

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

ATTAINMENT DEMONSTRATION FOR THE  
HOUSTON/GALVESTON  
OZONE NONATTAINMENT AREA  
PART II

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION  
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**HOUSTON/GALVESTON ATTAINMENT DEMONSTRATION  
LIST OF ACRONYMS**

ACT - Alternative Control Techniques  
AIRS - Aerometric Information Retrieval System  
AMS - Area and Mobile Source  
AQAC - Air Quality Advisory Committee  
ARACT - Alternate Reasonably Available Control Technology  
ARPDB - Acid Rain Program Database  
ASC - Area Source Categories  
ATC - Air Traffic Control  
AUTO-GENERAL CONFORMITY - Automated Gas Chromatograph  
AVHRR - Advanced Very High Resolution Radiometer  
BACT - Best Available Control Technology  
BEIS-2 - Biogenic Emissions Inventory System, version 2  
BELD - Biogenic Emissions Land cover Database  
BIOME - Biogenic Model for Emissions  
BLRID - Boiler ID  
BPA - Beaumont/Port Arthur  
CAM - Compliance Assurance Monitoring  
CAMS - Continuous Air Monitoring Station  
CAMx - Comprehensive Air Quality Model with Extensions  
CARE - Clean Air Responsibility Enterprise  
CB-IV HC - Carbon Bond IV Hydrocarbon  
CEMS - Continuous Emissions Monitoring System  
CHMSPL - CHEMical SPLit  
CNTLEM - CoNTroL EMissions  
CO - Carbon Monoxide  
COAST - Coastal Oxidant Assessment for Southeast Texas  
CTG - Control Technique Guidelines  
DFW - Dallas/Fort Worth  
DFWN - Dallas/Fort Worth North  
DFWRTM - Dallas/Fort Worth Regional Transportation Model  
DOW - Day of Week  
DRI - Desert Research Institute  
EI - Emissions Inventory  
EIQ - Emissions Inventory Questionnaire  
ELP - El Paso  
EGAS - Economic Growth Analysis System  
EGU - Electric Generating Unit  
EMS-5 - Emissions Modeling System, 1995  
EMSCVT - EMISSIONS CONVERT  
EPA - U. S. Environmental Protection Agency  
EPN - Emission Point Number  
EPS-2 - Emission Preprocessing System, Version 2  
ETR - Employer Trip Reduction

FAA - Federal Aviation Administration  
FACA - Federal Advisory Committee Act  
FCAA - Federal Clean Air Act  
FDDA - Four-Dimensional Data Assimilation  
FIPS - Federal Information Placement System  
FMVCP - Federal Motor Vehicle Control Program  
FTP - File Transfer Protocol  
GIS - Geographic Information System  
GMAQS - Gulf of Mexico Air Quality Study  
GRDEM - GRiD Emissions  
HAP - Hazardous Air Pollutant  
HAXL - Houston Air Excellence in Leadership  
HB - House Bill  
HDDV - Heavy-Duty Diesel Vehicle  
HGA - Houston/Galveston  
H-GAC - Houston-Galveston Area Council  
HPMS - Highway Performance Monitoring System  
HRM - Houston Regional Monitoring  
HYSPLIT - HYbrid Single Particle Lagrangian Integrated Trajectory  
IIG - Interim Implementation Guidance  
IIP - Interim Implementation Plan  
I/M - Inspection and Maintenance  
INIT - Initial Condition Tracer  
ITWS - Integrated Terminal Weather System  
kg/ha - Kilograms/hectare  
km - Kilometer  
LBASE - Link-BASEd emissions preprocessor  
LDEQ - Louisiana Department of Environmental Quality  
LEV - Low Emission Vehicle  
LULC - Land Use Land Cover  
m - Meter  
MACT - Maximum Achievable Control Technology  
MMS - Minerals Management Service  
MRGUAM - MeRGe Urban Airshed Model ready files  
NAAQS - National Ambient Air Quality Standard  
NCDC - National Climatic Data Center  
NCTCOG - North Central Texas Council of Governments  
NDBC - National Data Buoy Center  
NEGU - Non-electric Generating Units  
NET - National Emission Trends  
NLEV - National Low Emission Vehicle  
NO<sub>x</sub> - Nitrogen Oxides  
NO<sub>y</sub> - Nitrogen Species  
NSR - New Source Review  
NWS - National Weather Service  
O<sub>3</sub> - Ozone  
OAQPS - Office of Air Quality Planning and Standards

OASIS - Online Access and Service Information System  
OBD - On-Board Diagnostics  
ODEQ - Oklahoma Department of Environmental Quality  
ORISN - Acid Rain Program Facility Identifier  
OSAT - Ozone Source Apportionment Technology  
OTAG - Ozone Transport Assessment Group  
OZPK - Ozone Peak  
PAMs - Photochemical Assessment Monitoring Sites  
PEI - Periodic Emissions Inventory  
PGM - Photochemical Grid Model  
PiG - Plume-in-Grid  
PLNAME - Plant Name  
PM<sub>10</sub> - Particulate Matter less than 10 microns  
ppb - Parts Per Billion  
ppbc - Parts Per Billion Carbon  
ppmv - Parts Per Million by Volume  
PREAM - PREprocessor for Area and Mobile source emissions  
PREPNT - PREprocessor for PoiNT  
PSDB - Point Source Database  
QA/QC - Quality Assurance/Quality Control  
RACT - Reasonably Available Control Technology  
RAQPC - Regional Air Quality Planning Committee  
REMI - Regional Economic Modeling, Inc.  
RFG - Reformulated Gasoline  
ROP - Rate-of-Progress  
RSQE - Research Seminar in Quantitative Economics  
SAI - Systems Applications International  
SAIMM - Systems Applications International Meteorological Model  
SAQM - SARMAP Air Quality Model  
SB - Senate Bill  
SCC - Source Classification Code  
SCRAM - Support Center for Regulatory Air Models  
SETRPC - Southeast Texas Regional Planning Commission  
SIC - Standard Industrial Classification  
SIP - State Implementation Plan  
SMOKE - Sparse Matrix Operator Kernel Emissions  
SO<sub>2</sub> - Sulfur Dioxide  
SO<sub>x</sub> - Sulfur Compounds  
SOCMI - Synthetic Organic Chemical Manufacturing Industry  
SumPol - Sum of identified PAMS target list compounds  
TACB - Texas Air Control Board  
TAFF - Texas Alternative Fuel Fleet  
TAZ - Traffic Analysis Zone  
TCF - Texas Clean Fleet  
TCM - Transportation Control Measure  
TNRCC - Texas Natural Resource Conservation Commission  
TIGER - Topographically Integrated Geographic Encoded Referencing System

