REVISIONS TO THE STATE IMPLEMENTATION PLAN FOR THE CONTROL OF OZONE AIR POLLUTION

SAN ANTONIO AREA EARLY ACTION COMPACT OZONE STATE IMPLEMENTATION PLAN REVISION

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
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SECTION VI. CONTROL STRATEGY

A. Introduction (No Change)

B. Ozone (Revised)

1. *Dallas/Fort Worth* (No change)
2. *Houston/Galveston* (No change)
3. *Beaumont/Port Arthur* (No change since October 2004 revision)
4. *El Paso* (No change.)
5. *Regional Strategies* **(**No Change**)**
6. *Northeast Texas*
7. *Austin Area*
8. *San Antonio Area*
   Chapter 1: General
   Chapter 2: Emissions Inventory
   Chapter 3: Photochemical Modeling
   Chapter 4: Data Analysis
   Chapter 5: Control Strategies
   Chapter 6: Maintenance for Growth

C. Particulate Matter (No change.)

D. Carbon Monoxide (No change.)

E. Lead (No change.)

F. Oxides of Nitrogen (No change.)

G. Sulfur Dioxide (No change.)

H. Conformity with the National Ambient Air Quality Standards (No Change)

I. Site Specific (No change.)

J. Mobile Sources Strategies (No change)

LIST OF ACRONYMS

AACOG- Alamo Air Council of Governments
AIR - Air Improvement Resources (Committee)
AIRS- Air Improvement Resources
AFV- Alternative Fuel Vehicles
AQTF- Air Quality Task Force
BESL- Brooks Energy Sustainability Laboratory
CAMS- Continuous Air Monitoring System
CAMx- Comprehensive Air Quality Model with Extensions
CO- carbon monoxide
COSA-City of San Antonio
CPS- City Public Service
DFW- Dallas/Fort Worth
EAC- Early Action Compact
EDMS- Emissions and Dispersion Modeling System
EGAS- Economic Growth Analysis System
EGU- Electric Generating Unit
EI- emissions inventory
EIP- Early Implementation Plan
EIQ- Emissions Inventory questionnaires
EPA- Environmental Protection Agency
ESL- Energy Systems Laboratory
FAR- Flexible Attainment Region
FCAA- Federal Clean Air Act
FY - Fiscal Year
GloBEIS- Global Biogenic Emissions Inventory System
HAP- hazardous air pollutant
HB- House Bill
HC-hydrocarbon
HGB- Houston/Galveston/Brazoria
HGB MCR - Houston/Galveston/Brazoria Mid-Course Review
ITS- Intelligent Transportation System
km - kilometer
lbs/day - pounds per day
MFG - Maintenance for Growth
MOBILE 6.2 - Mobile Model version 6.2
MM5- Fifth Generation Mesoscale Model
MPO- Metropolitan Planning Organization
MSA - Metropolitan Statistical Area
NAAQS- National Ambient Air Quality Standards
NEGU- Non- Electric Generating Unit
NNA-near nonattainment areas
NO_x- nitrogen oxides

PiG- plume-in grid
PM- particulate matter
PPM- Piece-wise Parabolic Method
ppb- parts per billion
PSDB- Point Source Data Base
Q-Q - Quantile-Quantile plot
RRF - Relative Reduction Factor
SA-BC MPO- San Antonio-Bexar County Metropolitan Planning Organization
SACAP- San Antonio Clean Air Plan
SAEAD - San Antonio EAC Attainment Demonstration
SAER- San Antonio EAC Region
SB- senate bill
SIP- State Implementation Plan
SO2- sulfur dioxide
SOS-Southern Oxidants Study
TCEQ- Texas Commission on Environmental Quality (formerly the TNRCC)
TDM- Transportation Demand Management
TERMs- Transportation Emission Reduction Measures
TexAQS - Texas Air Quality Study
TIP- Transportation Improvement Plan.
TMMNA- Toyota Motor Manufacturer North America
TNRCC- Texas Natural Resource Conservation Commission (renamed the TCEQ)
tpd- tons per day
tpy- tons per year
TTI-Texas Transportation Institute
UAM- urban airshed model
VMT- vehicle miles traveled
VOC- volatile organic compounds

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CHAPTER 1: GENERAL INFORMATION

1.1 BACKGROUND

In 1999, in response to the promulgation of the new 8-hour ozone National Ambient Air Quality Standards (NAAQS), the local elected officials and air quality planners in the San Antonio Texas "near non-attainment" area proposed the Accelerated Attainment Area (AAA) concept to the then Texas Natural Resource Conservation Commission (TNRCC) (now the TCEQ) and to the EPA. This concept, which San Antonio designed to help them voluntarily achieve the 8-hour ozone standard, eventually developed into the Early Implementation Plan (EIP). Neither concept was ever endorsed by EPA, although in 2001 EPA proposed the Ozone Flex program to allow areas to create voluntary plans to address the 1-hour ozone standard.

TCEQ continued to be committed to the concept of voluntary, early action toward the 8-hour ozone standard, however, and throughout the next year continued to work with EPA and members of the environmental community toward that end. In March 2002, TCEQ approached EPA for approval of the concept of early action plans, to be established through a compact between local, state and EPA officials for areas that are in attainment (including no monitored violations) of the 1-hour ozone standard, but are approaching or monitoring exceedances of the 8-hour ozone standard.

This concept of early voluntary 8-hour ozone air quality plans, or Early Action Compacts (EAC), was endorsed by EPA Region 6 in June 2002, then slightly modified and made available nationally in November 2002. These plans will include all the necessary elements of a comprehensive air quality plan, but will be tailored to local needs and driven by local decisions. An EAC is designed to develop and implement control strategies, account for growth, and achieve and maintain the 8-hour ozone standard. This approach offers a more expeditious time line for achieving emission reductions earlier than EPA's expected 8-hour ozone implementation rulemaking, while providing "fail-safe" provisions for the area to revert to the traditional State Implementation Plan (SIP) process if specific milestones are not met.

The principles of the tri-party EAC, executed by local, state and EPA officials, were:

- Early planning, implementation, and emission reductions leading to expeditious attainment and maintenance of the 8-hour ozone standard;
- Local control of the measures to be employed, with broad based public input;
- State support to ensure technical integrity of the early action plan;
- Formal incorporation of the early action plan into the SIP;
- Deferral of the effective date of nonattainment designation and related requirements so long as all Compact terms and milestones are met; and
- Safeguards to return areas to traditional SIP requirements should EAC terms and/or milestones be unfulfilled, with appropriate credit given for emission reduction measures implemented.

Table 1.1-1 - Time line for EACs under Protocol for Early Action Compacts

EAC Protocol Time line	
Year	**Task/Commitment**
2002	Compact detailing milestones for how an area will create their early action plan must be finished and signed
2003	Local area completes technical work and develops own control measures
2004	Early action plan must be complete and integrated into the SIP for submittal to EPA
2005	All control strategies must be implemented
2006	Ongoing local reporting and review process, including plan updates as necessary
2007	Area reaches attainment of the 8-hour ozone standard
2008	EPA re-designates area as attainment, with no further requirements

Should an EAC area miss a milestone at anytime during the agreement, including attaining the 8-hour ozone standard by 2007, they will forfeit their participation and rejoin the 8-hour ozone implementation process in progress, and will be subject to the same requirements and deadlines which would have been effective had they not participated in this program, with no delays or exemptions from EPA rules.

During the past several years, air quality planning in the San Antonio area has intensified as monitored ozone concentrations have exceeded 8-hour ozone NAAQS levels. During the ozone seasons of 1997 through 2000, local air quality monitors recorded ozone levels above the concentrations allowed under the 8-hour ozone NAAQS. In December 2003, the EPA indicated its intent, barring review of compelling evidence from the State to the contrary, to designate the counties of Bexar, Comal, Guadalupe, and Wilson as nonattainment of the 8-hour ozone NAAQS. These counties constituted the San Antonio Metropolitan Statistical Area (MSA) at the time an EAC, a major component of the area's 8-hour ozone San Antonio Clean Air Plan (SACAP), was developed and submitted to the EPA. Since EPA guidance suggests that MSAs be considered for establishing the boundaries of new 8-hour ozone nonattainment areas, air quality planning focused on Bexar, Comal, Guadalupe and Wilson Counties. EPA’s designations became final June 15, 2004, designating Bexar, Comal and Guadalupe counties as nonattainment with a deferred attainment date under their EAC.

Local elected officials, concerned leaders in business and industry, and other citizens committed to air quality planning have worked together for years to create an air quality plan for the citizens of the San Antonio area. This group, meeting as the Air Improvement Resources (AIR) Committee of the Alamo Area Council of Governments (AACOG), has proactively created an air quality plan that is comprehensive, flexible, and relies on EPA-approved technical analysis for its control strategy recommendations.

1.1.1 Background

As early as 1995, the Air Quality Committee of AACOG, chaired by Senator Jeff Wentworth, first met to address air quality issues in the San Antonio region. This committee requested the first emissions inventory, for inventory year 1994.

In January 1996, the San Antonio Mayor's Blue Ribbon Committee on Air Quality merged with the Air Quality Committee of AACOG to form the Air Quality Task Force (AQTF). The charge of the AQTF was to develop public education and provide advice to elected officials on air quality issues. The major accomplishment of the early AQTF was the establishment of the Ozone Action Day program. During FY 1996 - 1997, the AQTF provided input on the first near nonattainment grant, authorized by the 75th Texas Legislature.

However, when, in the summer of 1996, the EPA proposed the new 8-hour ozone NAAQS, the focus of the AQTF began to shift, first by providing comments and guidance on the impact of the new 8-hour ozone NAAQS. In the summer of 1998 a local contingency met with EPA Region 6 to begin discussion on the development of a Flexible Attainment Region (FAR) agreement.

The AACOG developed its first photochemical model in 1997 along with sponsoring air quality monitoring efforts at St. Hedwig (southeast Bexar County) during the 1997 ozone season. Monitoring results indicated that on high ozone level days, background levels coming into Bexar County were at or near ozone NAAQS threshold levels. When EPA finalized the 8-hour ozone NAAQS it became apparent that, based on historical data, the San Antonio EAC Region (SAER) could well be designated non-attainment when the EPA made the first 8-hour ozone nonattainment designations initially scheduled for July 2000.

During July 1998, the City of San Antonio (COSA), San Antonio-Bexar County Metropolitan Planning Organization (MPO), Bexar County, and AACOG recommended to local elected officials that the AQTF be revised to fit the structure advised by the TCEQ, then known as the TNRCC. During January -February 1999, the Boards of Directors and other responsible parties representing COSA, Bexar County, MPO, and AACOG approved the formation of the AIR Committee consortium including the Executive/Advisory, Technical, and Public Education Committees and member appointments. The AIR Committee conducted its first official meeting during April 1999, with the goal to establish an organized, comprehensive, and aggressive plan of action to keep the SAER from slipping into nonattainment of the ozone standard.

Working with partners in the near nonattainment areas across Texas, the AACOG has developed a second photochemical model for September 1999. This episode models ozone formation for four of the five near nonattainment areas of the state, Corpus Christi, Austin, Victoria and San Antonio. AACOG is now expanding the network of ozone and meteorological monitoring stations in the SAER. The TCEQ is responsible for maintaining monitors upon which official air quality data depends. Better monitoring allows for refined technical analysis of human exposure to ozone, a greater understanding of the formation and movement of ozone in the SAER, and provides a database for verification of the performance of future photochemical models.

1.1.2 The Early Action Compact

On December 9, 2002, the SACAP was signed by elected officials representing the SAER. The SACAP was designed to enable a local approach to ozone attainment and to encourage early emission reductions that will help keep the SAER in attainment of the 1-hour ozone NAAQS and ensure attainment of the 8-hour ozone NAAQS, and protect human health. The SACAP also incorporates the EAC for the San Antonio area. The EAC protocol was endorsed by EPA Region 6 on June 19, 2002, and revised November 21, 2002. The EAC is designed to develop and implement control strategies, account for growth, and achieve and maintain the 8-hour ozone standard. As such, it represents a key component to finalizing this area's SACAP.

The AIR Committee has worked to transform the results of its planning effort into a protocol to address air quality planning requirements originating with the Federal Clean Air Act (FCAA). The AIR Committee recognizes that the SACAP provides the means to sustain the region's air quality by proactively seeking local solutions within a state and federally approved protocol. The SACAP is designed to be a working document providing comprehensive planning for the ozone challenge faced by the citizens of the entire SAER. Adoption of the San Antonio EAC Attainment Demonstration SIP revision (SAEAD), based on the SACAP, requires development of control strategies, or methodologies for lowering ozone concentrations to acceptable levels, which are designed to meet the area clean air challenge. The technical analysis of the photochemical modeling, used to demonstrate the effectiveness of the control strategies, is performed by AACOG and is reviewed and approved by the AIR Committee and AACOG, and is reviewed by the TCEQ and the EPA.

1.2 PUBLIC INVOLVEMENT AND HEARING INFORMATION

1.2.1 EAC Local Public Involvement

The EAC for the SAER requires that the AIR Committee be responsible for the assessment and reporting of the region's progress against milestones with deliverables sent to the TCEQ and the EPA and reported in a regular, public process at least every six months. Public reporting of assessment and progress against milestones occurs at least once every six months during the regularly scheduled, public meetings (scheduled on a monthly basis), of the joined AIR Executive/Advisory Committees of the AACOG. Every regularly scheduled meeting of the AIR Executive and Advisory Committees is a public meeting, with notification of the meeting time and location published by AACOG according to the Texas Open Meetings Act. EAC milestones were discussed during the AIR Executive/Advisory Committee meetings conducted at the AACOG offices. In addition to the meetings listed in Appendix J, AACOG conducted public workshops in all four SAER counties to discuss elements of the SACAP and obtain citizen feedback. Meeting topics and meeting dates for these public workshops are provided in Appendix J, "Modeling/Analysis Protocol."

1.2.2 TCEQ Public Hearings

The commission held public hearings on the revisions to the SIP and related rules:

- Monday, August 23, 2004, 2 PM at TCEQ Bldg F Room 2210, at 12100 Park 35 Circle, Austin, Texas;
- Tuesday, August 24, 2004, 10 AM at Longview City Hall Council Chambers, located at 300 West Cotton Street, Longview, Texas; and
- Thursday, August 26, 2004, 10 AM and 7 PM at AACOG Board Room, located at 8700 Tesoro Dr. , San Antonio, Texas.

The comment period closed on August 30, 2004.

1.3 SOCIAL AND ECONOMIC CONSIDERATIONS

For detailed explanation of the social and economic issues involved with any of the state assisted strategies, please refer to the preambles that precede each proposed rule package accompanying this SIP. Because the San Antonio Area EAC SIP is a local voluntary initiative, the state has not performed an analysis of social and economic considerations for the locally implemented strategies, although such an analysis may be available from AACOG.

1.4 FISCAL AND MANPOWER RESOURCES

The state has determined that its fiscal and manpower resources are adequate and will not be adversely affected through implementation of this plan.

1.5 HEALTH EFFECTS OF OZONE

There are health concerns associated with poor air quality. In 1997, EPA revised the air quality standards for ozone to incorporate scientific data that indicated longer-term exposures to moderate levels of ozone could cause health effects. Ozone can cause acute respiratory effects and aggravate asthma. To support the 8-hour ozone standard, EPA provided information indicating ozone can temporarily decrease lung capacity in some healthy adults and cause inflammation of lung tissue. Exposure to elevated ozone levels contribute to hospital admissions and emergency room visits.

Children may be at higher risk from exposure to ozone. Children breathe more air per pound of body weight than adults. Since children's respiratory systems are still developing, they may be more susceptible than adults to changing air quality. The most likely time of year for elevated ozone readings in Texas is the last half of August to early October which coincides with school starting and an increase school related activities.

Adults most at risk to ozone exposure are outdoor workers, people outside exercising, and individuals with preexisting respiratory diseases. Repeated ozone exposure is similar to repeated sunburns of the lungs that potentially could change the quality of life in the future.

Ground-level ozone interferes with the ability of plants to produce and store food, so growth, reproduction and plant health are compromised. Ozone makes plants more susceptible to disease, pests and other environmental stresses. Reduced agriculture yields from some crops (e.g. soybeans, kidney beans, wheat and cotton) have been linked to ground-level ozone.

EPA believes the 8-hour ozone standard is more protective of human health than the 1- hour standard. As a result, EPA believes there will be fewer admissions to the hospital or trips to the emergency room by individuals with asthma. EPA states that the reduced risks of more frequent childhood illnesses and subtle effects such as repeated lung inflammation will lead to a better quality of life. EPA thinks that the reduced loss in agriculture crops will be significant.

