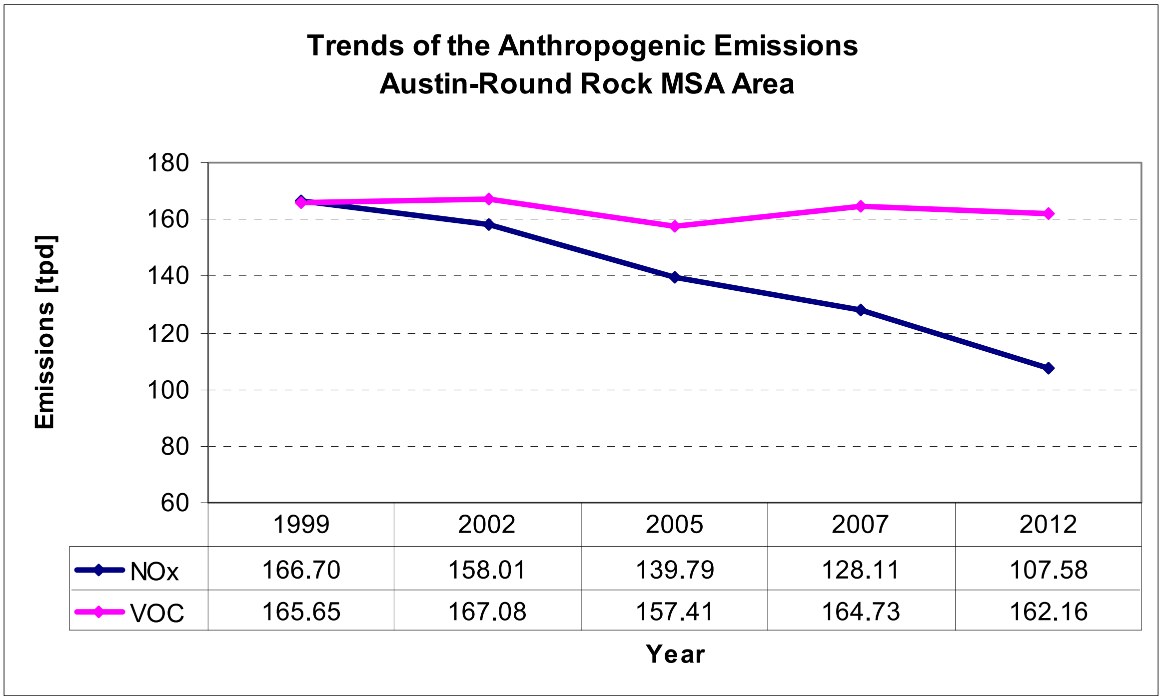
NOx Emission Trends					
	1999	**2002**	**2005**	**2007**	**2012**
Area Sources	7.82	8.17	8.49	9.96	10.29
Nonroad Mobile Sources	28.44	26.93	29.88	27.47	29.65
Onroad Mobile Sources	97.86	91.25	70.66	60.53	37.12
Point Sources	32.58	31.67	30.75	30.15	30.51
Biogenic Sources	24.93	24.93	24.93	24.93	24.93
Total	**191.63**	**182.94**	**164.72**	**153.04**	**132.51**
Total Anthropogenic	**166.70**	**158.01**	**139.79**	**128.11**	**107.58**

Table 4.1 NOx Emissions for the Austin-Round Rock Region by Source

VOC Emission Trends					
	1999	**2002**	**2005**	**2007**	**2012**
Area Sources	90.56	93.29	97.27	106.42	110.37
Nonroad Mobile Sources	22.49	22.68	19.63	19.88	20.07
Onroad Mobile Sources	50.19	47.85	36.43	33.79	26.97
Point Sources	2.42	3.25	4.08	4.63	4.75
Biogenic	394.09	394.09	394.09	394.09	394.09
Total	**559.74**	**561.17**	**551.50**	**558.82**	**556.25**
Total Anthropogenic	**165.65**	**167.08**	**157.41**	**164.73**	**162.16**

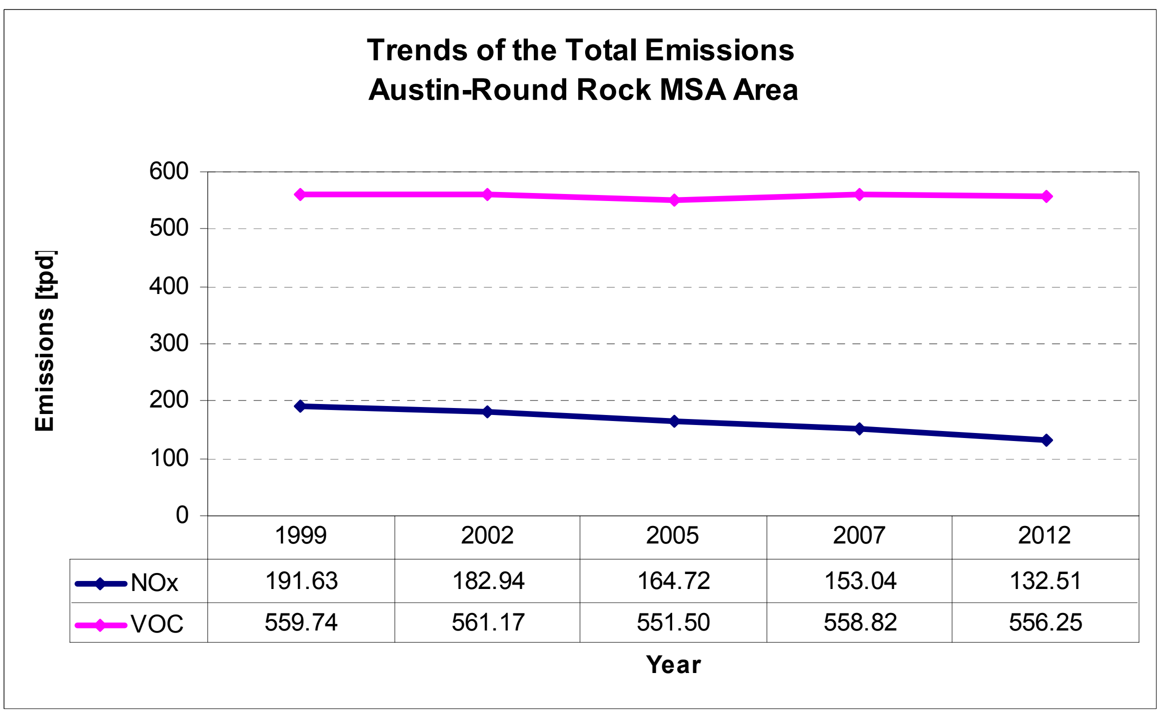
Table 4.2 VOC Emissions for the Austin-Round Rock Region by Source

As mentioned in previous sections, due to the federal, state, and local emission control policies, the downward trend of emissions will be sustained into the year 2012, despite predicted growth in population size and economic activities. The application of sound development policies and environmentally friendly technologies in future years is expected. (Figures 4.1 and 4.2)



	1999	2002	2005	2007	2012
NOx	166.70	158.01	139.79	128.11	107.58
VOC	165.65	167.08	157.41	164.73	162.16

Figure 4.1 Anthropogenic Emissions for the Austin-Round Rock Region



	1999	2002	2005	2007	2012
NOx	191.63	182.94	164.72	153.04	132.51
VOC	559.74	561.17	551.50	558.82	556.25

Figure 4.2 Total Emissions Trend for the Austin-Round Rock Region