TMPFAC - TemPoral FACtor  
TMPRL - TeMPoRaL allocation processor  
TNMOC - Total nonmethane organic compounds  
TOMS - Total Ozone Mapping Spectrometers  
TPOD - Tons Per Ozone Day  
TPY - Tons Per Year  
TSP - Total Suspended Particulates  
TTI - Texas Transportation Institute  
UAM - Urban Airshed Model  
USDA - United States Department of Agriculture  
USGS - United States Geological Survey  
UTM - Universal Transverse Mercator  
VMT - Vehicle Miles Traveled  
VNR or VNRAT- VOC-NO<sub>x</sub> ratios  
VOC - Volatile Organic Compound  
WDWE - Weekday/Weekend  
WOE - Weight of Evidence

**HOUSTON/GALVESTON ATTAINMENT DEMONSTRATION  
LIST OF APPENDICES**

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Appendices A through M referenced in this document can be obtained from Bettie Bell by phone at (512) 239-6087 or by e-mail at [BBELL@tnrcc.state.tx.us](mailto:BBELL@tnrcc.state.tx.us). Electronic modeling data files can be obtained from Mr. Chris Kite by phone at (512) 239-1959, or by e-mail at [CKITE@tnrcc.state.tx.us](mailto:CKITE@tnrcc.state.tx.us).

## VI: Ozone Control Strategy

### A. INTRODUCTION

**This introduction is intended to provide the reader with a broad overview context of the SIP revisions that have been submitted to the EPA by the state of Texas. Some sections may be obsolete or superseded by new revisions, but have been retained for the sake of historical completeness. The reader is referred to the body of the SIP for details on the current SIP revision.**

Requirements for SIP specified in 40 Code of Federal Regulations Part 51.12 provide that "...in any region where existing (measured or estimated) ambient levels of pollutant exceed the levels *specified* by an applicable national standard," the plan shall set forth a control strategy which shall provide for the degree of emission reduction necessary for attainment and maintenance of such national standard.

Ambient levels of (SO<sub>2</sub>) and (NO<sub>x</sub>), as measured from 1975 through 1977, did not exceed the national standards set for these pollutants anywhere in Texas. Therefore, no control strategies for these pollutants were included in revisions to the Texas SIP submitted on April 13, 1979. Control strategies were submitted and approved for inclusion in the SIP for areas in which measured concentrations of ozone, TSP, or CO exceeded a NAAQS during the period from 1975 to 1977. On October 5, 1978, the Administrator of the EPA promulgated a lead ambient air quality standard. The FCAA Amendments of 1977 required that each state submit an implementation plan for the control of any new criteria pollutant. A SIP revision for lead was submitted in March 1981.

The control strategies submitted in 1979 provided by December 31, 1982 the amount of emission reductions required by EPA policy to demonstrate attainment of the primary NAAQS, except for ozone in the Harris County nonattainment area. For that area, an extension to December 31, 1987 was requested, as provided for in the FCAA Amendments of 1977.

Supplemental material, including emission inventories for VOC and TSP submitted with the 1979 SIP revisions, is included in Appendices H and O of the 1979 SIP submittal.

Proposals to revise the Texas SIP to comply with the requirements of the FCAA Amendments of 1977 were submitted to EPA on April 13, November 2, and November 21, 1979. On December 18, 1979 (44 FR 75830-74832), EPA approved the proposed revision to the Texas SIP relating to vehicle inspection and maintenance and extended the deadline for attainment of the NAAQS for ozone in Harris County until December 31, 1987 (see Appendix Q of the 1979 SIP submittal for the full text of the extension request and the approval notice). On March 25, 1980 (45 FR 19231-19245), EPA approved and incorporated into the Texas SIP many of the remaining provisions included in the proposals submitted by the state in April and November 1979. The March 25, 1980 *Federal Register* notice also included conditional approval of a number of the proposed SIP revisions submitted by the state.

Additional proposed SIP revisions were submitted to EPA by the state on July 25, 1980 and July 20, 1981 to comply with the requirements of the March 25, 1980 conditional approvals. By May 31, 1982, all of the proposed revisions to the Texas SIP submitted to EPA in April and November 1979, July 1980, and July 1981, with the exception of provisions relating to the definition of major modification used in new source review (NSR) and certain portions of the control strategy for TSP in Harris County,

had been fully approved or addressed in a *Federal Register* notice proposing final approval. The NSR provisions were approved on August 13, 1984.

The FCAA Amendments of 1977 required SIPs to be revised by December 31, 1982 to provide additional emission reductions for those areas for which EPA approved extensions of the deadline for attainment of the NAAQS for ozone or CO. Paragraph B.5. of this section of the SIP contains the revision to the Texas SIP submitted to comply with the FCAA Amendments of 1977 and EPA rules for 1982 SIP revisions. Supplementary emissions inventory data and supporting documentation for the revision are included in Appendices Q through Z of the 1982 SIP submittal.