CHAPTER 2: EMISSIONS INVENTORY

2.1 INTRODUCTION

The 1990 Amendments to the FCAA and 40 CFR, §51.322 require that emissions inventories be prepared statewide, particularly for ozone nonattainment areas. Because ozone is photochemically produced in the atmosphere when VOCs are mixed with NO_x in the presence of sunlight, it is critical to compile information on the important sources of these precursor pollutants. The role of the emissions inventory (EI) is to identify the source types present in an area, the amount of each pollutant emitted, and the types of processes and control devices employed at each plant or source category. The EI provides data for a variety of air quality planning tasks, including establishing baseline emission levels, calculating reduction targets, control strategy development for achieving the required emission reductions, emission inputs into air quality simulation models, and tracking actual emission reductions against the established emissions growth and control projections. The total inventory of emissions of VOC and NO_x, for an area is summarized from the estimates developed for five general categories of emissions sources which are described below. Details for the development of the 1999 and 2007 EIs, developed according to EPA and EAC guidance, are found in Appendices D and F.

2.2 POINT SOURCES

Major point sources are defined for inventory reporting purposes in nonattainment areas as industrial, commercial, or institutional sources which emit actual levels of criteria pollutants at or above the following amounts: 10 tpy of VOC, 25 tpy of NO_x, or 100 tpy of any of the other criteria pollutants, which are CO, sulfur dioxide (SO_2), particulate matter (smaller than 10 microns—PM_{10}), and lead. For the attainment areas of the state, any company that emits a minimum of 100 tpy of any criteria pollutant must complete an inventory. Additionally, any source that generates or has the potential to generate at least 10 tpy of any single hazardous air pollutant (HAP) or 25 tpy of aggregate HAPs is also required to report emissions to the commission.

To collect emissions and industrial process operating data for these plants, the TCEQ mails emissions inventory questionnaires (EIQ) to all sources identified as having emissions that trigger the reporting requirements. Companies must annually report the previous year's type of emissions from all emission-generating units and emission points, as well as the amount of materials used in the processes which result in emissions. Information is also requested in the EIQ on process equipment descriptions, operation schedules, emissions control devices, abatement device control efficiency, and stack parameters such as location, height, and exhaust gas flow rate. All data submitted via the EIQ are subjected to quality assurance procedures and are entered into the Point Source Data Base (PSDB). This data source was used for the point source portion of the base case EI.

2.3 AREA SOURCES

Area sources are defined as emission sources that fall below the point source reporting levels, and are too numerous or too small to identify individually. To estimate emissions from these sources, calculations are performed on the basis of source category or group. Area sources are commercial, small-scale industrial and residential categories of sources which use materials or operate processes which can generate emissions. Area sources can be divided into two groups, characterized by the emission mechanism: hydrocarbon evaporative emissions and fuel combustion emissions. Examples of evaporative losses include printing, industrial coatings, degreasing solvents, house paints, leaking underground storage tanks, gasoline service station underground tank filling, and vehicle refueling operations. Fuel combustion sources include stationary source fossil fuel combustion at residences and businesses, as well as outdoor burning, structural fires, and wildfires. These emissions, with some exceptions, may be calculated by multiplication of an established emission factor (emissions per unit of activity) times the appropriate activity or activity surrogate responsible for generating emissions. Population is the most commonly used activity surrogate for many area source categories, while other activity data including amount of gasoline sold in an area, employment by industry type, or acres of cropland.

2.4 ONROAD MOBILE SOURCES

Onroad mobile sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling a region's roadways. Combustion-related emissions are estimated for vehicle engine exhaust, and evaporative hydrocarbon emissions are estimated for the fuel tank and other sources of leaks from vehicles. Emission factors were developed using the EPA's mobile emission factor model, MOBILE 6.2. Model inputs were developed specifically for the San Antonio area. These inputs include such parameters as vehicle speeds by roadway type, vehicle registration by vehicle type and age, percentage of miles traveled by vehicle type, and gasoline vapor pressure. All of these inputs have an impact on the emission factor calculated by the MOBILE 6.2 model. Every effort is made to use parameters reflecting local conditions. To complete the emissions estimate, the emission factors calculated by the MOBILE 6.2 model must be multiplied by vehicle miles traveled (VMT). The level of vehicle travel activity is developed from the federal Highway Performance Monitoring System (HPMS) data compiled by the Texas Department of Transportation (TXDOT) for each county. Finally, roadway speeds, which are required for the MOBILE 6.2 model's input, are obtained from an analysis for several roadway types performed by the Texas Transportation Institute (TTI). More information about TTI's mobile source work can be seen in Appendix C.

2.5 NONROAD MOBILE SOURCES

Nonroad mobile sources are a subset of the area source category. This subcategory include aircraft operations, recreational boats, railroad locomotives, and a very broad category of off-highway equipment that includes everything from 600-hp engines mounted on construction equipment to 1-hp string trimmers. Methods for calculating emissions from nonroad engine sources are based on information about equipment population, engine horsepower, load factor, emission factor, and annual usage. Emission estimates for all sources in the nonroad category except aircraft, locomotives, commercial marine vessels, diesel construction equipment, and airport support equipment were originally developed using the current version of EPA's NONROAD model. Emissions were projected to later years by running the NONROAD model for the required years.

Aircraft emissions have been estimated from landings and takeoff data for airports used in conjunction with the Emissions and Dispersion Modeling System (EDMS) aircraft emissions model. Locomotive emissions have been developed from fuel usage and track mileage data obtained from individual railroads.

2.6 BIOGENICS

Biogenic sources include hydrocarbon emissions from crops, lawn grass, and forests, as well as a small amount of NO_x emissions from soils. Plants are sources of VOC such as isoprene, monoterpene, and alpha-pinene. Tools for estimating emissions include satellite imaging for mapping of vegetative types, field biomass surveys, and computer modeling of emissions estimates based on emission factors by plant species. A locally specific biogenic EI was developed for the SAER. The EI was initially prepared using an updated version of EPA's Biogenic Emissions Inventory System, version 2 (BEIS2) biogenic model called Global Biogenic Emissions Inventory System (GloBEIS), which allows locally specific data to be used. A final base case inventory used the GloBEIS2 model, which effectively reduced the estimated biogenic VOC emissions by 30 percent. Because emissions from biogenic sources are largely beyond the scope of reasonable emission reduction measures, the plan assumes that biogenic emissions will remain the same in the future and does not include biogenic emission reduction measures. However, the biogenic emissions are important in determining the overall emissions profile of an area, and therefore are required for photochemical grid modeling.

2.7 EMISSIONS SUMMARY

The 1999 VOC and NO_x base and future case emissions inventories for the San Antonio area are shown in Figures 2.7-1 through 2.7-2. These numbers represent emission estimations for Wednesday, September 15, 1999, a typical weekday. This 1999 base case was used as the basis for modeling for the SAER. The pie charts show that for NO_x, the largest man-made contribution is from onroad mobile sources, and for VOC, from area sources. Biogenics are included in the summary. However, control strategies are limited to the reduction of anthropogenic emissions.

- The percent contributions from VOC sources in the September 15, 1999 base case inventory include the following: 53.8 percent from biogenic, 26.6 percent from area/nonroad, 18.2 percent from onroad, and 1.5 percent from point sources.
- The percent contributions from NO_x sources for the September 15, 1999 EI include: 45.7 percent from onroad, 32.3 percent from point sources, 15.3 percent from area/nonroad, and 6.7 percent from biogenic.

In addition to creating a 1999 base case EI, a 2007 future base EI was developed to facilitate attainment demonstration modeling. The 2007 EI was projected from 1999 emissions using growth factors and control factors. Figures 2.7-3 and 2.7-4 summarize the 2007 future base EI for the four SAER.

- The percent contributions from VOC sources in the September 2007 (Wednesday) future case inventory include the following: 59.5 percent from biogenic, 26.0 percent from area/nonroad, 11.5 percent from onroad, and 3.1 percent from point sources.
- The percent contributions from NO_x sources for the September 2007 EI include: 36.5 percent from onroad category, 33.3 percent from point sources, 21.0 percent from area/nonroad, and 9.3 percent from biogenic.

Texas EAC areas each developed their own base case and future case emissions files for their respective local area and shared those files with other areas. The TCEQ provided 4 km, 12 km, and 36 km emissions files for base case areas outside of the EAC areas. The emissions files outside of the EAC areas were the same as the emissions files being used for the HGB Mid-Course Review at the time the EACs were developed. A sensitivity study based upon ozone modeling conducted to evaluate the impact of Houston emissions upon the Austin and San Antonio areas has shown little impact. Based upon that study no adjustments to Houston VOC emissions were made in either the base case or future case modeling.

Figure 2.7-1 September 15, 1999 (Wednesday) VOC Emissions Inventory for the SAER

	Tons/Day	Percent
On-road	88.8	18.2%
Area/Non-road	130.2	26.6%
Point	7.2	1.5%
Biogenic	263.0	53.8%
Total	489.2	100.0%

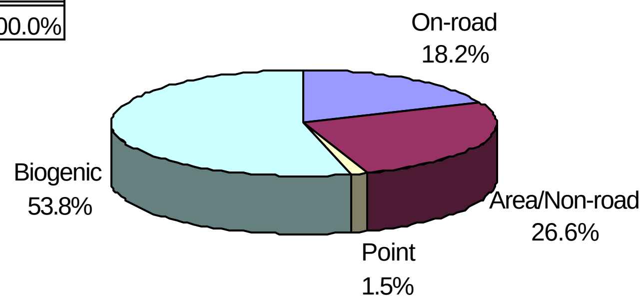


Figure 2.7-2 September 15, 1999 (Wednesday) NO_x Emissions Inventory for the SAER

	Tons/Day	Percent
On-road	143.6	45.7%
Area/Non-road	48.1	15.3%
Point	101.3	32.3%
Biogenic	21.0	6.7%
Total	314.0	100.0%

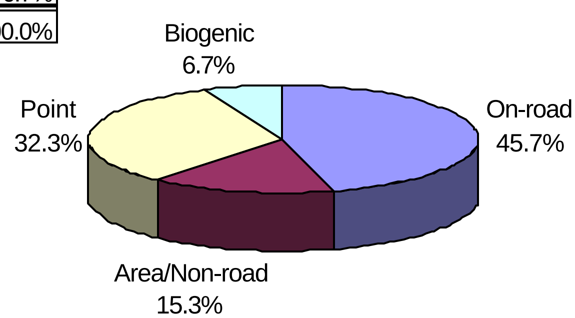


Figure 2.7-3 Estimated Wednesday, September 2007 VOC Emissions Inventory for the SAER

	Tons/Day	Percent
On-road	50.7	11.5%
Area/Non-road	114.8	26.0%
Point	13.5	3.1%
Biogenic	263.0	59.5%
Total	441.9	100.0%

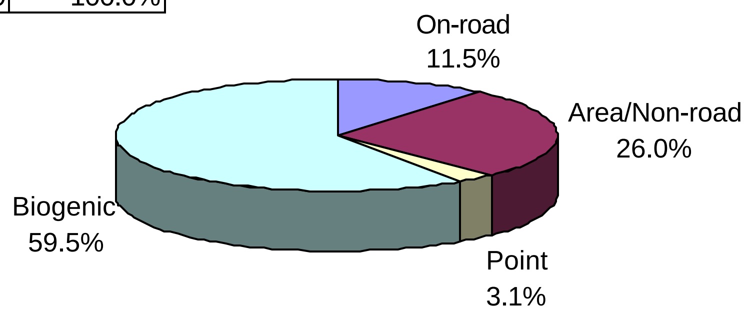
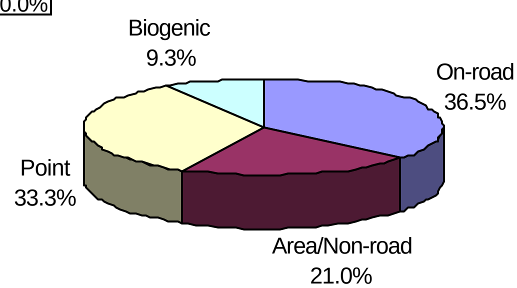


Figure 2.7-4 Estimated Wednesday, September 2007 NO_x Emissions Inventory for the SAER

	Tons/Day	Percent
On-road	82.3	36.5%
Area/Non-road	47.3	21.0%
Point	75.1	33.3%
Biogenic	21.0	9.3%
Total	225.7	100.0%



CHAPTER 3: PHOTOCHEMICAL MODELING

3.1 INTRODUCTION

The Natural Resources Section of AACOG has supported the development of and made refinements to two discrete photochemical episodes for potential use in attainment demonstrations in the SAER. The first was a 1995 episode simulation developed to establish a base case for an attainment demonstration in the region's EIP and O3 Flex plans. These plans were forerunners to the current Early Action Compact. The 1995 model simulation was presented to EPA Region 6 and the TCEQ in 2002 and was found adequate for attainment work.

AACOG also refined, with the assistance of other agencies, a 1999 episode that is being used to demonstrate attainment in the SAER's EAC SIP. Development of the September 15th through 20th, 1999 episode model was sponsored by four South-central Texas near nonattainment areas (NNA) and the TCEQ. Monitors in the SAER recorded 8-hour ambient ozone levels as high as 96 parts per billion (ppb) at the Camp Bullis monitor on September 18 as shown in Figure 3.2-1. This exceeds the 85-ppb threshold established by the 8-hour ozone standard. During the same period, other urban areas of South and Central Texas experienced elevated ozone concentrations.

The intent of developing the 1999 ozone simulation was to provide a base case as the first step in projecting air quality conditions to the year 2007 so clean air measures could be modeled and analyzed for their effectiveness. Furthermore, the Early Action Compacts for Austin and San Antonio require attainment by 2007. Modeling inventories for 2007 for other parts of the state were readily available. As a result, the Texas nonattainment and EAC areas benefit from the use of coordinated time lines and coordinated planning of control strategy programs.

3.2 BACKGROUND

An initial step in the attainment demonstration process entailed developing a conceptual model of the San Antonio area's ozone problem. The conceptual model of ozone formation provided a basis for determining episode selection. One of the intents of the conceptual model was to summarize both the local meteorological conditions and the synoptic weather patterns typically associated with elevated ozone concentrations. The conceptual model is based on assembling and reviewing all available ambient air quality data, meteorological data, and previous photochemical modeling efforts. Appendix A provides a description of the conceptual model developed for the SAER.

Ozone formation in the SAER is influenced by many of the same factors as in other areas of Texas. These factors include sunny skies, high pressure, and low wind speeds. The ozone season occurs during the warm weather that predominates in the SAER from April through October.

EPA’s 1999 draft modeling guidance recommends using four criteria, at a minimum, to select episodes appropriate for modeling. The minimum criteria include: 1) reviewing a mix of episodes that represent a variety of meteorological conditions associated with observed 8-hour ozone daily maxima in excess of 84 ppb; 2) selecting periods in which observed 8-hour daily ozone maxima approximate the average fourth highest 8-hour ozone concentrations; 3) reviewing periods for which extensive air quality/meteorological data exist; and 4) modeling a sufficient number of days to represent a complete ozone cycle.

Figure 3.2-1 shows the location of current monitors in the SAER. Note that several monitors have been added to the four that were in place during the modeling episode.

Table 3.2-1 shows the 8-hour daily maximums at SAER monitors operating during the modeling episode.

Table 3.2-1 8-hour Average Daily Maxima during the Ramp-up Period and Modeling Episode, September 13 - 20, 1999

Monitoring Site	13	14	15	16	17	18	19	20
San Antonio Northwest C23	57	66	82	**85**	75	**92**	**89**	84
Camp Bullis C58	57	63	79	78	74	**96**	**91**	81
CPS Pecan Valley C678	56	57	74	74	64	76	84	**86**
Calaveras Lake C59	64	64	81	81	76	80	**89**	84

*Numbers in bold represent exceedances of the 8-hour average threshold.

From five candidate episodes, the September 13 – 20, 1999, high ozone episode was chosen for the most recent modeling effort. This episode includes a variety of meteorological conditions, so it meets the primary selection criteria recommended by EPA. In addition, this episode met some secondary criteria, such as inclusion of weekend days and correspondence with the current design value. The decision to model the September 1999 episode was also based on another secondary selection criterion; i.e., the 1999 time period represented an elevated ozone episode for other regions of Texas. The benefits of developing a regional model covering four NNA areas included cost-sharing, consistent procedures, and a stable Central Texas base case on which to model clean air strategies.

The September episode consists of two model initialization days, September 13th and 14th, and five primary episode days, September 15 – 20, 1999. These days were chosen for the elevated ozone levels which occurred in South-Central Texas, however the modeling domain covers a much larger geographical area. The larger domain is necessary to simulate the effects of transport of precursors and background concentrations of ozone into the SAER. The 32-hour back trajectories for the 1999 episode reached back into southeastern Missouri. The 36-km coarse grid used in the model simulation extends throughout much of the South and Central U.S. including the Ohio River Valley to the north and Atlanta to the east, as shown in Figure 3.2-2. This regional scale grid matches the TCEQ standard modeling domain. The grid formulation includes two nested grids: a 12-km grid domain that incorporates eastern Texas including the nonattainment areas of Dallas/Fort Worth, Houston/Galveston/Brazoria, and Beaumont/Port Arthur, and an urban scale 4-km grid that covers the four NNAs in South-central Texas.

The EAC agreement requires development of other episodes, as necessary, to fully represent the variety of situations that typically contribute to local ozone production. The SAER agreed in the Early Action Compact signed December 2002, to investigate further episode development based on conceptual model updates. Based on the April 2003 update of the conceptual model, no additional candidate episodes are needed.

The photochemical model used for this attainment demonstration is the public domain Comprehensive Air Quality Model with Extensions (CAMx). CAMx is a state of the science photochemical grid model with numerous improvements over the 1990-vintage Urban Airshed Model, version IV. CAMx uses the

Carbon Bond Mechanism, version IV (CB-IV) chemistry package, nested grids, plume-in-grid (PiG) treatment for point sources, and three choices for advection schemes: Smolarkiewicz, Bott, or Piece-wise Parabolic Method (PPM). For this modeling exercise, PiG treatment was applied to major point sources, and the PPM advection scheme was used.

3.3 METEOROLOGICAL MODELING

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 grid cell and hour being modeled to fill in the gaps in the observing network.

Table 3.3-2 provides Met Run 5g (the final modeling run used by both Austin and San Antonio) performance statistics for several regions within the 4-km domain. These 4-km grid subdomains include Austin/San Antonio, Corpus Christi/Victoria, Houston/Galveston/Brazoria, and Beaumont/Port Arthur. The second column lists performance benchmarks for comparison purposes. The benchmarks represent state of the science performance goals established as the result of comparing statistical summaries of nearly thirty regional meteorological models developed for various areas of the country. The goals reflect the results of meteorological work that has been accepted and used in support of regulatory air quality photochemical modeling efforts (CAPCO, 2004).

The subdomain performance statistics listed in Table 3.3-2 are based on comparisons between observations obtained from ground-level monitoring stations and Met Run 5g predictions. As indicated by the results, Met Run 5g demonstrated excellent performance for wind speed and good performance for temperature and humidity over the 4-km domain. A few problems remain with the wind direction and gross error in Central Texas, as values in the table highlighted in bold demonstrate. While a number of meteorological variables are important to the ozone model, wind speed and direction are the primary variables of interest for model performance. Details may be found in Appendix E.

Table 3.3-2. Comparisons of Mean Daily Statistics with Performance Benchmarks for Selected Urban Regions

Parameter	Benchmark	Episode Mean		
		Austin/ San Antonio	Corpus Christi/ Victoria	Houston/ Galveston/ Beaumont/ Port Arthur
Wind Speed RMSE*	<2.0 m/s	1.2	1.3	1.3
Wind Speed Bias	± 0.5 m/s	0.0	0.5	0.4
Wind Speed IOA**	>0.60	0.68	0.81	0.63
Wind Direction Gross Error	<30 deg	**36**	23	30
Wind Direction Bias	± 10 deg	-6	-5	2
Temperature Gross Error	<2.0 K	**2.1**	1.3	1.5
Temperature Bias	± 0.5 K	**-1.3**	0.4	**-0.6**
Temperature IOA**	>0.80	0.92	0.92	0.95
Humidity Gross Error	<2.0 g/kg	1.4	**2.4**	1.1
Humidity Bias	± 1.0 g/kg	-0.3	**-1.6**	-0.3
Humidity IOA**	>0.60	**0.47**	0.53	0.61

Note: Values in bold denote statistics outside the performance goals
*RMSE: root mean square error
**IOA: index of agreement

3.4 EMISSIONS INVENTORY

In addition to meteorological inputs, photochemical models require emissions inputs that are grid-, day- and hour-specific to the modeled time period, with the ozone season emission inventory as a starting point for developing this episode-specific EI. For the September 1999 ozone episode, this required identifying and quantifying sources of VOC and NO_x. Ozone forms as a result of chemical reactions between these chemical precursors in the presence of sunlight. In order to prepare an EI for use in an air quality model, the emissions were adjusted to account for seasonal differences in activity and temporally adjusted to apportion emissions to a particular day or hour, in accordance with EPA policy. Furthermore, the emissions were spatially allocated to each grid cell in the modeling domain, both horizontally and vertically. Details are found in Appendix D.

3.4.1 Local Emissions Inventory

The TCEQ provided local biogenic and point source emissions inventories for the 12-county AACOG region. Area and nonroad inventories were developed using guidance from such documents as EPA's Air Chief and AP-42 and the NONROAD model. Whenever possible, emission calculation methodologies were supplemented with data obtained from surveys. Specific sources that were surveyed in development of the local 1999 EI included quarry operations; power plants; construction operations, commercial, industrial, railroad, and agricultural equipment; bakeries; wineries; breweries; wastewater treatment plants; and asphalt paving operations.

The onroad inventories were developed by TTI for a September 17 – 20, 1999, time frame. TTI's documentation on development of NNA onroad emission inventories is included as Appendix C of this SIP. MOBILE 6 was used to develop the onroad emissions inventory. The process of converting TTI's emissions inventory from an abbreviated episode, September 17-20, 1999, to the complete episode including ramp-up period (September 13 – 20, 1999), is presented in Appendix D.

3.4.2 Texas and Regional Emissions Inventories

September 1999 area and nonroad modeling EIs were developed for three other urban areas within the 4-km subdomain (the NNA partners participating in the joint modeling project - Austin, Corpus Christi, and Victoria) for inclusion in the photochemical model. Area/nonroad files for the remainder of Texas were based on the TEXAQS 2000 data set. In order to use this data set for modeling a September 1999 ozone episode, the data were backcast to 1999 using the ratio of 1999/2000 emissions as determined by the Economic Growth Analysis System (EGAS) 4.0 and NONROAD 2000 models.

Non-electric generating unit (NEGU) emissions originated from the TCEQ's point source database (PSDB). Electric generating unit (EGU) emissions were taken from a September 1999 emissions package that was updated with data from the 1999 Acid Rain Program Data Base (ARPDB). This data set applied to all of Texas with the exception of Houston. The 11-county Houston point source file was based on a 2000 NEGU and EGU emissions inventory. No adjusted EI's were used for the Houston area for either the base or future case.

Onroad mobile EI data for Texas were developed by TTI. MOBILE6, version 1 was used to develop on-road emissions for the Houston area, Gregg County and Smith County. Onroad EI files for the remainder of the state were developed using MOBILE5a_h.

In some cases the Texas area, nonroad, and mobile EI data required additional refinement. The modeling EI for the Houston area, for example, was developed for an August 2000 ozone episode. Therefore, the emissions data were backcast from August 2000 to September 1999 using appropriate modeling software such as the EGAS, MOBILE6 and NONROAD models.

Regional EI data for states outside of Texas were, other than point sources for the State of Louisiana, based on emission rates from EPA's 1999 National Emission Inventory (NEI v.2). The point source EI for Louisiana was obtained from the Louisiana Department of Environmental Quality, then quality assured and updated with September data from the ARPDB.

3.4.3 QA/QC Methodology and Preparation of EI Data for Photochemical Modeling

Several quality assurance/quality control methodologies were used to assess the reliability of the EI calculations, including "reality checks" in which calculations were evaluated for reasonableness, peer review by the TCEQ, replication of calculations for some emissions sources, statistical checks, and computerized checks. In addition to checking data for accuracy in terms of calculation methodologies and geographical allocation, data were also evaluated in terms of temporal allocation. More information can be found in Appendix G.

The original September 1999 model was developed by ENVIRON and further refined by collaboration between ENVIRON and University of Texas Austin. The model was then provided to the NNA partners for further modifications, including refinement of the emissions inventory inputs, development of the future case, and clean air strategy analyses. To ensure that the various agencies' models would be similar and provide similar predictions for the base case, future case, and control strategy runs, several steps were taken, particularly to ensure that the Austin and San Antonio base and future cases contained identical input. Often this involved discussions between the two agencies, and the TCEQ, regarding the most appropriate model procedures and EI data for local and regional areas. Discrepancies in emissions inputs were corrected prior to the final San Antonio and Austin runs.

As a result of this effort, the base and future cases for Austin and San Antonio are nearly identical. An analysis of predictions made by the two cities reveals an insignificant difference in the predictions at the two Austin monitors. The average differences, during the six-day episode, between peak predictions at the Murchison and Audubon monitors when comparing the San Antonio and Austin base cases were 0.00 ppb and 0.05 ppb, respectively. For the 2007 future cases, the average differences in peak concentrations were –0.06 ppb (Murchison) and –0.04 ppb (Audubon). Daily differences in peak predictions by the two models are provided in the summary of Appendix E.

3.5 BASE CASE PERFORMANCE EVALUATION

In addition to refinement of the MM5 meteorological modeling and the 1999 modeling EI inputs, other model configurations were reviewed for suitability during an on-going test and evaluation process. This step entailed performing sensitivity analyses on various model options including dry deposition algorithms, chemistry data, and boundary/initial conditions. As a result of these studies, changes were made to some model settings including dry deposition algorithms to account for mild drought conditions occurring in eastern Texas during September 1999 and boundary condition data. Sources of refined boundary/initial condition data included EPA's guidance on Urban Airshed Model (UAM), measurements of rural oxidants collected during the Southern Oxidants Study (SOS), and data collected during the Gulf of Mexico Air Quality Study sponsored by the Minerals Management Service. The final base case initial and boundary conditions are consistent with those used by the TCEQ for modeling in 1-hour ozone nonattainment areas.   Appendix E provides a more extensive description of 1999 photochemical model development including the modifications made to the dry deposition algorithms, chemistry data, and boundary/initial conditions.

In accordance with EPA's 1999 draft 8-hour ozone modeling guidance, the September 1999 photochemical simulation was subjected to a variety of 1-hour and 8-hour ozone performance analyses. 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 EAC area.

Statistical evaluation of the 1-hour ozone model performance used the following statistical 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 ozone modeling for the seven Central Texas monitors meets all of these criteria.

The model performance for 8-hour ozone attainment demonstrations is being evaluated for the first time in many areas and could be subject to future modifications. Many of the tests conducted, including scatter plots, Q-Q plots, and ozone metrics, were used to measure the differences between predictions and their paired observations. In recognition of this, analysts used the following three different methodologies in selecting predicted ozone concentrations to compare to observed value:

- The predicted daily maximum ozone concentration within grid cells ‘near' a monitor, as defined by EPA guidance (1999);
- 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
- A bilinear interpolation of predicted daily maximum ozone concentration around the monitor location.

EPA's draft guidance provides default recommendations for delineating the area "near a monitor." The defaults are based on the size of the grid cells used in the photochemical model. Since the 1999 episode was modeled using a 4-km grid, "near a monitor" was determined to be the 7 x 7 array of cells surrounding each monitor. The 7 x 7 arrays surrounding the Central Texas monitors are represented by dashed red lines in Figure 3.5-3. The Central Texas monitors include four CAMS sites located in the 10-county Capital Area Planning Council (CAPCO) region and four monitors located in the 12-county AACOG region.

The 1999 base case was evaluated using a second type of performance analysis: sensitivity tests. These tests were used to determine how accurately the model responds to changes in emissions. Diagnostic, or sensitivity, tests were conducted throughout the model development process. The type of sensitivity test applied to the model depended on the stage of model development. During the performance evaluation stage, sensitivity analysis efforts focused on testing the impacts of precursor species on ozone concentrations. These tests and test results are provided in Section 3.5.2.

3.5.2 Ozone Metrics

EPA recommends calculating ozone metrics to produce statistical comparisons between observed ozone concentrations and the model’s predicted concentrations. The recommended metrics include calculations of bias, error, and correlation coefficients.

In addition to conducting the metrics calculations for individual monitors, the EPA recommends “pooling” data by monitor location, i.e., developing average statistics for downwind, city center, and upwind groups of monitors. Both the San Antonio and Austin areas have relatively sparse monitoring networks. Although bias, error, and other metrics were calculated for monitoring groups when possible, the two EAC regions, based on recommendations from the TCEQ and EPA Region 6, evaluated performance based on the averaged statistics for all stations in Central Texas. The ozone metrics calculated for the pooled eight Central Texas monitors are provided in this section. Metrics for individual monitors and monitor groups are provided in Appendix E.

In EPA’s 1999 draft modeling guidance, specific goals are recommended for each of the ozone metrics tests. Table 3.5-3 details these goals.

Table 3.5-3 EPA Recommended 8-hour Ozone Performance Evaluation Metrics

Test	Goal
Bias between predicted/observed mean 8-hour (and 1-hour) daily maxima near each monitor	20% most monitors (8-hour comparisons only)
Fractional bias between predicted/ Observed mean 8-hour (and 1-hour) daily maxima near each monitor	20% most monitors (8-hour comparisons only)
Correlation coefficients, all data, temporally paired means, spatially paired means	Moderate to large positive correlation
Average Bias (8-hour daily maxima and 1-hour observed/predicted), all monitors	5 – 15%
Normalized Gross error (8-hour daily maxima and 1-hour observed/predicted), all monitors	30 – 35%

Statistical metrics averaged for the eight Central Texas monitors, using each of the three methodologies described in Section 3.5.1, are presented in Tables 3.5-4 through 3.5-6. Likewise, scatter plots with correlation coefficients and Q-Q results, using each of the three methodologies, are provided in Figures 3-4 through 3-6. These statistical and graphical metrics were performed on the control strategy model run, CAMx Run 18, which incorporated the refined meteorological model (Met Run 5g), refined emissions inventories, modified dry deposition algorithms to account for vegetation moisture stress, and the modified boundary/initial conditions described in Appendix E.

Calculating performance statistics is not required for the two-day model initialization, or “ramp-up”, period, but these metrics are included in Tables 3.5-4 through 3.5-6 for comparison purposes. Metrics for the initialization days are highlighted.

As demonstrated, all bias and error metrics averaged for the eight Central Texas monitors fall within the established EPA goals. Furthermore, the goals are met on primary episode days (September 15 – 20, 1999) as well as on the initialization days.

Table 3.5-4. Statistical Metrics (%), Based on the Predicted Daily Maximum Ozone Concentration within a 7x7 Array of Grid Cells Near Each Monitor, used to Assess 8-hour Performance of the September 13-20, 1999 Photochemical Model in Central Texas

Date	Maximum Observed 8-Hour Ozone Concentration (ppb)	Maximum Predicted 8-Hour Ozone Concentration (ppb)	Average Normalized Bias (±15%)	Average Fractional Bias (±15%)	Average Normalized Error (35%)	Average Fractional Error (35%)
9/13/99	55.74	52.87	-4.54	-5.01	8.63	8.94
9/14/99	60.03	59.56	-0.13	-0.70	7.51	7.39
9/15/99	75.41	74.09	-1.28	-1.67	6.80	6.92
9/16/99	76.19	75.04	-0.80	-1.13	7.46	7.50
9/17/99	82.12	80.75	-0.79	-1.16	7.66	7.74
9/18/99	85.53	83.59	-2.13	-2.40	5.96	6.15
9/19/99	88.76	89.58	1.16	0.82	7.07	7.01
9/20/99	82.24	86.20	4.68	4.43	6.40	6.21

Table 3.5-5. Statistical Metrics (%), Based on the Predicted Daily Maximum Ozone Concentration within a 7x7 Array of Grid Cells Near Each Monitor that is Closest in Magnitude to the Observed Daily Maximum, used to Assess 8-hour Performance of the September 13-20, 1999 Photochemical Model in Central Texas

Date	Maximum Observed 8-hour Ozone Concentration (ppb)	Maximum Predicted 8-hour Ozone Concentration (ppb)	Average Normalized Bias (±15%)	Average Fractional Bias (±15%)	Average Normalized Error (35%)	Average Fractional Error (35%)
9/13/99	55.74	51.92	-6.45	-6.84	6.74	7.13
9/14/99	60.03	57.59	-3.84	-4.07	3.84	4.07
9/15/99	75.41	72.15	-4.09	-4.34	4.11	4.36
9/1699	76.19	72.77	-4.13	-4.32	4.13	4.32
9/17/99	82.12	78.25	-4.24	-4.47	4.32	4.55
9/18/99	85.53	81.83	-4.20	-4.43	4.26	4.49
9/19/99	88.76	86.02	-2.88	-3.02	3.15	3.30
9/20/99	82.24	81.61	-0.85	-0.88	1.01	1.04

Table 3.5-6. Statistical Metrics (%), Based on a Bilinear Interpolation of Predicted Daily Maximum Ozone Concentration, used to Assess 8-hour Performance of the September 13-20, 1999 Photochemical Model in Central Texas

Date	Maximum Observed 8-hour Ozone Concentration (ppb)	Maximum Predicted 8-hour Ozone Concentration (ppb)	Average Normalized Bias (±15%)	Average Fractional Bias (±15%)	Average Normalized Error (35%)	Average Fractional Error (35%)
9/13/99	55.74	50.49	-8.82	-9.61	9.87	10.65
9/14/99	60.03	55.17	-7.55	-8.17	9.23	9.81
9/15/99	75.41	68.04	-9.37	-10.07	9.73	10.43
9/16/99	76.19	70.04	-7.43	-8.07	9.37	9.96
9/17/99	82.12	73.97	-9.22	-9.92	10.22	10.90
9/18/99	85.53	76.44	-10.52	-11.34	10.52	11.34
9/19/99	88.76	82.97	-6.30	-6.82	8.41	8.85
9/20/99	82.24	78.36	-4.69	-5.20	6.68	7.16

Observed and predicted 8-hour ozone maxima were compared graphically using scatter plots and Q-Q plots. Q-Q plots are used to determine whether two data sets, observed and predicted values in this case, come from populations with a common mean. Quantile plots divide the data sets into five ranges, compute the average for each cluster, and plot the averages. The closer the Q-Q points follow the 1:1 reference line, the greater the evidence that the two data sets come from populations with similar distributions. Figures 3.5-4 through 3.5-6 provide combined scatter/Q-Q data pairs determined for the pooled Central Texas monitors using the three methodologies described previously. Only the third methodology (Figure 3.5-6) yields observed/predicted data pairs (indicated by "+" signs) outside the ±20 indicator lines. Q-Q points, designated by circles, follow the 1:1 reference line closely in each graph, particularly for methods 1 and 2. Furthermore, each methodology yields moderate to high correlation coefficients. Therefore, the graphics tests indicate a high degree of correlation between peak 8-hour ozone concentrations measured during the September 1999 episode and the predicted 8-hour ozone maximums predicted by the model for the same period.