The only area in Texas receiving an extension of the attainment deadline to December 31, 1987 was Harris County for ozone. Proposals to revise the Texas SIP for Harris County were submitted to EPA on December 9, 1982. On February 3, 1983, EPA proposed to approve all portions of the plan except for the Vehicle Parameter I/M Program. On April 30, 1983, the EPA Administrator proposed sanctions for failure to submit or implement an approvable I/M program in Harris County. Senate Bill 1205 was passed on May 25, 1983 by the Texas Legislature to provide the Texas Department of Public Safety with the authority to implement enhanced vehicle inspection requirements and enforcement procedures. On August 3, 1984, EPA proposed approval of the Texas SIP pending receipt of revisions incorporating these enhanced inspection procedures and measures ensuring enforceability of the program. These additional proposed SIP revisions were adopted by the state on November 9, 1984. Final approval by EPA was published on June 26, 1985.

Although the control strategies approved by EPA in the 1979 SIP revisions were implemented in accordance with the provisions of the plan, several areas in Texas did not attain the primary NAAQS by

December 31, 1982. On February 23, 1983, EPA published a *Federal Register* notice identifying those areas and expressing the intent to impose economic and growth sanctions provided in the FCAA.

However, EPA reversed that policy in the November 2, 1983 *Federal Register*, deciding instead to call for supplemental SIP revisions to include sufficient additional control requirements to demonstrate attainment by December 31, 1987.

On February 24, 1984, the EPA Region 6 Administrator notified the Governor of Texas that such supplemental SIP revisions would be required within one year for ozone in Dallas, Tarrant, and El Paso Counties and CO in El Paso County. The TACB requested a 6-month extension of the deadline (to August 31, 1985) on October 19, 1984. EPA approved this request on November 16, 1984.

Proposals to revise the Texas SIP for Dallas, Tarrant, and El Paso Counties were submitted to EPA on September 30, 1985. However, the revisions for Dallas and Tarrant Counties did not provide sufficient reductions to demonstrate attainment of the ozone standard and on July 14, 1987, EPA published intent to invoke sanctions. Public officials in the two counties expressed a strong desire to provide additional control measures sufficient to satisfy requirements for an attainment demonstration.

A program of supplemental controls was taken to public hearings in late October 1987. As a result of testimony received at the hearings, a number of the controls were modified and several were deleted, but sufficient reductions were retained to demonstrate attainment by December 31, 1991. These controls were adopted by the TACB on December 18, 1987 and were submitted to EPA as proposed revisions to the SIP. Supplemental data and supporting documentation are included in Appendices AA through AO of the 1987 SIP submittal.

The FCAA Amendments of 1990 authorized EPA to designate areas failing to meet the NAAQS for ozone as nonattainment and to classify them according to severity. The four areas in Texas and their respective classifications include: HGA (severe), BPA (serious), ELP (serious), and DFW (moderate).

The FCAA Amendments required a SIP revision to be submitted for all ozone nonattainment areas classified as moderate and above by November 15, 1993 which described in part how an area intends to decrease VOC emissions by 15%, net of growth, by November 15, 1996. The amendments also required all nonattainment areas classified as serious and above to submit a revision to the SIP by November 15, 1994 which described how each area would achieve further reductions of VOC and/or NO<sub>x</sub> in the amount of 3.0% per year averaged over three years and which includes a demonstration of attainment based on modeling results using the UAM. In addition to the 15% reduction, states were also required to prepare contingency rules that will result in an additional 3.0% reduction of either NO<sub>x</sub> or VOC, of which up to 2.7% may be reductions in NO<sub>x</sub>. Underlying this substitution provision is the recognition that NO<sub>x</sub> controls may effectively reduce ozone in many areas and that the design of strategies is more efficient when the characteristic properties responsible for ozone formation and control are evaluated for each area. The primary condition to use NO<sub>x</sub> controls as contingency measures is a demonstration through UAM modeling that these controls will be beneficial toward the reduction of ozone. These VOC and/or NO<sub>x</sub> contingency measures would be implemented immediately should any area fall short of the 15% goal.

Texas submitted rules to meet the ROP reduction in two phases. Phase I consisted of a core set of rules comprising a significant portion of the required reductions. This phase was submitted by the original deadline of November 15, 1993. Phase II consisted of any remaining percentage toward the 15% net of growth reductions, as well as additional contingency measures to obtain an additional 3.0% of

reductions. Phase II was submitted by May 15, 1994. The complete list of contingency measures was submitted by November 15, 1994. The appropriate compliance date was to be incorporated into each control measure to ensure that the required reductions will be achieved by the November 15, 1996 deadline. A commitment listing the potential rules from which the additional percentages and contingency measures were selected was submitted in conjunction with the Phase I SIP on November 15, 1993. That list of Phase II rules was intended to rank options available to the state and to identify potential rules available to meet 100% of the targeted reductions and contingencies. Only those portions of the Phase II rules needed to provide reasonable assurance of achieving the targeted reduction requirements were adopted by the commission.

The DFW and ELP areas achieved sufficient reductions with the 15% ROP SIP to demonstrate attainment by 1996. Attainment Demonstration SIP Revisions for these two areas were submitted on September 14, 1994.

The FCAA Amendments of 1990 classified the BPA area as a serious nonattainment area. The BPA nonattainment area includes Hardin, Jefferson, and Orange Counties. The BPA nonattainment area has an ozone design value of 0.16 ppm, which places the area in the serious classification.

The FCAA Amendments of 1990 require a Post-96 ROP SIP revision and accompanying rules to be submitted by November 15, 1994. According to the FCAA Amendments, this submittal had to contain an Attainment Demonstration based on UAM. Additionally, the revision had to demonstrate how the HGA and BPA nonattainment areas intend to achieve a 3.0% per year reduction of VOC and/or NO<sub>x</sub> until the year 2007, and additional reductions as needed to demonstrate modeled attainment. The plan was also required to carry an additional 3.0% of contingency measures to be implemented if the

nonattainment area fails to meet a deadline. To use NO<sub>x</sub> reductions for all or part of the Post-96 controls or the contingency measures required a demonstration using UAM showing that NO<sub>x</sub> controls would be beneficial in reducing ozone.

On November 9, 1994, the state submitted a SIP revision designed to meet the 3.0% per year ROP requirements for the years 1997-1999. This Post-96 ROP SIP revision detailed how the BPA and HGA nonattainment areas intend to achieve these three years' reductions of VOC (or 9% net-of-growth). Most of this amount was achieved by quantifying additional reductions due to existing rules and reductions due to federally-mandated rules. Rules to achieve the further reductions needed to meet the ROP SIP goal were submitted to EPA on January 11, 1995. This submittal included modeling demonstrating progress toward attainment, using a 1999 future year emissions inventory.

On August 14, 1994, the state submitted preliminary UAM modeling results for the BPA and HGA nonattainment areas that showed the relationship between emission levels of VOC and NO<sub>x</sub>, and ozone concentrations. This modeling was conducted with a 1999 future year emissions inventory. Based on the results of this preliminary modeling, which showed that NO<sub>x</sub> reductions might increase ozone concentrations, on April 12, 1995 the state received a temporary Section 182(f) exemption from all NO<sub>x</sub> requirements including reasonably available control technology (RACT), I/M, NO<sub>x</sub> NSR, and transportation conformity requirements. Permanent §182(f) exemptions from all NO<sub>x</sub> requirements were granted for DFW and ELP, and temporary exemptions until December 31, 1996 for HGA and BPA. The commission subsequently requested that EPA extend this date until December 31, 1997. EPA approved this 1-year extension on May 14, 1997.

On March 2, 1995, Mary Nichols, EPA Assistant Administrator for Air and Radiation, issued a memo which gave states some flexibility to design a phased Attainment Demonstration. It provided for an initial phase which was intended to continue progress in reducing levels of VOC and/or NO<sub>x</sub> while giving states an opportunity to address scientific issues such as modeling and the transport of ozone and its precursor pollutants. The second phase was designed to draw upon the results of the scientific effort and design a plan to bring the area into attainment. To constitute Phase I under this approach, the EPA guidance required that states submit the following SIP elements by December 31, 1995:

- ◆ Control strategies to achieve reductions of ozone precursors in the amount of 3.0% per year from the 1990 baseline emissions inventory (EI) for the years 1997, 1998, and 1999.
- ◆ UAM modeling out through the year 1999, showing the effect of previously-adopted control strategies which were designed to achieve a 15% reduction in VOCs from 1990 through 1996.
- ◆ A demonstration that the state has met the VOC RACT requirements of the FCAA Amendments.
- ◆ A detailed schedule and plan for the "Phase II" portion of the attainment demonstration which will show how the nonattainment areas can attain the ozone standard by the required dates.
- ◆ An enforceable commitment to:
  - Participate in a consultative process to address regional transport;
  - Adopt additional control measures as necessary to attain the ozone NAAQS, meet ROP requirements, and eliminate significant contribution to nonattainment downwind; and
  - Identify any reductions that are needed from upwind areas to meet the NAAQS.

Texas submitted the first two of these required sections in November 1994. The remaining three, a VOC RACT demonstration, the required commitments, and a Phase II plan and schedule, were submitted on January 10, 1996 to EPA.

ROP SIP modeling was developed for the HGA nonattainment area in two phases using the UAM. The first phase of ROP modeling was the modeling submitted in January 1995, as described above. The second phase of the ROP modeling was conducted using data obtained primarily from the COAST project, an intensive 1993 field study. The COAST modeling for HGA and the associated SIP were projected to be completed by December 1996 for submittal in May of 1997. Control strategies developed in this second phase were planned to be based on a more robust data base, providing a higher degree of confidence that the strategies would result in attainment of the ozone NAAQS or target ozone value. A discussion of the schedule for the UAM modeling for the Phase II Attainment Demonstration can be found in Appendix 11-F of the January 10, 1996 submittal.

On January 29, 1996, the EPA proposed a limited approval/limited disapproval for the Texas 15% ROP SIP revision. The EPA proposed a limited approval because the SIP revision would result in significant emission reductions from the 1990 baseline, and would, therefore, improve air quality. Simultaneously, the EPA proposed a limited disapproval because they believe that the plan fails to demonstrate sufficient reductions to meet the 15% ROP requirements. It also proposed a limited approval/disapproval of the contingency plans (designed to achieve an additional 3.0% of reductions if needed because a milestone is missed) along the same lines as the 15% action. The EPA stated that some of the control measures submitted along with the SIP revision did not meet all of the requirements of the FCAA Amendments of 1990, and, therefore, cannot be approved. The EPA further stated that it was not making a determination at this time whether the state has met its requirements regarding RACT, or any other underlying FCAA Amendments of 1990 requirements. Finally, the EPA proposed approval of the Alternate Means of Control portion of the November 9, 1994 Post-96 SIP submittal, but did not propose action on any other portion of that submittal.

Additionally, on November 29, 1995, the President signed the National Highway Systems Designation Act, which, among other things, prohibited EPA from discounting the creditable emissions from a decentralized vehicle I/M testing program if an approvable conditional I/M SIP revision was submitted to EPA within 120 days of the bill's signature. EPA's Office of Mobile Sources issued guidance stating that they would accept an interim I/M SIP proposal and Governor's letter 120 days after signature of the bill in lieu of an adopted SIP revision. The SIP proposal and letter was submitted to the EPA prior to the March 27, 1996 deadline to meet the 120-day time frame. The final I/M SIP revision (Rule Log No. 96104-114-AI), commonly referred to as the "Texas Motorist's Choice Program," was adopted by the commission on May 29, 1996 and submitted to the EPA by the state on June 25, 1996. On October 3, 1996, EPA proposed (61 FR 51651-51659) conditional interim approval of the Texas Motorist's Choice Program based upon the state's good faith estimate of emission reductions and the program's compliance with the Clean Air Act.

Part of EPA's determination that the new I/M SIP is approvable depends on the program's ability to achieve sufficient creditable VOC reductions so that the 15% ROP can still be achieved. The commission designed the revised I/M program to fit in with the other elements of the 15% SIP to achieve the full amount of creditable reductions required. The I/M program also achieves creditable reductions for the Post-96 ROP SIP.