Regardless of the methodology used to determine the predicted maximum concentration within Central Texas, the results of applying metrics tests to Run 18 for each day of the September 13 – 20, 1999, episode fell within EPA guidelines. The 1-hour and 8-hour ozone metrics conducted on individual monitors and groups of monitors also yielded acceptable results. These tests and results are described in Appendix E.

3.6 FUTURE BASE CASE EMISSIONS INVENTORY AND MODELING

Future Case modeling used projected 2007 emission inventories with the same biogenic emissions, 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). Development of the future base case EI required projecting the 1999 base case modeling EI to the future year using both control and growth factors. Growth factors accounted for anticipated increases or decreases in emission-generating activities as the result of change in employment rates, population, and transportation.

Control factors were applied to emission projections to account for state and federal control regulations that are mandated and will be in place by the attainment year. Such control factors are expected to impact local emissions through changes in technology, fuel formulations, fuel use, energy efficiency, and other emission reduction programs.

Emission projection procedures are specific to the source category – onroad mobile, area/nonroad, and point – and are discussed in detail in Appendix F. Austin and San Antonio developed their own base case and growth emissions files for its own local area and shared those files with other areas. The TCEQ provided 4-km, 12-km, and 36-km emissions files for base case and future growth for areas outside of the EAC areas. The emissions files outside of the EAC areas were the same as the emissions files being used for the HGB MCR at the time the EACs were developed. Growth and control assumptions for areas outside of Texas and Louisiana were taken from EPA sponsored Heavy Duty Diesel Modeling for 2007. Data was downloaded via FTP from the EPA website and reformatted into AFS files for modeling. The TCEQ made diurnal adjustments to the point files, but the emissions totals were unchanged. In accordance with EPA guidance, the biogenic inventory for 2007 was identical to that used in the 1999 base case.

3.7 ATTAINMENT DEMONSTRATION PROCESS

An attainment demonstration compares predicted ozone concentrations with the thresholds established by the ozone NAAQS. The NAAQS are met if the fourth highest 8-hour daily maximum ozone concentration averaged over three consecutive years is less than or equal to 0.08 ppm. Therefore, the modeled attainment test is passed when the predicted future design values near all monitoring sites are less than or equal to 84 ppb. EPA has specified a procedure for calculating the future design values. In order to determine the level of reductions needed to reach attainment by 2007, the future design values for the SAER were calculated in accordance with EPA guidance.

3.7.1 Design Values and Relative Reduction Factors

As recommended by EPA, attainment demonstrations for the 8-hour ozone NAAQS should be based on the results of modeled attainment tests, screening tests, and, when appropriate, weight-of-evidence determinations. Key components of these tests are the predicted and observed design values.

The "current" design value for the SAER was determined using EPA guidelines. This step entailed reviewing the three-year period straddling the year represented by the most recently available emissions inventory (1998 – 2000) and the three-year period that is anticipated to be used to designate the area nonattainment (2001 – 2003). The “current” monitored design values were selected based on the higher of the two estimates at each monitor, as shown in Table 3.7-7. Based on this procedure, the area-wide "current" design value for the San Antonio area is 89 ppb at CAMS 23.

Table 3.7-7 Selection of Current Monitored Design Values based on Comparison of 1998 – 2000 Values with 2001 – 2003 Values

Monitor	1998-2000 Design Value	2001-2003 Design Value	Current Monitored Design Value Used in the Modeled Attainment Test
CAMS 23	85 ppb	89 ppb	89 ppb
CAMS 58	84 ppb	87 ppb	87 ppb
CAMS 59	79 ppb	78 ppb	79 ppb
CAMS 678	77 ppb	76 ppb	77 ppb

3.7.2 Modeled Attainment Test

The modeled attainment test predicts whether or not all observed future design values will be less than or equal to 84 ppb under the same meteorological conditions as those simulated for the base case (EPA, May 1999). The future design value is calculated by multiplying the "current" design value by a "Relative Reduction Factor," which is the relative change in modeled values between the base and future case. The test was performed for each monitoring site within the SAER.

Future Design Value = Relative Reduction Factor x Current Design Value

The relative reduction factor (RRF) is calculated for each site by comparing the future 8-hour daily maximum concentration predicted near a monitor (within the 7 X 7 grid) to the base case 8-hour daily maximum concentration predicted near a monitor. The modeled attainment test is passed if all resulting predicted future design values are less than 85 ppb. Table 3.7-8 provides the results of the modeled attainment test at each SAER monitor. As indicated, the test was passed at all the monitors used to determine attainment.

Table 3.7-8 Modeled Attainment Test Results at SAER Monitors

Monitor	Modeled Average Daily Maximum Ozone Concentration – 1999	Modeled Average Daily Maximum Ozone Concentration - 2007	RRF	Current Design Value	Future Design Value	Pass / Fail Status
CAMS 23	88 ppb	84 ppb	0.95	89 ppb	84 ppb	Pass
CAMS 58	87 ppb	82 ppb	0.95	87 ppb	82 ppb	Pass
CAMS 59	78 ppb	73 ppb	0.94	79 ppb	74 ppb	Pass
CAMS 678	80 ppb	77 ppb	0.96	77 ppb	74 ppb	Pass

While the future design values listed in Table 3.7-8 indicate the SAER would be in compliance with the 8-hour ozone NAAQS by the attainment year without implementing any additional local clean air controls, the results for CAMS 23 are very close to the 85-ppb threshold. Chapter 5 describes additional local controls that were evaluated as a means of further reducing ozone concentrations in the SAER by the attainment year. These strategies include Stage I Vapor Recovery which is creditable and enforceable in terms of the requirements for credit taken in the SIP.

3.7.3 Screening Test

Since the modeled attainment test provides no indication of future ozone concentrations at locations without monitors, EPA recommends a supplementary screening analysis to support an attainment demonstration. The screening test is particularly important in areas such as Central Texas where monitoring networks are relatively sparse. The screening test requires identifying areas in the domain where absolute predicted 8-hour daily maximum ozone concentrations are consistently greater than any predicted in the vicinity of a monitoring site. The final step in the screening test requires estimating the future design value for each "hot spot" area.

The default criterion recommended by EPA for defining areas with consistently high predictions of 8-hour daily maximum ozone concentrations requires identifying 8-hour ozone concentration predictions that are greater than five percent higher than any near a monitored location on 50 percent or more of the modeled days. Table 3.7-9 provides a list of the daily maximum 8-hour ozone concentrations predicted within the SAER for the September episode model and compares the data to daily maximum 8-hour ozone concentrations in the vicinity of a monitoring site. As shown, the predicted 8-hour ozone daily maximum for the SAER exceeded the highest predicted 8-hour ozone daily maximum near a monitor by more than 5 percent on only two days of the episode September 16th and 17th. Since the 5 percent threshold was not exceeded on "50 percent or more modeled days," a screening test is unnecessary.

Table 3.7-9. Screening Cell Design Value Scaling Results*

Date	8-hour Daily Maximum				Maximum Screened Cell Value	Percent difference compared to Peak CAMS Value
	CAMS 23	CAMS 58	CAMS 59	CAMS 679		
15th	81.14	75.59	66.89	70.16	83.22	2.56%
16th	78.08	77.26	72.38	71.51	**84.67**	8.43%
17th	81.36	82.01	69.90	69.90	**86.13**	5.03%
18th	98.57	98.57	72.12	79.63	98.57	0.00%
19th	101.40	101.83	81.75	91.49	101.83	0.00%
20th	93.20	91.30	86.26	87.65	93.20	0.00%

*Bold type indicates > 5 percent of modeled daily maximum value

3.8 SUPPLEMENTAL CONTROL STRATEGY MODELING

Table 3.8-10 provides the future design values, by monitor, calculated from a 2007 supplemental control strategy run that incorporated the impacts of Stage I Vapor Recovery Systems, Transportation Emission Reduction Measures (TERMs), Transportation Demand Management (TDM), energy efficiency projects, and diesel retrofits in the SAER. The table provides a comparison between these values and the future design values from Table 3.7-8 calculated from the 2007 future case (without supplemental local controls). Although EPA guidance (May 1999) suggests truncating design value calculations, decimal places are provided in Table 3.7-9 to allow for comparison with the standard. These results indicate that implementation of these control strategies in the SAER is expected to reduce ozone concentrations at all SAER monitors. More information on clean air strategies and calculation of design values is provided in Chapter 5 of this attainment document and Appendix H.

Table 3.8-10. Modeled Attainment Test Results that Account for Implementation of Stage I

Vapor Recovery, TERMs, TDMs, Energy Efficiency Projects, and Diesel Retrofits in the SAER..

	Future Design Value with Mandated Controls		**Future Design Value with Supplemental Controls**	
Monitor Site	**(ppb) (from Table 3.7-17)**	**Pass/Fail Status**	**(ppb)**	**Pass/Fail Status**
CAMS 23	84.78	Pass	84.27	Pass
CAMS 58	82.40	Pass	81.96	Pass
CAMS 59	74.46	Pass	74.33	Pass
CAMS 678	74.26	Pass	74.26	Pass

As noted previously, even without any additional control strategies, the CAMx modeling results indicate that the area will be in attainment in 2007.

Figure 3.2-1 Map of Monitors in the SAER

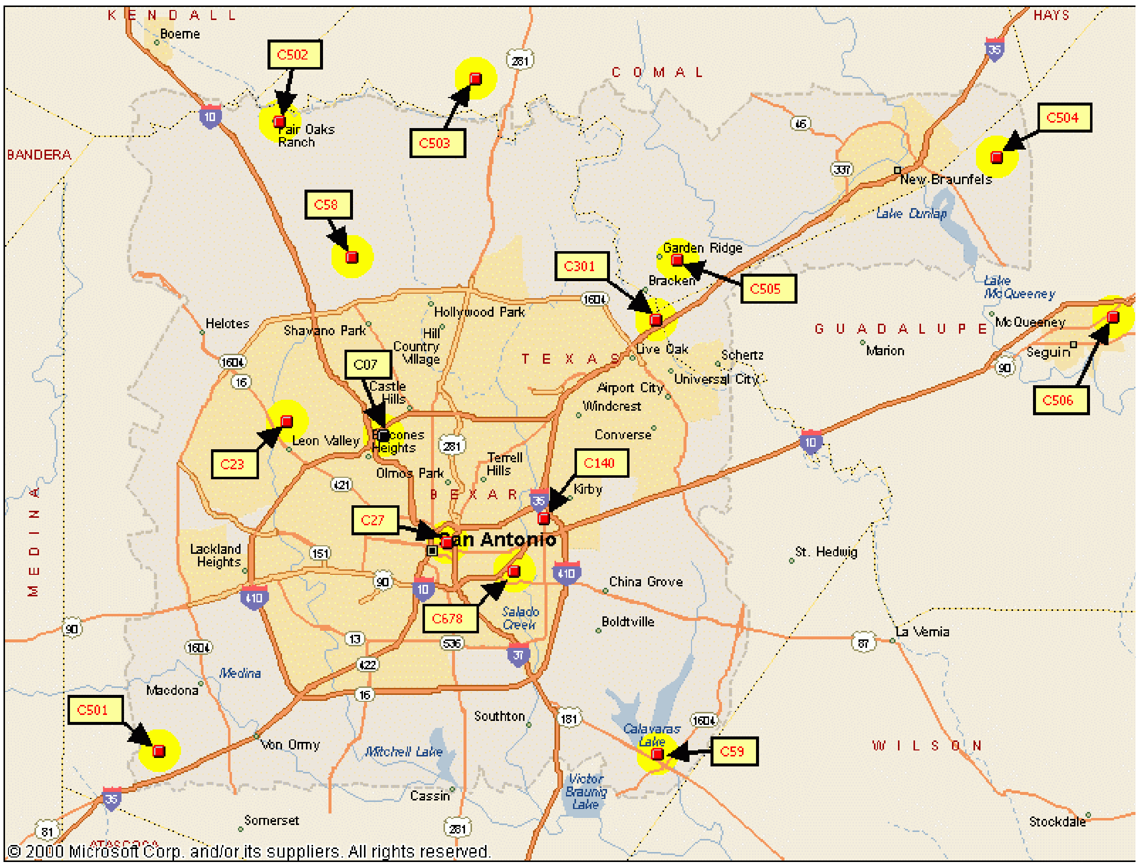
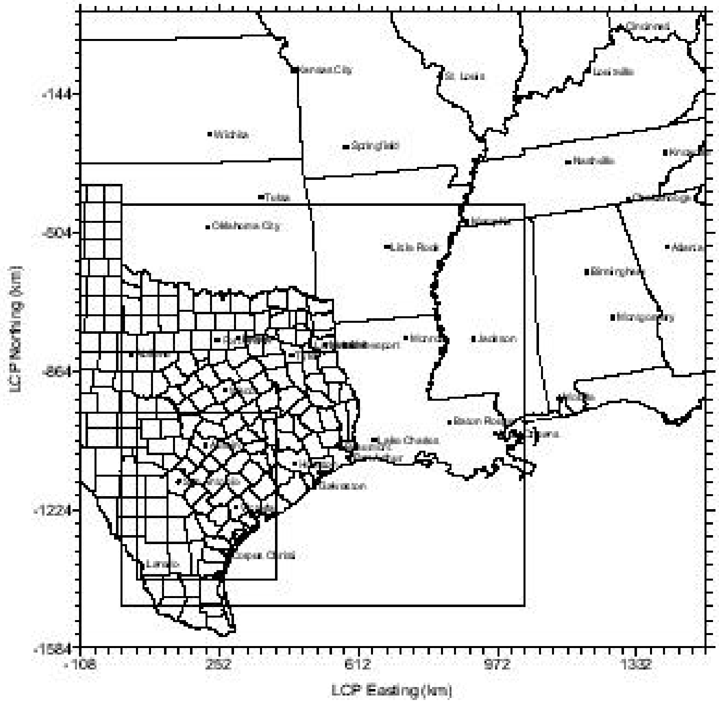


Figure 3.2-2 Modeling Domain used to Simulate the September 13 - 20, 1999 High Ozone Episode



CAMx Grid Dimensions

LCP Grid with reference origin at (40N, 100 W)

36 km Grid: 45 x 46 cells from (-108, -1584) to (1512, 72)
12 km Grid: 87 x 87 cells from (0, -1476) to (1044, -432)
4 km Grid: 90 x 108 cells from (36, -1404) to (396, -972)
(nested grid dimensions do not include buffer cells)

Figure 3.5-3. Locations of Central Texas Air Quality Monitors in the Model's 4-km Grid System. Dashed red lines represent the 7 x 7 array of cells surrounding each monitor