Changes to the I/M program have had an impact on the ELP §818 Attainment Demonstration as well. This demonstration was predicated on the assumption that the I/M program would be implemented as adopted for the 15% SIP. An addendum to the §818 Demonstration shows that the basic underlying assumptions of the modeling still pertain despite the revisions to the I/M program.

The ETR program revision to the SIP and ETR rule were adopted in October 1992 by the TACB to meet the mandate established in the FCAA Amendments of 1990 (§182 (d)(1)(B)). This section of the FCAA required states with severe or extreme ozone nonattainment areas to develop and implement ETR programs in those areas. For Texas, the only area affected was the HGA area. The ETR program required large employers (those with 100 or more employees) to implement trip reduction programs that would increase the average passenger occupancy rate of vehicles arriving at the workplace during the peak travel period by 25% above the average for the area.

Congress amended the FCAA in December of 1995 by passing House Rule 325. This amendment allows the state to require an ETR program at its discretion. It also allows a state to “remove such provisions (ETR program) from the implementation plan...if the state notifies the Administrator, in writing, that the state has undertaken, or will undertake, one or more alternative methods that will achieve emission reductions (1.81 tons/day) equivalent to those achieved by the removed...provisions.” As such, large employers will no longer be mandated to implement trip reduction programs. The HGA ozone nonattainment area will, however, through the coordination of the Houston-Galveston Area Council, implement a voluntary regional initiative to reduce vehicle trips.

The 1990 Adjusted Base Year EI was submitted on November 12, 1993. It is the official inventory of all emission sources (point, area, on-road and off-road mobile) in the four nonattainment areas. There have been several changes to the EI due to changes in assumptions for certain area and non-road mobile source categories. Changes to the baseline EI have affected the target calculations and creditable assumptions made in the 15% and 9% SIPs.

In December of 1990, then-Texas Governor William Clements requested that the BPA area be reclassified as a "moderate" ozone nonattainment area in accordance with §181(a)(4) of the FCAA Amendments of 1990. That request was denied on February 13, 1991. A recent review of the original request and supporting documentation has revealed that this denial was made in error. As provided by §110(k)(6) of the Act, the EPA Administrator has the authority to reverse a decision regarding original designation if it is discovered that an error had been made.

Monitoring data from a privately-funded, special purpose monitoring network which was not included in the Aerometric Information Retrieval System database was improperly used to deny this request. Furthermore, subsequent air quality trends demonstrated that BPA is more properly classified as a moderate nonattainment area, and could attain the standard by the required date for moderate areas of November 15, 1996. Therefore, Governor Bush sent a letter and technical support to EPA on July 20, 1995, requesting that the BPA area be reclassified to moderate nonattainment status. BPA planned to demonstrate attainment one of the following ways:

- ◆ Monitored values showing attainment of the standard at state-operated monitors for the years 1994-1996, which is the time line the FCAA Amendments of 1990 specifies for moderate areas.
- ◆ UAM modeling showing attainment of the standard but for transport of ozone and/or precursors.

EPA Region VI verified the data submitted in support of this request, and concurred that it is valid. On June 3, 1996, the reclassification of the BPA area became effective. Because the area was classified as serious, it was following the SIP submittal and permitting requirements of a serious area, which included the requirements for a Post-96 SIP. With the consolidated SIP submittal, the commission

removed the BPA area from the Post-96 SIPs, which became applicable to the HGA nonattainment area only.

The state of Texas, in a committal SIP revision submitted to EPA on November 15, 1992, opted out of the Federal Clean Fuel Fleet program in order to implement a fleet emission control program designed by the state. In 1994, Texas submitted the state's opt-out program in a SIP revision to the EPA and adopted rules to implement the TAFF program. In 1995, the 74th Texas Legislature modified the state's alternative fuels program through passage of SB 200. In response to SB 200, the commission adopted regulations modifying the TAFF program to create the TCF program.

Since adoption, on July 24, 1996, and subsequent submission to EPA of the TCF SIP revision, the 75th Texas Legislature modified the state's alternative program once again through passage of SB 681. Staff is currently working on modifications to the TCF program, now called the TCF Low Emission Vehicle program, to reflect changes mandated by SB 681.

On June 29, 1994 the commission adopted a revision to the SO<sub>2</sub> SIP regarding emissions in Harris County. The SIP revision was required by EPA because of exceedances of the SO<sub>2</sub> NAAQS in 1986, 1988, and 1990. An EPA study conducted by Scientific Applications International Corporation also predicted SO<sub>2</sub> exceedances. On April 22, 1991 the EPA declared that portions of Harris County were potentially in nonattainment of the SO<sub>2</sub> NAAQS. Consequently, the HRM Corporation volunteered to find reductions in SO<sub>2</sub> in order to prevent being redesignated to nonattainment. HRM's efforts resulted in finding voluntary SO<sub>2</sub> reductions. These reductions were adopted in thirteen commission Agreed Orders and were included as part of the June 29, 1994 SIP revision. The EPA approved the Harris County SO<sub>2</sub> SIP on March 6, 1995 (60 FR 12125).

On May 14, 1997, the commission adopted an additional revision to the Harris County SO<sub>2</sub> SIP to incorporate modifications to two of the thirteen commission Agreed Orders. The remaining sections of the SIP remained the same. While on the scale of "minor technical corrections," the modified orders were submitted as a SIP revision because the new emission rates differ from what EPA had previously approved. The two agreed order modifications concerned grandfathered units at Simpson Pasadena Paper Company and Lyondell-Citgo Refining Company, Ltd. The commission approved changes to both Agreed Orders on July 24, 1996.