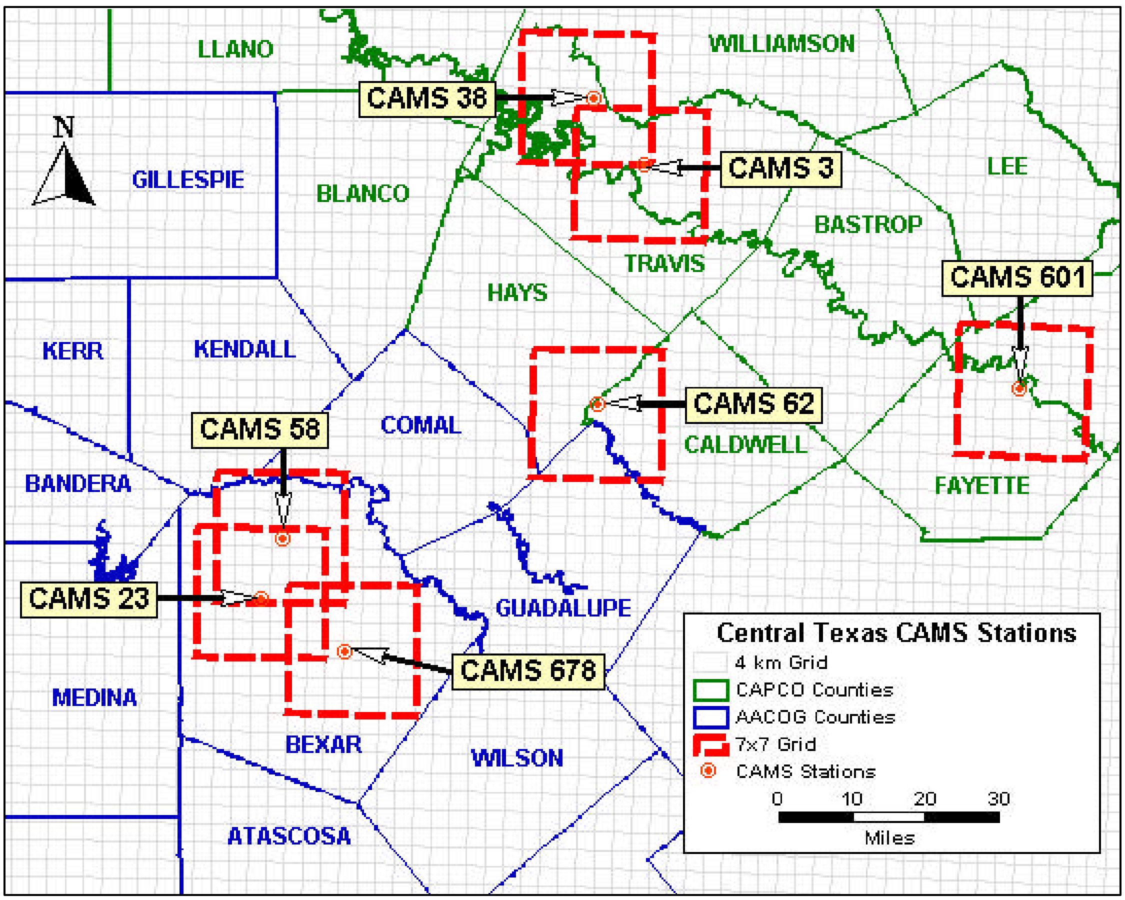


Figure 3.5-4. Observed and Predicted (within 7x7 array of grid cells near each monitor) Daily Maximum 8-hour Ozone Concentrations at Central Texas Monitors

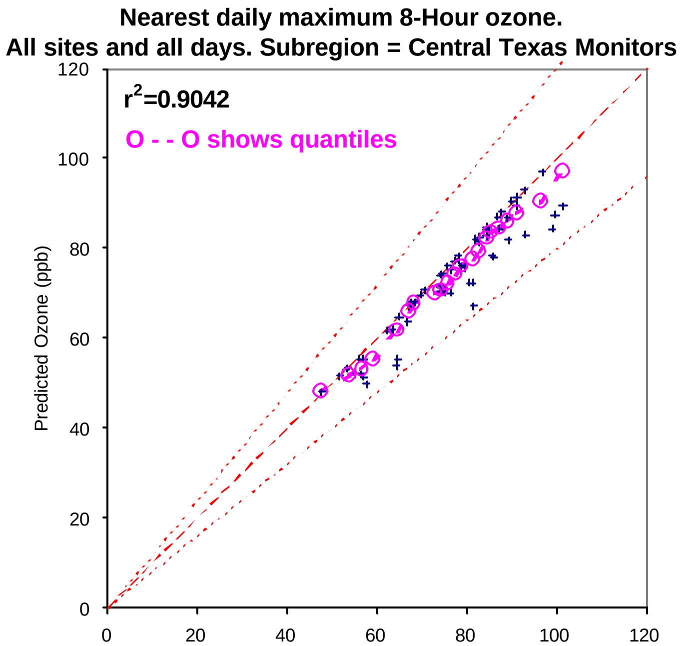


Figure 3.5-5. Observed and Predicted (within 7x7 array of grid cells near each monitor that is closest in magnitude to the observed daily maximum) Daily Maximum 8-hour Ozone Concentrations at Central Texas Monitors

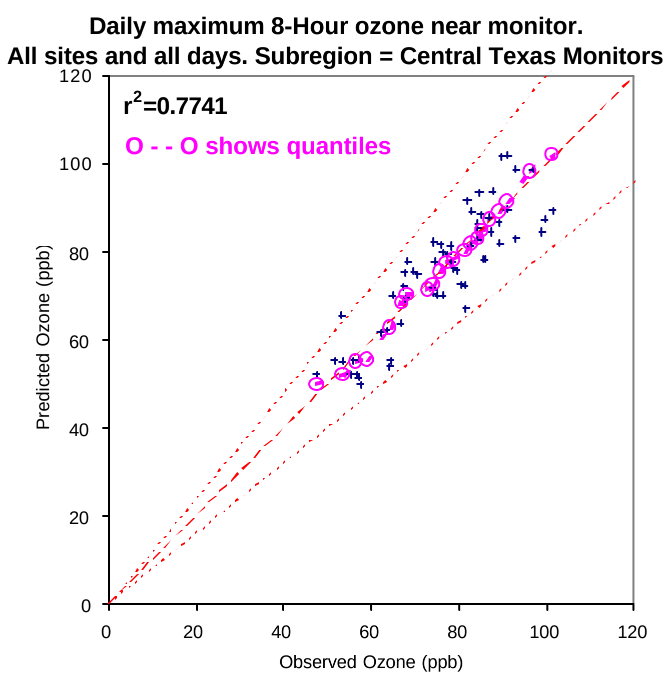
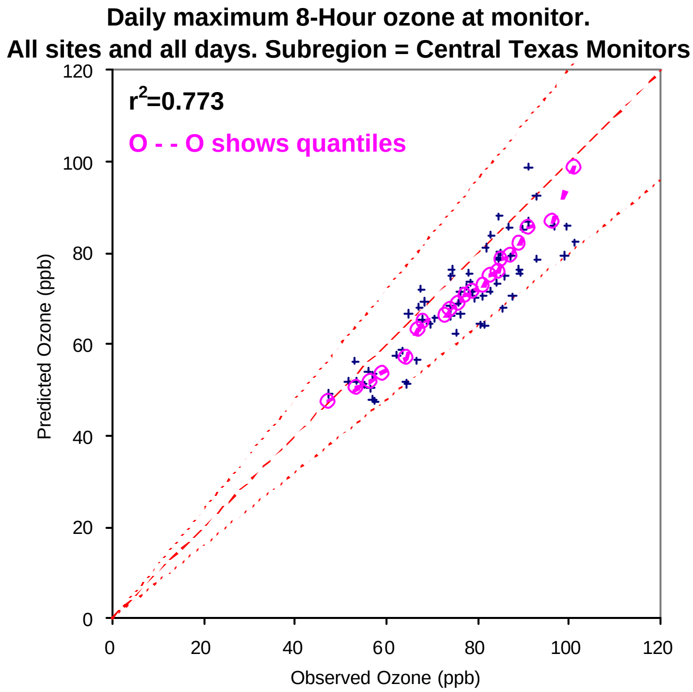


Figure 3.5-6. Observed and Predicted (based on a bilinear interpolation of daily maximum ozone concentrations around each monitor) Daily Maximum 8-hour Ozone Concentrations at Central Texas Monitors



CHAPTER 4: DATA ANALYSIS

4.1 INTRODUCTION

Ozone data analysis entails examining ambient air quality data and other information The results of these analyses supplement the photochemical and meteorological processes and enhance the decision making process for clean air strategy selection. The following sections summarize the results and conclusions of several analyses that support photochemical modeling efforts. Detailed information on these topics is provided in Appendices A and M.

4.2 MONITORING TRENDS

The SAER continues to meet the 1-hour ozone NAAQS. However, since promulgation of the 8-hour ozone standard in 1997, the SAER has exceeded the 8-hour ozone standard during several averaging periods. Figure 4.2-1 identifies the annual peak 1-hour and 8-hour ozone concentrations measured by any SAER monitor between 1995 and 2002. Of note is the relative rarity of 1-hour ozone exceedances in the SAER. From 1995-2003, the SAER has recorded a total of five 1-hour ozone readings at or above 125 ppb. One of these, May 7, 1998, was associated with a Mexican smoke event and is not used for regulatory purposes. This graph also indicates the highest 8-hour ozone average measured in the SAER varies from year to year. Due to the limited information this graph provides (annual peak values), and the relatively short (8 years) study period, no conclusions can be drawn regarding ozone concentration trends.

Figure 4.2-2 displays the 8-hour ozone design value trends, by site, between the years 1980 and 2003. Although this graph provides a much wider data range than Figure 4.2-1, there is little indication of ozone trends in this graph, as the values tend to vary from year to year. The lowest 8-hour design values generally occurred during the early 1990s. However, beginning in 1995, the design values began to rise and the 85-ppb design was exceeded multiple times. Only the design values for CAMS 59 (Calaveras Lake) and CAMS 678 (CPS Pecan Valley) consistently remained below 85 ppb. During the ozone season, these monitors are historically upwind of the local urban plume. Since CAMS 59 and 678 typically measure background concentrations, these monitors are expected to have lower design values than San Antonio's downwind monitors, CAMS 23 and 58.

Figure 4.2-3 provides an indication of the frequency of 8-hour ozone threshold exceedances. This graph identifies, on an annual basis, the number of days the 85ppb threshold was exceeded between 1995 and 2002. The annual values range from one exceedance day in 2001 to 17 exceedance days the following year, 2002. As with annual peak concentrations, this comparison shows a great deal of variability between 1995 and 2002, with no obvious conclusions regarding trends.

While few conclusions can be drawn regarding annual trends in ozone data as demonstrated above, aggregated annual data may be more useful. Figure 4.2-4 shows ozone exceedance counts by two-week period for San Antonio. Figure 4.2-5 compares high ozone measurements in several areas of Texas, by two-week period, for the combined years of 2000-2002. The curve for the SAER is similar to several other Texas urban areas in which peak measurements are typically recorded in June, August, and September. These peaks indicate the influence of seasonal weather patterns on regional ozone concentrations, given that exceedance frequency occurs in patterns when averaged.

4.3 METEOROLOGICAL ANALYSIS

The TCEQ conducts periodic studies to determine air quality/meteorological conditions, both at the surface and aloft, throughout Texas. Several of these studies have involved the use of aircraft for collecting air samples. For example, the Baylor University Institute for Air Science has been collecting airborne air quality data in Texas for several years. Sonoma Technology, Inc. analyzed air quality data collected by the Baylor Airborne sampling program during the years 1997 and 1998 and concluded that, in the SAER, elevated ozone levels were associated with high pressure systems, clear skies, light flow aloft, and peak mixing heights at approximately 1500 meters (MacDonald, et. al., 1999).

Additional meteorological analyses have been conducted including analyzing the relationship of regional ozone concentrations to several meteorological parameters: temperature, wind speed, and solar radiation. Results of these analyses are provided in Figures 4.3-6 through 4.3-8.

The average daily peak temperature on 8-hour ozone exceedances days during the study period of 1998-2002 was 91.2^{o} F. As shown in Figure 4.3-6, 95 percent of the exceedances occurred on days when peak daily temperatures were greater than 84^{o} F. Although 8-hour ozone exceedances in the SAER typically occur when peak temperatures are greater than 84^{o} F, the figure also makes it clear that peak temperatures do not necessarily produce ozone exceedances. The majority of high temperature days are associated with ozone levels below the 85 ppb threshold. The temperature data indicate that other factors, or combinations of factors, are of greater influence on concentrations than temperature alone.

Analysis of 1997 – 2002 wind speed data indicate no exceedances occurred on days when wind speeds surpassed 6 mph. A majority of exceedance days occur when the average wind speed is less than 5 mph. Stagnation is an important factor in ozone exceedances.

Since ozone forms as the result of photochemical reactions between precursor emissions, the amount of solar radiation reaching the lower atmosphere is another meteorological condition that influences the chemical's formation. Figure 4.3-8 shows that below 1 langley/minute, there were only two days between 1999 and 2002 in which 8-hour ozone levels exceeded 85 ppb. Below 0.9 langleys/minute there were no exceedances. As with temperature and wind speed however, certain solar radiation levels may be conducive to, but by no means guarantee, ozone exceedances.

Local ozone exceedances are typically associated with certain meteorological conditions: high pressure systems and stagnation, high ambient temperatures, high levels of solar radiation, and low wind speeds. As demonstrated, these conditions do not always produce excessive ozone concentrations in SAER. Other factors also influence ozone buildup. Such conditions include background ozone concentrations and transport. These issues are discussed in more detail in the following section.

4.4 TRANSPORT

Transport of ozone and ozone precursors appears to be an issue related to the 8-hour ozone standard. In the SAER, transport can contribute to the local ozone problem, reducing the impact that local emission reductions can have on local ambient air quality.

As is shown in Appendix M, photochemical modeling runs in which the entire anthropogenic emissions inventory for the four-county SAER is removed lowers the peak ozone levels by up to 25 percent in the 1999 base case. Transport and background ozone levels can influence the ozone levels recorded at local ozone monitors.

Based on the modeled results of implementing clean air strategies locally, many strategies which reduce ambient ozone concentrations in 1-hour nonattainment areas would be less effective in the SAER. See Chapter 5 for results of modeled clean air strategies in the SAER.

Some of the transport determinations described in Appendix M are based strictly on modeling results for a specific time period; however, there is evidence that indicates SAER ozone levels are impacted by transport. Smoke and haze events tracked by the Navy Aerosol Analysis and Prediction System and other agencies' monitoring programs, as described in Appendix M, support transport as an element of high ozone in the SAER.

Figure 4.2-1 Annual Peak 1-hour and 8-hour Ozone Measurements within SAER

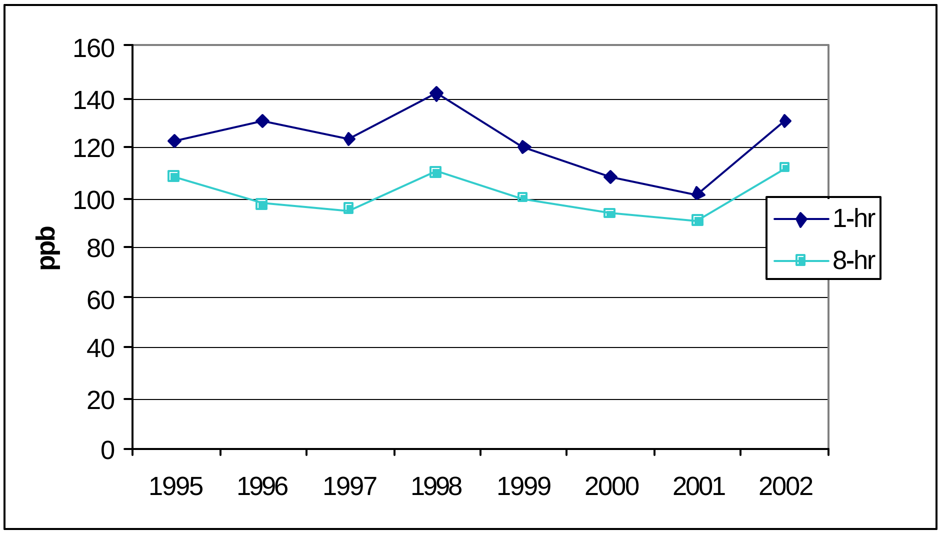


Figure 4.2-2 San Antonio 8-hour Ozone Design Value Trends by Site
(Each plotted value covers a 3-year period ending with the year indicated.**)**

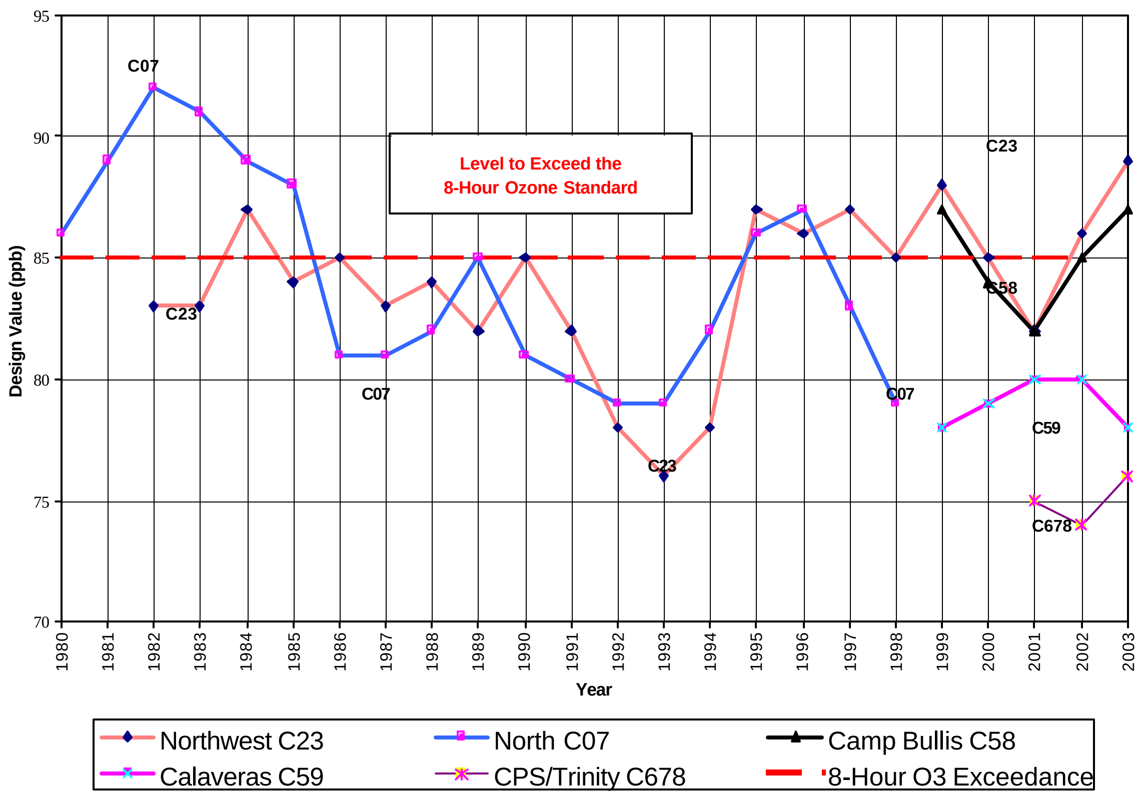


Figure 4.2-3 Annual Number of Days in which Measured 8-hour Averages Met or Exceeded 85 ppb at SAER Monitors

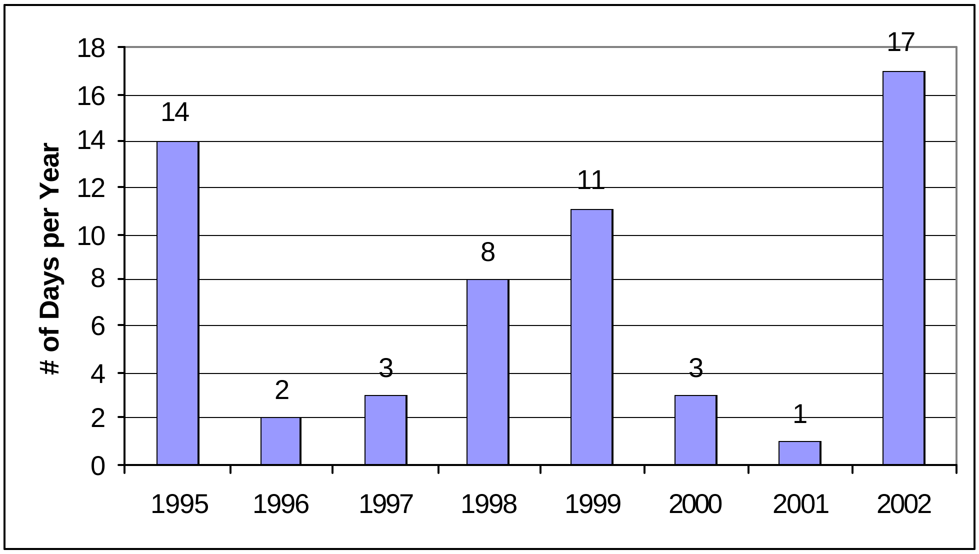


Figure 4.2-4 High Ozone Readings by Two-week Period for SAER.

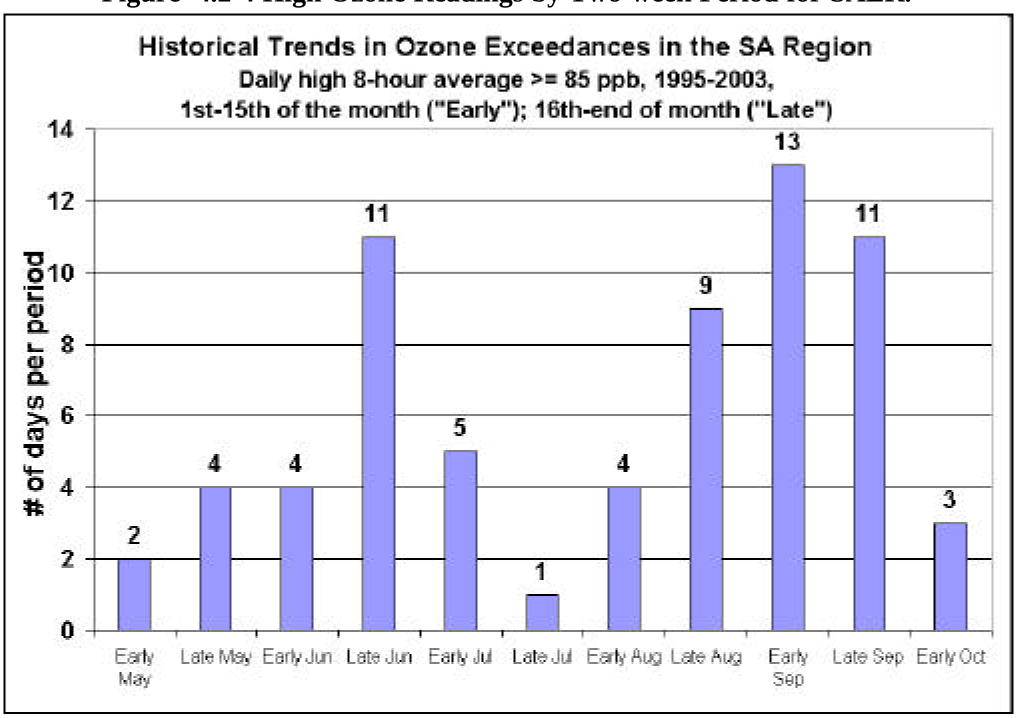


Figure 4.2-5 High Ozone Readings by Two-week Period for Major Texas Urban Areas.

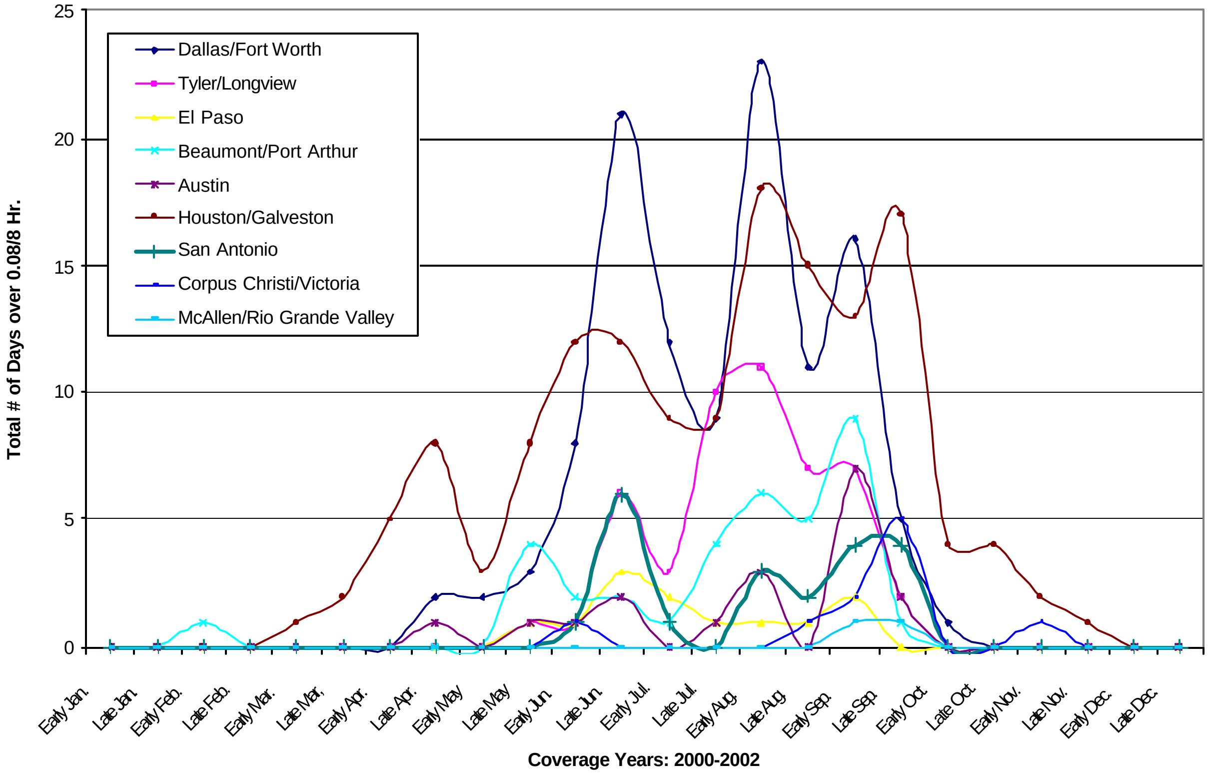


Figure 4.3-6 Daily 8-Hour Ozone Maxima Measures at CAMS 23 v. Peak Temperature, 1998-2000

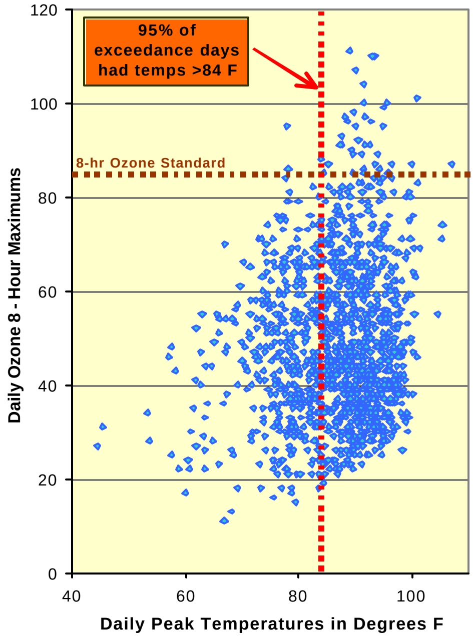


Figure 4.3-7 Daily 8-Hour Ozone Maxima v. Average Wind Speeds, 1997-2002

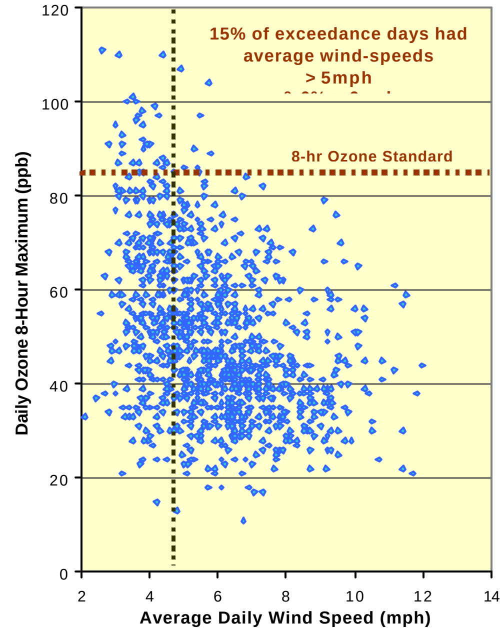
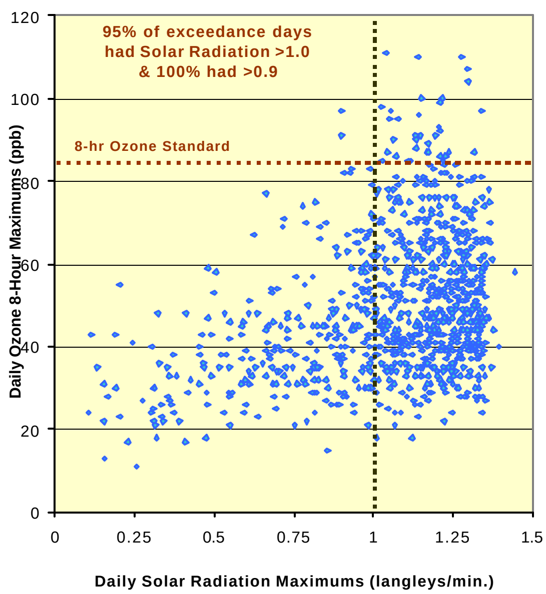


Figure 4.3-8 Comparison of Daily 8-Hour Ozone Maxima and Daily Solar Radiation Maxima, 1999-2002



CHAPTER 5: CONTROL STRATEGIES

5.1 INTRODUCTION

The SAER EAC was designed to develop and implement control strategies, account for growth, and achieve and maintain the 8-hour ozone standard. The EAC requires that clean air strategies, or methodologies for lowering ozone concentrations to acceptable levels, be developed to meet the region's clean air challenge. The technical analysis of the photochemical modeling was used to demonstrate the effectiveness of the control strategies.

The base case modeling has been developed based on the September 1999 ozone episode. The future and base case modeling account for all Federal, State, and local controls that will be implemented by 2007. Tables 5.1-1 and 5.1-2 detail VOC and NO_x emissions that are inputs in the base case and future case. The tables also contain the emission reductions from the proposed supplementary clean air measures.

Table 5.1-1 SAER VOC Emission Reduction Estimates for an Average Weekday (Wednesday)

Emissions Inventory Category	1999 Base Case (tpd)	Percent of 1999 Total	2007 Future Base (tpd)	Percent of 2007 Total	1999-2007 Base Case Change (tpd)	2007 Future Control Strategy (tpd)
Area and Nonroad sources	130	27%	115	26%	-15	109
Point sources	7	1%	14	3%	+7	14
Onroad mobile sources	89	18%	51	11%	-38	50
Biogenic sources	263	54%	263	60%	0	263
TOTALS	**489**	**100%**	**441**	**100%**	**-46**	**436**

Table 5.1-2 SAER NO_x Emission Reduction Estimates for an Average Weekday (Wednesday)

Emissions Inventory Category	1999 Base Case (tpd)	Percent of 1999 Total	2007 Future Base (tpd)	Percent of 2007 Total	1999-2007 Base Case Change (tpd)	2007 Future Control Strategy (tpd)
Area and Nonroad sources	48	15%	47	21%	-1	45
Point sources	101	32%	75	33%	-26	75
Onroad mobile sources	144	46%	82	37%	-62	82
Biogenic sources	21	7%	21	9%	0	21
TOTALS	**314**	**100%**	**225**	**100%**	**-89**	**223**

The requirements for clean air strategy development and selection according to the EAC Protocol are listed below:

- Adopted federal and state controls implemented by December 31, 2007, are included in the model. If needed, the area will identify additional local controls to demonstrate attainment of the 8-hour ozone standard by December 31, 2007.
- Local controls will be specific, quantified, permanent, and enforceable strategies.
- Controls will include specific implementation dates, as well as detailed documentation and reporting processes.
- Controls will be implemented as soon as practicable, but not later than December 31, 2005.
- Controls will be designed and implemented by the community with full stakeholder participation.
- Control measures will be incorporated into the SIP, and submitted to EPA for approval. In the event that SAER wishes to add or substitute measures after SIP submittal, plan modifications will be treated as SIP revisions.

This chapter details the strategies implemented on the federal, state, and local level as well as the emission reductions and effects the strategies will have on regional ozone levels.

5.2 FEDERAL AND STATE MEASURES

Various state and federal strategies are scheduled to be promulgated and enforced by the TCEQ and EPA by 2007. These strategies will provide emission reductions in the SAER in future years. Detailed descriptions of the federal and state reduction strategies can be found in Appendix I. The reduction estimations listed in Table 5.2-3 are calculated for the four county SAER of Bexar, Comal, Guadalupe and Wilson Counties.