On May 14, 1997, the commission also adopted a revision to the SIP modifying the vehicle I/M program. This revision removed the test-on-resale component that had been included in the vehicle I/M program, as designed in July of 1996. Test-on-resale required persons selling their vehicles in the I/M core program areas to obtain emissions testing prior to the title transfer of such vehicles. Test-on-resale was not required to meet the FCAA Amendments of 1990 and did not produce additional emissions reduction benefits. The SIP revision also incorporated into the SIP the Memorandum of Understanding between the commissions and the Department of Public Safety, adopted by the commission on November 20, 1996.

The FCAA Amendments of 1990 required that, for severe and above ozone nonattainment areas, states develop SIP revisions that include specific enforceable TCMs, as necessary, to offset increases in motor vehicle emissions resulting from growth in VMT or the number of vehicle trips. This SIP revision would also satisfy reductions in motor vehicle emissions consistent with the 15% ROP and the Post-1996 ROP SIPs.

Therefore, the commission developed and submitted to EPA a committal SIP revision for the HGA nonattainment area on November 13, 1992, and VMT Offset SIP revisions on November 12, 1993, and November 6, 1994, to satisfy the requirements of the 15% ROP SIP revision. The former SIP revision laid out a set of TCMs and other mobile source controls which reduced emissions below the modeled ceiling. The 1994 SIP revision did not require additional TCMs.

As a result of changes in the I/M and the ETR programs, it was necessary to do the 1997 VMT Offset SIP revision for the HGA area, which was adopted on August 6, 1997. Additional TCMs were included: high occupancy vehicle lanes, park and ride lots, arterial traffic management systems, computer transportation management systems, and signalization. These TCMs were part of the “Super SIP” submitted to EPA on July 24, 1996.

Using the best technical guidance and engineering judgement available at the time, the state of Texas calculated emissions reductions available from the enhanced monitoring rule that was to be part of the Title V permitting program. The enhanced monitoring rule was later revised and transformed into the CAM Rule. Texas maintained that its calculation methodologies still accurately reflected the amount of creditable reductions available. EPA has indicated that it disagrees with the calculation methodologies used by the state and intend to disapprove the 9% SIP as a result. EPA has also indicated that the emission reduction credits claimed for the Texas Clean Fuels Fleet program are not approvable due to a legislative change to the program. The state plans to submit a SIP revision for this program in a separate action, but has removed the credits claimed in the 9% SIP in this action. The state of Texas proposes to submit a revision to the 9% SIP which revises the reductions claimed by the state toward the 9% emissions target.

The State of Texas did not re-apply for an extension of the NO<sub>x</sub> 182(f) waivers for HGA and BPA as discussed previously. Therefore, on December 31, 1997, the waivers expired. The state is now required to implement several NO<sub>x</sub> control programs. Among them is a requirement for all major NO<sub>x</sub> sources within the areas to implement RACT. The state has adopted a revised compliance date of November 15, 1999 for this program. The state believes that this program, taken in concert with the approvable VOC measures in the existing Post-96 SIP, will satisfy the ROP requirements of that SIP.

On July 18, 1997, EPA promulgated a new 8-hour NAAQS for ozone. This standard is intended to replace the previous one-hour standard. However, EPA decided that areas would not be subject to the new 8-hour standard until they had attained the one-hour standard. Therefore, on December 29, 1997, EPA issued guidance on requirements for areas that have not yet attained the one-hour standard. In Texas, this includes DFW, BPA, ELP, and HGA. Each area has a unique set of circumstances which will be addressed in future SIP submittals. In this action, the state is adopting a SIP revision to address attainment demonstration requirements for the HGA area only as discussed in the December 29, 1997 EPA guidance.

A complete discussion of the December 29, 1997 guidance requirements and how the state intends to meet those requirements can be found in Section B.9.c.1). In summary, among other elements, the guidance requires a SIP revision to be submitted to EPA by April 1998. The State of Texas has met this requirement by submitting a SIP revision which contains UAM modeling based on the COAST study described above, identification of the level of controls necessary to achieve attainment of the 1-hour ozone standard, identification of emissions sources for potential future control strategies, and a commitment schedule for future attainment demonstration SIP submittals.

The DFW area was classified as a moderate ozone nonattainment area in accordance with the FCAA Amendments of 1990. As a moderate nonattainment area, DFW was to demonstrate, through monitoring, attainment of the 1-hour ozone standard by November 15, 1996, or face being “bumped up” to the serious classification. Air quality data from DFW ambient air quality monitors for the years 1994-96 show that the 1-hour NAAQS for ozone has been exceeded more than one day per year over this three-year period. On February 18, 1998, the EPA issued a final notice in the *Federal Register* that the DFW area was being reclassified to the serious classification for failing to attain the NAAQS for ozone. As a result of this reclassification, the EPA required that a new SIP demonstrating attainment of the ozone standard in DFW be submitted by March 20, 1999. The state submitted a SIP for DFW that included photochemical modeling showing the level of reductions needed to attain the standard by 1999, a 9% ROP target calculation for the years 1997-99, VOC RACT rules in Chapter 115 applicable to sources meeting the 50 tpy major source level, NO<sub>x</sub> RACT rules in Chapter 117 applicable to major sources of NO<sub>x</sub>, and amendments to Chapter 116 reinstating nonattainment new source review for NO<sub>x</sub>. The governor submitted to this SIP to EPA on March 16, 1999. Because there was not enough time to implement the rules to achieve necessary reductions of ozone precursor emissions in the DFW area by the required attainment date of November 15, 1999, the state proposed to submit in March 2000 a full attainment demonstration including a complete rule package necessary to attain the 1-hour ozone standard.