Table 5.2-3 State and Federal Issued Rules

FEDERAL ISSUED RULES	Estimated NO_x Reductions in 2007 (tpd)	Estimated VOC Reductions in 2007 (tpd)
Federal area measures: On-board Refueling Vapor Recovery	0.00	8.20
Federal onroad measures: National Low Emission Vehicle (NLEV) Program Tier II Vehicle Emission Standards Federal Regulation of Onroad Diesel Engines	22.39	12.43
Federal non- road measures: Standards for Compression-ignition Vehicles and Equipment Standards for Spark-ignition Off-road Vehicles and Equipment Tier III Heavy Diesel Equipment Lawn and Garden Equipment Recreational Marine Standards Locomotives	1.10	10.97
TOTAL	**23.49**	**31.6**

STATE ISSUED RULES	Estimated NO_x Reductions in 2007 (tpd)	Estimated VOC Reductions in 2007 (tpd)
State area measures: Stage I Vapor Recovery (throughput ≥ 125,000 gal / month)[1] TAC Chapter 106 Degreasing Controls	0.00	7.61
State point measures: Senate Bill 766 – Grandfathered Power Plants Senate Bill 7 – Grandfathered Power Plants	39.51	1.06
TOTAL State	**39.51**	**8.67**
TOTAL State and Federal	**63.00**	**40.27**

The change in base case emissions between 1999 and 2007 is caused by emissions reductions from existing federal and state control strategies and change in population and economic growth. Control strategies listed in Table 5.2-3 reduced approximately 63 tpd NOx and 40 tpd VOC. However, the overall change in emissions includes more than the effect of control strategies. The impact of control strategies can be affected by population, economic, and technical factors, as shown in the change from 1999 to 2007 in Tables 5.1-1 and 5.1-2. For example, although most of the reductions in the nonroad category were due to control strategies, fleet turnover and increases in fleet size also contributed to the difference. Similarly, the large difference in mobile emissions is due to fleet turnover as newer cars become available. In addition, the development of new technologies to control emissions from vehicles, such as hybrid vehicles, reduces emissions even further. The reductions achieved by point source controls were offset by the addition of new power plants and manufacturing facilities. There will be three major new facilities in the SAER region: Toyota Manufacturing Plant in Bexar County, Guadalupe Power Partners in Guadalupe County, and Rio Nogales Power Projects in Guadalupe County. These three new point sources contribute a large share of the increase in emissions between 1999 and 2007. Area emissions were also affected by factors other than controls. The main reason for the projected area source reductions is the rapid increase in population for San Antonio.

5.3 LOCAL STRATEGIES

5.3.1 Introduction

Signatories of the SACAP for the SAER are committed to early planning and actions that will benefit the region's air quality. These actions were accomplished through cooperation between the representatives of the affected region, state, and federal officials in assessing the region's air quality and developing the best available approach to attain the 8-hour ozone NAAQS. Since the EAC was created to enable early local actions, it is pertinent to implement strategies locally that will improve air quality most effectively.

5.3.2 Locally Implemented Measures

Table 5.3-4 summarizes the emission reductions anticipated as the result of implementing local strategies. Energy efficiency, TERMs, and TDM projects were included in the 2007 control strategy run.

Table 5.3-4 Local Control Strategy Emission Reductions in the Future Control Strategy Model Run

Local Control Strategies	Estimated NO_X Reductions in 2007 (tpd)	Estimated VOC Reductions in 2007 (tpd)
Energy Efficiency/Renewable Energy Projects	0.06	0.00
Transportation Emission Reduction Measures	0.32	0.92
Transportation Demand Management	0.03	0.03

5.3.2a Modeled Measures

Energy Efficiency / Renewable Energy Projects

The TCEQ revised the HGB and the DFW SIPs to include a protocol for implementing and calculating emission reductions from energy saving resulting from SB5 and SB7 measures. The proposal relied on assumptions about the level of commitment by political subdivisions to implement the 5 percent per year reduction within their facilities. SB5 only requires that a target of 5 percent reduction in energy usage per year be set, it remains the responsibility of each individual political subdivision to adopt ordinances, resolutions, procedures or plans to demonstrate its commitment. Since the passage of SB5 and SB7, efforts have been underway both to implement the energy reductions and to quantify the associated ozone precursor reductions. The Energy Systems Laboratory (ESL) of Texas A&M University, the local

Metropolitan Partnership for Energy, and the Brooks Energy Sustainability Laboratory (BESL) of the Texas Engineering Experiment Station have worked to quantify the emission reductions due to energy efficiency projects in the San Antonio area. Documentation of this process and the estimated NOx reductions in Table 5.3-4 and included in the final control strategy modeling run can be found in Appendix N. Additional discussion of energy efficiency/renewable energy projects can be also be found in Appendix K.

Transportation Emission Reduction Measures (TERMs)
TERMs are strategies or actions that can be employed to offset increases in NO_x and VOC emissions from mobile sources by reducing either the number of vehicle trips, vehicle miles traveled, or both. These strategies may include ride sharing, telecommuting programs, clean fuel vehicle programs, improved transit/ bicycling facilities, or other possible actions such as intersection improvement and signalization.

It is important to note that many of projects included in the San Antonio-Bexar County Metropolitan Planning Organization (SA-BC MPO) Transportation Improvement Programs (TIP) can be quantified as creditable reductions. They are listed in Appendix K as TERM projects since the projects target vehicle trip reduction and improvement of air quality. AACOG's 2007 control strategy run accounts for an estimated 1,839 lbs/day of VOC and 649 lbs/day of NOx due to the implementation of the TERM projects. Traffic signalization and intelligent transportation system projects (ITS) are included as TERMS.

Traffic signalization projects can reduce carbon monoxide (CO) and VOC by reducing the number of vehicular stops and idling, which would reduce travel times and traffic delays. Reductions in fuel consumption have also been observed through traffic signal re-timing. Traffic flow at intersections can be improved in interconnection and coordination of signals. Of many projects shown in the SA-BC MPO's TIP in Appendix K, certain traffic signals for various intersections in the Bexar County were separately evaluated for their impacts on air quality.

Intelligent Transportation System (ITS) projects have proven to be a crucial ingredient of traffic management in metropolitan areas throughout the nation. Studies indicate that ITS have a significant impact on reducing the delays due to accidents and congestion on freeway systems in metropolitan areas. (Henk, R., et.al., 1996), (Carter, M., et.al., 2000) The most effective stand-alone implementation is incident management, but improvements in all measures assessed were seen. VMS and arterial traffic signal control can provide additional improvement in many of these areas. For the particular corridor modeled during this study, optimum implementation of the integrated VMS and incident management result in a 5.7 percent decrease in delay, a 2.8 percent decrease in accidents, and a 1.2 percent decrease in fuel consumption annually. Integrated use of incident management, VMS and arterial traffic control can achieve an annual benefit of a 5.9 percent reduction in delay, a 2.0 percent decrease in accidents, and a 1.4 percent decrease in fuel consumption for travelers in the corridor. ITS projects were included in photochemical modeling as part of TERMS projects.

Transportation Demand Management
Transportation Demand Management (TDM) projects are transportation-related projects that attempt to reduce vehicle use, change traffic flow, or reduce congestion conditions. A 2002 AACOG survey identified TDMs that are or will be implemented by government agencies and companies in the San Antonio area. These TDMs included: ride share, telecommuting, flex time, compressed workweek, and staggered hours. Study results revealed that during the weekday peak hours, TDMs could help reduce

onroad source emissions of VOCs by 3.3 percent and NO_x by 2.4 percent in 2007. These reduction rates however, have not been included in the photochemical modeling for the 2007 attainment demonstration.

5.3.2b Unmodeled Measures

In addition to control strategies that are included in the future control strategy model run, the SAER is implementing additional programs that, although difficult to quantify and include in photochemical modeling, contribute to cleaner air. These programs provide additional support for the SAER's attainment demonstration.

Alternative Fuel Vehicles (AFV)

A local alternative fuel survey was conducted in 2001, which inventoried the AFV fleet in the San Antonio MSA. The survey provided information on the number of AFVs, specific fuel type, the percentage of time that they operate on alternative fuel, the number of days per week they typically operate, and an estimate on how many VMT were accumulated by each vehicle for 2001.

The results indicated that there were 2,050 AFVs in the SAER, and this number is expected to increase to 2,442 AFVs by 2006. Of the reported fleet, 1,755 vehicles were modeled as the September 2001 fleet and 2,147 vehicles modeled for the September 2007 fleet. Analysis of fleets indicated that this fleet generated emission reductions of 62 lbs/day of VOC, 45 lbs/day of CO, and 689 lbs/day of NO_x. By 2007, it is projected that this fleet could contribute emissions reductions of 72 lbs/day of VOCs, 45 lbs/day of CO, and 858 lbs/day of NO_x for the year 2007. These reductions do not meet the EPA definition of enforceable commitments and so were not included in the 2007 control strategy modeling.

Lawnmower Recycling Program

Gasoline-powered lawnmowers contribute a significant amount of NO_x, VOCs, and particulate matter to the atmosphere. A lawnmower "buy back" program was initiated in 1998. The first trade-in event was held on March 31, 2001 and continued through the 2004 ozone season. Since its inception, the lawn mower rebate program has removed over 3,200 pieces of gasoline-powered lawn equipment and replaced them with cleaner electric lawn equipment. The emissions reductions attributed to this program are voluntary and therefore have not been taken into account in the photochemical modeling. The reductions for all VOC, CO, and NO_x categories have been calculated for Bexar County and the procedure for calculation of these reductions is presented in the Appendix K of this document. Table 5.3-5 shows the amount of these reductions.

Table 5.3-5 Reduced Emissions from Lawnmower Recycling Program

2003 Emissions Reductions* Due To City Public Service "Mow Down Smog" Program						
Emission	Exhaust	Crank	Diurnal	Displacement	Spillage	Total
VOC	90.62	3.60	5.84	1.50	12.70	114.24
NO_X	4.78					4.78
CO	1145.39					1145.39
*pounds per ozone season day (Ozone season in 1999 EI report consists of 196 days)						

5.3.3 State Assisted Measures

The AIR Committee recommended three Clean Air Strategies for inclusion in the SACAP to local EAC signatory governments for their final approval. The strategies were:

- Reid Vapor Pressure lowered to 7.2 pounds per square inch during the ozone season for the SAER;
- Degreasing Equipment Operation Controls, described in TAC, Title 30, Ch. 115; and
- Stage I Vapor Recovery required of service stations of 25,000 gallons throughput of gasoline or more per month.

The signatories to the EAC for the SAER deliberated these strategies during regularly scheduled meetings of their representatives (i.e., during City Council meetings or during Commissioners' Court sessions). All eight governments approved each of the three strategies specified above. Copies of their signed resolutions to this effect are attached in Appendix O.

Low Reid Vapor Pressure Gasoline

Based on requests from the San Antonio EAC signatory governments, the commission requested a waiver from the U.S. EPA that would allow the adoption of rules lowering Reid Vapor Pressure in gasoline to 7.2 pounds per square inch during the ozone season. In a letter dated October 14, 2004, the U.S. EPA denied the commission’s request.

5.3.3.A1 Stage I Vapor Recovery at Stations Dispensing Greater Than 25,000 Gallons/Month

At the request of local governments, the TCEQ has revised Chapter 115, Subchapter C, Volatile Organic Compound Transfer Operations, Division 2, Filling of Gasoline Storage Vessels (Stage I) for Motor Vehicle Fuel Dispensing Facilities to lower the exemption level for facilities subject to Stage I Vapor Recovery controls from 125,000 gallons to 25,000 gallons of gasoline in a calendar month in the four counties in the SAER. 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. Program participants are gasoline stations and fuel dispensing facilities in the MSA.

Stage I Vapor Recovery systems are designed to control the escape of gasoline vapors from gasoline storage tanks. The uncontrolled vapors escape from storage tanks when displaced by liquid gasoline unloaded from refueling trucks. With installation of Stage I equipment, the storage tank vapors are captured by a vapor return hose and are returned to the refueling truck.

Evaluation of this strategy involved quantification of emission reductions resulting from potential strategy implementation. The estimated 2007 VOC tonnage from Source Classification Code 2501060053 (Tanker Truck Unloading) was multiplied by an emission factor. Further details regarding emission reduction calculations can be found in Appendix I.

5.3.3.A2 Degreasing

At the request of local governments, the TCEQ has revised Chapter 115, Subchapter E, Solvent-Using Processes, Division 1, Degreasing Processes, to extend the control requirements to the four counties in the SAER.

Degreasing equipment is designed and used for containing a solvent to use in cleaning operations such as 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 impurities, such as grease, wax, and oil from metal parts, circuit boards, sheet metal, assemblies, and other materials. Emissions of VOC primarily result from evaporation. Program participants are facility owners and operators that conduct degreasing operations in the MSA.

Due to uncertainty in the credit for this measure additional credit was not taken in the final modeling run. However, further details regarding emission reduction calculations can be found in Appendix I, page 22.

5.3.3.A3 Texas Emission Reduction Plan (TERP)

The 77th Texas Legislature established TERP in 2001, through enactment of SB5. The program was not fully funded, however, until the 78th Legislature enacted HB 1365 in 2003. The TCEQ expects to have approximately $104 million in FY 2004 to be available for the TERP . Those figures are expected to increase in each of the subsequent fiscal years through FY 2008, averaging a total of $150 million each year. The program is scheduled to end after FY 2008.

The primary purpose of the TERP is to provide financial incentives to repower, retrofit or replace on and nonroad diesel engines with cleaner equipment. TERP is expected to help achieve reductions in forty one counties designated as "affected counties" by the Texas Legislature. Businesses and political subdivisions in the counties are eligible for TERP funding to reduce onroad and nonroad equipment emissions.

HB1365 designated all four counties in the SAER as "affected counties" and therefore eligible for participation. This voluntary program is available to eligible vehicles and equipment in any of the four counties. The TERP web page at http://www.terpgrants.org provides additional information on the TERP program.

The signatories to the SAER EAC intend to pursue TERP grants and to work with other public and private sector entities operating in the SAER and have committed to pursue grants that will result in total NO_x reductions of up to 2 tpd. On August 16, 2004, the commission allocated funding for 2.5 tpd of NO_x reductions to the San Antonio area by 2007. This supports the area's commitment to pursue at least 2 tpd NO_x reductions by 2007, as included in the final modeling run.

5.3.3.A4 Statewide Portable Fuel Container Rule

The portable fuel container rule establishes new requirements relating to the design of fuel containers and spouts. The new rules will establish design criteria for "no-spill" portable fuel containers based in large part on the CARB standards. Effective December 31, 2005, these new rules will limit the type of portable fuel containers and portable fuel container spouts sold, offered for sale, manufactured, and/or distributed in Texas.

Fuel released into the environment leads to the contamination of both the state's air and water. This rule will ensure that portable fuel containers manufactured under these standards will release less fuel as the result of spillage and evaporation. Reductions from this program were included in the model as statewide adjustments and so there are no county specific reduction estimates.

5.3.3.A5 Impact of State Rules

Various emission reducing strategies were analyzed for their effectiveness in reducing ozone precursors as well as reducing ambient ozone levels in the photochemical model. Local entities involved in the strategy selection process were provided numerous control strategies that would have an effect on the ambient air quality. AACOG presented a preliminary list that detailed over 100 clean air strategies. The strategies on the list were then analyzed based on criteria acceptable to the TCEQ and EPA. The criteria consisted of emission reducing strategies that were quantifiable, enforceable , and permanent. Once strategies had been eliminated, the potential clean air strategies were analyzed based on feasibility, cost effectiveness, and emission reducing capacity. The strategies that met these criteria were then incorporated into the photochemical model so that the impact on modeled ozone levels could be predicted. The strategies listed in Table 5.3-4 were selected as local initiatives that will assist the SAER reach 8-hour ozone attainment standards. Table 5.3-6 depicts the emission reductions the selected strategies are projected to provide by 2007. Table 5.3-7 shows the ozone reductions obtained from the these control measures. Table 5.3-8 lists the design values for the CAMs stations in the SAER.

Table 5.3-6 Locally Recommended State Control Strategies and Rules

State Assisted Local Clean Air Strategies	Estimated NO_x Reductions in 2007 (tpd)	Estimated VOC Reductions in 2007 (tpd)
Stage I Vapor Recovery for gas stations dispensing 25,000 to 125,000 gallons/month	0.00 tpd	5.81 tpd
Degreasing Controls	See State Rules; thru Ch. 106	See State Rules; thru Ch. 106
	0	*
TERP - Diesel Retrofits	2.0 tpd	0

* Potential Emissions Reductions are listed in Appendix I.

Table 5.3-7 Projected Ozone Reductions at the Controlling Monitor (CAMS 23) as the result of Locally Recommended State Rules

Strategy	Reduction in Ground-Level Ozone (ppb)	Implementing Entity
Degreasing Solvent	*	State
Stage I Vapor Recovery (25K)	0.12	State

*Potential Emissions Reductions are listed in Appendix I.

Table 5.3-8 Comparison of 1999 Base, 2007 Future, and 2007 Future with Control Strategies

Model Run	Design Value at CAMS 23	Design Value at CAMS 58	Design Value at CAMS 59	Design Value at CAMS 678
1999 Base Case	89	87	79	77
2007 Future Base	84.78	82.40	74.46	74.26
2007 Future Base with Control Strategies	84.27	81.96	74.33	74.26

5.4 ADDITIONAL EVIDENCE

The following paragraphs include local projects, additional studies, and indicators supporting the results of the photochemical model in showing attainment of the eight hour ozone NAAQS by the year 2007. In addition to the local emission reduction strategies described in Section 5.3.2, which were not quantified in the future base or control strategy modeling runs, these measures will reduce emissions in the SAER and surrounding areas by 2007 and help improve air quality.

Windshield Wiper Fluid

In 1998, the EPA promulgated rules pertaining to the VOC emission standards for consumer solvents. One solvent, windshield wiper fluid, is limited to 35 weight-percent VOC. EPA calculated VOC reductions from this national consumer products rule to be 20 percent and allowed states to take this emission reduction credit in their SIPs. Prior to EPA's issuance of its national rule, Texas adopted a consumer products rule that limits automotive windshield washer fluid to 23.5 weight-percent VOC. Due to the more stringent Texas formulation, Texas takes credit for the difference. This measure was not modeled.

Public Education Program

A detailed description of the public outreach and education projects undertaken by AACOG staff, for the purpose of disseminating information on air quality and informing the public of seriousness of air pollution problem in the San Antonio area, is presented in the Appendix K. The main goal is to familiarize the public with actions they can take to improve the air quality. There has been no attempt to quantify the air quality impacts of these public outreach projects, however this program will add additional assurance that the SAER will achieve the goals of the EAC program.

CHAPTER 6: MAINTENANCE FOR GROWTH

6.1 MAINTENANCE FOR GROWTH DEMONSTRATION

The general elements required for the development of the Maintenance for Growth (MFG) were stated in the Protocol for Early Action Compacts Designed to Achieve and Maintain the 8-Hour Ozone Standard. The protocol states that the MFG must address emissions growth through December 31, 2012, to ensure the area will remain in attainment of the 8-hour ozone standard. The component may include modeling analyses, annual review of growth, or the identification and quantification of federal, state, and local control measures that indicate sufficient emission reduction. A continuing planning process that includes modeling updates and modeling assumption verification must also be included. The modeling should evaluate relevant new point sources, impacts from potential new source growth, and future transportation patterns. If the review of growth indicates that the adopted control measures are inadequate to address growth in emissions, additional measures can be added to the plan.

The SAEAD plans to achieve the 8-hour ozone standard by December, 2007. Maintaining the 8-hour ozone standard five years beyond the attainment date will be achieved through an annual review of growth as required in the EAC protocol.

The MFG analysis performed for the SAER has several stages or components:

Current Analysis: The current MFG analysis is an updated and expanded Trend Analysis, first published September 30, 2003, as an EAC milestone. The MFG section (Appendix L) analyzes the emissions inventories from 1996 and 1999 and projects emissions to 2007 and 2012. These future year projections encompass all relevant changes affecting future emissions, including revised or new federal, state, and local rules and any new practices that would result in changes to future year emissions inventories. As a separate document, the Trend Analysis itself is updated annually by September 30.

Continuing Planning Process: The assumptions underlying this analysis will be reviewed annually throughout the term of the EAC (through 2007). Changes in assumptions will be incorporated annually into an updated MFG analysis and reported as a component of the Semi-Annual Updates. The current analysis is reported in Appendix L.

New Strategy Requirements: In the event the annual analysis of emission trends and control strategies fails to maintain attainment standards, appropriate planning and implementation of additional clean air measures will result.

6.1.1 Current Analysis

As part of the initial analysis of the area's air quality, emission projections were developed. These projections provided insight to future air quality by evaluating increases in population and emission sources along with control strategies that will be implemented by state and federal agencies in the years to come. Table 6.1-4 summarizes emissions from various anthropogenic sources for 1996, 1999, 2007, and 2012.

Methodologies: 2012 projections

The 2012 emission projections were developed using the same methodologies in the development of 2007 emissions, which are described in Appendix F. Some components in the methodologies, such as emission factors, were altered to reflect predicted changes for 2012 differ from 2007. These alterations are described in Appendix L.

New Point Sources, 2007-2012
The following section describes new point sources that are expected between 2007 to 2012. Detailed descriptions of the new point sources and methods used to determine their projected emissions can be found in Appendix L.

Guadalupe County Power Plants
Two natural gas powered electrical generating facilities are slated for completion and operation prior to 2007. Both facilities are under construction in Guadalupe County. Two facilities are currently being constructed, each facility is projected to emit 3.79 tpd of NO_x and 0.24 tpd of VOC.

Tessman Road Landfill Gas Power Station
The proposed Tessman Road power station is located in Bexar County near Converse. The station will feature six Deutz TBG 620 V16 engines, producing electricity from methane and other landfill gases. It is calculated that the project will release 0.179 tpd of NO_x and 0.049 tpd of VOC.

City Public Service Power Plant is currently developing plans to build an additional coal burning power plant in the area. CPS estimates the plant will emit 5.92 tpd of NO_x by 2012 when the plant is fully operational. Also, CPS plans to have a natural gas plant on-line by September 2012 and its projected NO_x emissions are estimated at 0.72 tpd. CPS has committed to reduce their overall emissions, however, so that emissions increases at these locations will not increase the total emissions from their facilities in the area.

Toyota Motor Manufacturer North America (TMMNA)
TMMNA is building an auto-production assembly plant in southern Bexar County. Toyota provided emissions estimates of the anticipated pollutants produced by this plant at the start of production. Detailed emission data can be found in Appendix L. Table 6.1-1 contains total emissions projected to be emitted from production along with the other point source projected emissions. These figures do not include emissions from construction of this plant. Plant construction will be completed prior to 2012.

New Point Source Emission Total
Table 6.1-1 displays the cumulative VOC and NO_x emissions due to the introduction of new point source related emissions to SAER.

Table 6.1-1 Point Source VOC and NO_x Emissions of New Point Source Projects (tons/weekday)

Point Source	1999		2007		2012	
	VOC	NO_x	VOC	NO_x	VOC	NO_x
Emissions without new sources	7.3	96.6	8.0	67.1	8.3	49.8
CPS - New Coal Plant	0.0	0.0	0.0	0.0	0.0	5.9
CPS – New Gas Plant	0.0	0.0	0.0	0.0	0.0	0.7
Guadalupe Power Plants	0.0	0.0	0.4	7.5	0.4	7.5
Toyota	0.0	0.0	5.0	0.3	10.0	0.7
Tessman Road Power Station	0.0	0.0	0.0	0.2	0.0	0.2
Total	7.3	96.6	13.5	75.1	18.7	64.9

The VOC emissions will increase in 2007 emissions projection as well as the 2012 emissions projection. NO_x emissions decrease in the 2007 and 2012 projections.

6.1.3 Comparison of 2007-2012 Emissions by Major Category

Point

VOC emissions from point source are estimated to increase approximately 38.5 percent from 13.5 tpd to 18.7 tpd from 2007 to 2012. The rise is attributed to the emergence of new point sources within the SAER. NO_x emissions are expected to decrease by 13.6 percent from 75.1 tpd to 64.9 tpd. The reduction in NO_x is anticipated as a result of technologies employed at the CPS power production facilities.

Nonroad

The 17.6 percent decrease in VOC from 30 tpd to 24.7 tpd and the 8.2 percent reduction in NO_x emissions from 44 tpd to 40.4 tpd between 2007 and 2012 for nonroad emissions are based on state and federal control strategies. The files used to conduct this analysis are described in Appendix F.

Area

From 2007 to 2012, area source VOC emissions are projected to increase 3.2 percent from 80.5 tpd to 83.1 tpd and NO_x emissions are projected to increase by 5.6 percent 9 tpd to 9.5 tpd. Area sources are expected to continue to grow as the population and economy of the San Antonio area expand.

Onroad

Between 2007 and 2012, onroad VOC emissions will decrease by 25.5 percent from 53.8 tpd to 40.1 tpd and NO_x emissions will drop by 40% from 84 tpd to 50.4 tpd. State and federal control strategies can be found in Appendix C.

Airport

Airport and military emission data were compiled by AACOG. These emissions cannot be projected due to the uncertainty of future activities at the airport and military bases in the SAER. Emissions for this category remain the same for 1999, 2007, and 2012. Table 6.1-2 details the emissions from airport and military sources. These emissions are accounted for in the nonroad source emissions listed in Table 6.1-4.

Table 6.1-2 Airport/Military Emissions for the SAER in tpd

		1996		1999		2007		2012	
		VOC	NO_x	VOC	NO_x	VOC	NO_x	VOC	NO_x
Airport Sources	Bexar	2.7	6.8	3.0	9.9	3.0	9.9	3.0	9.9
	Comal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Guadalupe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Wilson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	2.7	6.8	3.0	9.9	3.0	9.9	3.0	9.9

Biogenic

Biogenic emissions were unchanged from 1999 for 2007 and 2012. Table 6.1-3 lists the biogenic emissions for the SAER. Biogenic emissions were not included in Table 6.1-4.

Table 6.1-3 Biogenic Emissions for the SAER in tpd

		1996		1999		2007		2012	
		VOC	NO_x	VOC	NO_x	VOC	NOx	VOC	NO_x
Biogenic Sources	Bexar	60.1	5.0	60.1	5.0	60.1	5.0	60.1	5.0
	Comal	56.5	1.5	56.5	1.5	56.5	1.5	56.5	1.5
	Guadalupe	83.6	7.5	83.6	7.5	83.6	7.5	83.6	7.5
	Wilson	62.8	6.5	62.8	6.5	62.8	6.5	62.8	6.5
	Total	263.0	20.6	263.0	20.6	263.0	20.6	263.0	20.6

Figure 6.1-4 illustrates the predicted emission trend from 1996 to 2012. This illustration further supports the SAER's projected maintenance of attainment of the NAAQS 8-hour ozone standard. Between 1999 and 2007, an overall reduction of 28 percent of NO_x emissions and a 23 percent reduction in VOC emissions are predicted. Between 2007 and 2012, an additional 22 percent reduction in NO_x emissions and 7 percent reduction in VOC emissions can be expected. These reductions indicate that improved air quality will continue.

Table 6.1-4 Anthropogenic Emissions within the SAER in tpd

SAER		Tpd Emission							
		1996		1999		2007		2012	
		VOC	NO_x	VOC	NO_x	VOC	NO_x	VOC	NO_x
Area Sources	Bexar	78.3	2.4	73.4	4.7	69.2	5.0	71.4	5.2
	Comal	4.4	0.1	3.7	0.3	3.4	0.5	3.6	0.5
	Guadalupe	6.1	0.3	5.4	0.9	5.2	1.7	5.4	1.8
	Wilson	2.6	0.4	2.7	0.9	2.7	1.8	2.7	2.0
	Total	91.4	3.3	85.2	6.8	80.5	9.0	83.1	9.5
Point Sources	Bexar	7.0	64.3	6.3	83.9	11.8	53.2	17.0	43.0
	Comal	0.4	8.2	0.5	12.2	0.5	13.8	0.5	13.8
	Guadalupe	0.4	0.3	0.5	0.5	1.1	8.1	1.1	8.1
	Wilson	0.0	0.0	0.01	0.004	0.1	0.004	0.1	0.004
	Total	7.8	72.8	7.3	96.6	13.5	75.1	18.7	64.9
Onroad Sources	Bexar	106.6	122.39	82.1	121.87	45.5	69.1	33.7	41.4
	Comal	6.8	10.4	6.2	11.7	3.9	7.1	3	4.3
	Guadalupe	6.6	10	5.6	10.5	3.4	6.5	2.6	3.9
	Wilson	1.9	1.9	1.6	1.9	1	1.3	0.8	0.8
	Total	121.9	144.69	95.5	145.97	53.8	84	40.1	50.4
Nonroad Sources	Bexar	54.3	55.2	36.3	36.4	25.6	36.3	21.0	32.9
	Comal	9.8	3.5	3.4	2.6	2.1	3.4	1.8	3.3
	Guadalupe	4.3	4.4	4.1	2.3	1.7	3.3	1.4	3.3
	Wilson	1.4	4.1	1.0	0.7	0.6	1.0	0.5	0.9
	Total	69.9	67.2	45.7	42.0	30.0	44.0	24.7	40.4

Table 6.1-5 is a synopsis of Table 6.1-4. The trend in emissions changes between 2007 and 2012 shown is a downward trend, most significantly in NO_x. The SAER will be in attainment by 2007 based on the results of the modeled attainment demonstration found in Appendix H. The SAER will stay in attainment through 2012 based on the downward trend in locally produced precursors between attainment year 2007 and maintenance year 2012.

Table 6.1-5 Anthropogenic Emissions within the SAER, 2007-2012

SAER	Change VOC 2007→2012 (TPD)	Change VOC 2007→2012 (%)	Change NO_x 2007→2012 (TPD)	Change NO_x 2007→2012 (%)
Area Sources	80.5→83.1 + 2.6	0.176	9→9.5 + 0.5	0.056
Point Sources	13.5→18.7 + 5.2	0.385	75.1→64.9 - 10.2	- 13.6%
Onroad Sources	53.8→40.1 - 13.7	- 25.5%	84→50.4 - 23.6	- 40%
Nonroad Sources	30→24.7 - 5.3	- 17.7%	44→40.4 - 3.6	- 8.2%
Total	177.8→166.6 - 11.2	- 6.3%	212.1→165.2 - 46.9	- 22.1%

Emission reductions achieved through state and federal control measures will be further complemented by local clean air strategies enacted through the EAC and the SIP, which are not shown in the 2007 baseline projections in Table 6.1-4. Periodic trend analyses updates, including clean air strategies enacted through the EAC, will ensure that the reductions achieved through all measures are adequate to maintain attainment through 2012.

6.2 CONTINUED PLANNING PROCESS

Various planning and verification activities will be performed on a continual basis to ensure timely emission reductions for the SAER to maintain air quality standards. The impacts of new point source related emissions, economic and population growth, and the implementation of new control strategies are evaluated during the air quality modeling process. The modeling output provides policy makers information on the impacts of new emission sources or control strategies. This preliminary trend analysis indicated that emissions for some sources were projected to increase while other sources would have a decrease in emissions. New point source emissions that come into existence between 1999 and 2012 will be accounted for in the analysis of emission growth. Analyzing the impact of new growth or new control strategies on modeled ozone levels is an important step in air quality planning.

6.2.1 Modeling Updates and Modeling Assumption Verification

AACOG staff will analyze air quality and related data and modeling updates including verification of modeling assumptions annually. If updated emission inventories, photochemical model inputs, or corrections to earlier assumptions are available, the modeling scenarios used to demonstrate attainment for the SAER may be updated. Modeling will be performed in accordance with state and federal guidelines.

Ongoing Updates

Gathering, updating, and verifying data is part of an ongoing process between the TCEQ, EPA, and AACOG. The updating and verification process will continue to occur in the context of the Joint NNA Area meetings including TCEQ, and the San Antonio, Victoria, Corpus Christi, Austin and the Tyler-Longview areas, or other appropriate venue. Joint NNA meetings are held at a minimum of once every three months. The meetings were established as a forum for discussion of new technology, new planning requirements, progress on air quality goals, as well as discussion of updates to modeling input and modeling techniques. AACOG frequently attends other technical modeling meetings hosted by the TCEQ, EPA and other agencies, which provides greater opportunity for information exchanges. AACOG attends regularly scheduled monthly technical meetings of the local SA-BC MPO, obtaining the most recent transportation planning information. AACOG provides all air quality analysis for the local MPO transportation projects. Local transportation planning updates to the modeling are incorporated as they occur, and their impacts analyzed.

Modeling updates and modeling assumption verification will be reported in the Semi-Annual Reports written by AACOG. Reports are due every six-months – December 31 and June 30 each year of the EAC. The last report is due on December 31, 2007. The reports will specifically address new point sources; impacts from potential new source growth; and future transportation patterns and will evaluate the impact on air quality in a manner that is consistent with the currently adopted Long Term Transportation Plan and current trend and projections of local motor vehicle emissions.

6.2.2 Transportation Patterns

The development of transportation patterns is influenced by land use and urban planning. Transportation patterns directly impact the emissions from onroad sources. Onroad emissions, as detailed in Table 6.1-4, are projected to decrease by 2012.

Through the continuing planning process transportation patterns and their impact on air quality will be evaluated and assessed. As specified in Section 6.3, the ongoing technical collaboration between AACOG and the local MPO is the central conduit to ensure that updated transportation information is integrated into air quality planning. Through the technical assistance provided by each agency, this cooperative relationship will assist in maintaining the 8-hour ozone standard.

6.2.3 New Strategy Requirements

The annual reviews of growth will provide valuable information for air quality planners. The extensive clean air strategy modeling performed by AACOG will facilitate planning if additional measures are considered.

If the review of growth indicates adopted control measures are inadequate to address emissions, additional measures may be considered. If additional control measures are needed for 2007 attainment, strategies will be evaluated using the current attainment demonstration adopted. If additional control measures for 2012 attainment are needed, AACOG staff will work with the TCEQ and EPA to analyze control strategies based on available photochemical models. Potential new control strategies will be assessed for their feasibility and reasonableness, and if necessary may be adopted through revisions to this SIP.

6.3 TRACKING AND REPORTING

All signatories and implementing agencies will review EAC activities twice year. The semi-annual review will track and document control strategy implementation and results, monitoring data and future plans. AACOG, or its designee, will continue to file reports with the TCEQ and EPA by June 30 and December 31 of each reporting year for the duration of the EAC or until December 2007. Reporting periods will be May 1 to October 31, and November 1 to April 30, to allow for adequate public notice and comment. AACOG has primary responsibility for report generation.

Figure 6.1-1 Trend of VOC and NO_x Emissions in the SAER, 1996, 1999, 2007, 2012