The BPA area is classified as moderate, and therefore was required to attain the 1-hour ozone standard by November 15, 1996. The BPA area did not attain the standard by that date, and also will not attain the standard by November 15, 1999, the attainment date for serious areas. In determining the appropriate attainment date for an area, EPA may consider the effect of transport of ozone or its precursors from an upwind area which interferes with the downwind area’s ability to attain. On July

16, 1998, EPA issued a guidance memorandum titled “Extension of Attainment Dates for Downwind Transport Areas.” The guidance, referred to hereinafter as the “transport guidance,” provides a means for EPA to extend the attainment date for an area affected by transported air pollution, without reclassifying (“bumping up”) the area to a higher classification. The transport guidance is particularly relevant to BPA, which is downwind of the HGA area and is affected by transport from HGA. If EPA approved such a determination for BPA, the area would have until no later than November 15, 2007, the attainment date for HGA, to attain the 1-hour ozone standard. On April 16, 1999, EPA proposed in the *Federal Register* to allow BPA to take advantage of the transport guidance if an approvable attainment demonstration is submitted by November 15, 1999. An attainment demonstration SIP for BPA is currently being prepared concurrently with the present HGA SIP. The BPA SIP contains results of photochemical modeling demonstrating transport from HGA to BPA, as well as showing the level of reductions required when local BPA emissions predominate. In addition, the SIP revision proposes to adopt rules for IWW and batch process sources to ensure that VOC emission limits for these sources meet EPA’s guidelines for RACT. Furthermore, the state is proposing to adopt rules establishing NO<sub>x</sub> RACT emission limits for gas-fired, lean-burn stationary internal combustion engines. The SIP revision contains a ROP demonstration showing 24% reduction in NO<sub>x</sub> and VOC emissions, net of growth, from 1999 to the attainment year of 2007.

## B. OZONE CONTROL STRATEGY

### 1. POLICY AND PURPOSE (Revised.)

#### a. Primary Purpose of the Plan (Revised.)

The primary purpose of this plan is to fulfill §182(c)(2) of the FCAA Amendments of 1990 concerning Attainment and Reasonable Further Progress Demonstrations, and various EPA guidance.

b.-d. (No change.)

## 2. SUMMARY OF THE PRINCIPAL ELEMENTS ADDRESSED WITHIN THIS PLAN

(Revised.)

a.-c. (No change.)

d. Required Emission Reductions (Revised.)

This plan contains an estimate of the required levels of reductions of the ozone precursors VOC and NO<sub>x</sub> necessary to achieve attainment of the 1-hour ozone standard in the HGA nonattainment area by the year 2007. These estimates are based on EPA protocols for projecting the EI from the 1993 urban airshed modeling base case EI out to 2007. The CAMx model was the tool used to determine the required level of reductions. Details regarding this plan can be found in Chapter 3 and Appendix B of this SIP.

e. Sources of Emission Reductions (Revised.)

3.-8. (No change.)

9. SIP REVISIONS FOR THE ATTAINMENT DEMONSTRATION (Revised.)

- a. El Paso §818 Attainment Demonstration (No change.)
- b. Dallas/Fort Worth Attainment Demonstration (No change.)
- c. Houston/Galveston Attainment Demonstration (Revised.)

10.-11. (No change.)

12. SOCIAL AND ECONOMIC CONSIDERATIONS OF THE PLAN (Revised.)

- a.-g. i. (No change.)
- h. Evaluation of the Houston/Galveston Attainment Demonstration (Revised.)

13. FISCAL AND MANPOWER RESOURCES (No change.)

14. HEARING REQUIREMENTS

- a.-g., i. (No change.)
- h. Public Hearings for the Houston/Galveston Attainment Demonstration (Revised.)

The state plans to conduct public hearings for this SIP on August 2, 1999 at 7:00 p.m. at the City of Houston Pollution Control Building Auditorium, located at 7411 Park Place Boulevard, Houston. Staff

will conduct a question and answer period one-half hour prior to the start of the hearing. The close of the public comment period will be on August 9, 1999.

## CHAPTER 1: BACKGROUND

The HGA ozone nonattainment area is classified as Severe-17, and therefore it is required to attain the 1-hour ozone standard of 0.12 ppm by November 15, 2007. The HGA area has been working to develop a demonstration of attainment in accordance with the FCAA Amendments of 1990. On January 4, 1995, Houston submitted the first of its Post-1996 SIP revisions.

This SIP consisted of UAM modeling for 1988 and 1990 base case episodes, adopted rules to achieve a 9% ROP reduction in VOCs, and a commitment schedule for the remaining ROP and attainment demonstration elements. At the same time, but in a separate action, the State of Texas filed for the temporary NO<sub>x</sub> waiver allowed by §182(f) of the FCAA. This SIP and the NO<sub>x</sub> waiver were based on early base case episodes which exhibited model performance marginally in accordance with EPA modeling performance standards, but which had a limited data set as inputs to the model. In 1993 and 1994, the commission was engaged in an intensive data-gathering exercise known as the COAST study. The state believed that the enhanced EI, expanded ambient air quality and meteorological monitoring, and other elements would provide a more robust data set for modeling and other analysis, which would lead to modeling results that the commission could use to better understand the nature of the ozone air quality problem in the HGA area. This modeling has been ongoing since that time.

At the same time, EPA policy regarding SIP elements and time lines has undergone changes. Two national programs in particular have resulted in changing deadlines and requirements. The first of these programs has been the OTAG. This group grew out of a March 2, 1995 memo from Mary Nichols, former EPA Assistant Administrator for Air and Radiation, that allowed states to postpone completion of their attainment demonstrations until an assessment of the role of transported ozone and precursors

had been completed for the eastern half of the nation, including the eastern portion of Texas. Texas participated in this study, and it has been concluded that Texas does not significantly contribute to ozone exceedances in the Northeastern U.S. The other major national program has been the revision to the national ozone standard. EPA promulgated a final rule on July 18, 1997 changing the ozone standard to an 8-hour standard of 0.08 ppm. In November 1996, concurrent with the proposal of the standards, EPA proposed an IIP that it believed would help areas like HGA transition from the old to the new standard. In an attempt to avoid a significant delay in planning activities, Texas began to follow this guidance, and readjusted its modeling and SIP development time lines accordingly. When the new standard was published, EPA decided not to publish the IIP, and instead stated that, for areas currently exceeding the 1-hour ozone standard, that standard would continue to apply until it is attained. The FCAA requires that HGA attain the standard by November 15, 2007.

EPA issued revised draft guidance for areas such as like HGA that do not attain the 1-hour ozone standard. The commission adopted on May 6, 1998 and submitted to EPA on May 19, 1998 a revision to the HGA SIP which contained the following elements in response to EPA's guidance:

- ◆ UAM modeling based on emissions projected from a 1993 baseline out to the 2007 attainment date.
- ◆ An estimate of the level of VOC and NO<sub>x</sub> reductions necessary to achieve the 1-hour ozone standard by 2007.
- ◆ A list of control strategies that the state could implement to attain the 1-hour ozone standard

- ◆ A schedule for completing the other required elements of the attainment demonstration
  
- ◆ A revision to the Post-1996 9% ROP SIP that remedied a deficiency that EPA believed made the previous version of that SIP unapprovable.
  
- ◆ Evidence that all measures and regulations required by subpart 2 of Title I of the FCAA to control ozone and its precursors have been adopted and implemented, or are on an expeditious schedule to be adopted and implemented.

In November 1998, the SIP revision submitted to EPA in May 1998 became complete by operation of law. However, EPA stated that it could not approve the SIP until specific control strategies were modeled in the attainment demonstration. EPA specified a submittal date of November 15, 1999 for this modeling. In a letter to EPA dated January 5, 1999, the state committed to model two strategies showing attainment.

As the HGA modeling protocol evolved, the state eventually selected and modeled eight basic modeling scenarios. As part of this process, a group of HGA stakeholders worked closely with commission staff to identify local control strategies for the modeling. These local strategies are described in Chapter 3 under Scenarios III and VI. Some of the scenarios that the stakeholders requested evaluation of include options such as California type fuel and vehicle programs as well as inspection and maintenance programs such as I/M 240. It should be made clear that the TNRCC is not proposing that any of these strategies be included in the ultimate control strategy submitted to EPA in 2000. This is the next step in an iterative process of evaluating potential control strategies, an effort which will continue through the

summer of 2000. Any additional controls which may be needed outside the 8 county area will be evaluated on a county by county basis.

This SIP contains the following elements:

- ◆ Photochemical modeling of specific control strategies for attainment of the 1-hour ozone standard in the HGA area by the attainment date of November 15, 2007.
- ◆ An analysis of eight specific modeling scenarios reflecting various combinations of federal, state, and local controls in HGA.
- ◆ Identification of the level of reductions of volatile organic compounds (VOC) and nitrogen oxides (NO<sub>x</sub>) necessary to attain the 1-hour ozone standard by 2007.
- ◆ A 2007 mobile source budget for transportation conformity.
- ◆ Identification of specific source categories which, if controlled, could result in sufficient VOC and/or NO<sub>x</sub> reductions to attain the standard.
- ◆ A schedule committing to submit other required elements of the attainment demonstration by December 2000.

## CHAPTER 2: EMISSIONS INVENTORY

Commission staff and regional HGA stakeholders identified the need to examine accuracy of certain parts of the emissions inventory, as well as completeness of the list of control strategies used in the HGA modeling. In cooperation with the stakeholders and a contractor, commission staff developed a project plan to accomplish the following:

- ◆ Identify and examine the accuracy of some key assumptions used in the inventory development, including spatial and temporal allocations
- ◆ Identify and perform critical review of growth assumptions used to project the inventory to 2007
- ◆ Based partly upon activities in other states, identify and quantify possible additional NO<sub>x</sub> control strategies.

The final project plan is a two-part approach to examining candidates for inclusion in an inventory refinement analysis, as follows:

### Part 1: Near-term Project Plan

Part 1 of the plan includes work that could be completed and documented in a matter of weeks, in time for inclusion in the current SIP.

## Part 2: Longer-term Project Plan

Part 2 of the plan includes additional inventory and control strategy work which could not be completed in time for inclusion in the current SIP. Instead, this work is being included in the project plan to be completed and documented over the next four to eight months. This would enable some of the improvements and refinements to be included in this SIP prior to submittal to EPA in November 1999. For portions of the project with completion times past November 1999, the improvements and refinements could be included in the 2000 SIP submittal to EPA.

Documentation of Part 1 project objectives and results, and plans for Part 2 of the project, are presented in Appendix A and its attachments.

## Transportation Conformity Budgets

Scenario VI<sub>f</sub>, discussed in Chapter 3, is the most stringent control scenario modeled. Attainment was modeled for the September 11 episode day. Transportation conformity budgets for 2007, established for NO<sub>x</sub> and VOC, on the basis of 2007 onroad mobile source emission values modeled in Scenario VI<sub>f</sub>, are summarized in Table 2-1.

Table 2-1

2007 Transportation Conformity Budgets

<b>Pollutant</b>	<b>Emissions Budget, tpod</b>
NO <sub>x</sub>	80
VOC	30



### CHAPTER 3: PHOTOCHEMICAL MODELING

On May 19, 1998, the commission submitted a modeling demonstration to the EPA which estimated the levels of reduction required for the HGA nonattainment area to attain the 1-hour ozone NAAQS. This modeling was based on an ozone episode occurring in September of 1993 with emissions projected to 2007, the HGA area's attainment date for the 1-hour standard. The modeling, which relied heavily on the rich COAST collection of meteorological, aerometric, and emissions data, was conducted using the variable-grid version of the UAM (UAM-V). The major conclusions were as follows:

- In order for HGA to reach attainment, reductions of NO<sub>x</sub> emissions by 65 to 85 % will be necessary.
- Concurrent reductions of VOC will help to mitigate a potential rise in peak ozone as emissions of NO<sub>x</sub> are reduced ("NO<sub>x</sub> disbenefit") by up to 50%. This disbenefit disappears for NO<sub>x</sub> reductions above 50%.
- Reductions will be required in all categories of NO<sub>x</sub> emissions in order for HGA to reach attainment.

The modeling described in this SIP revision builds upon the previous modeling by evaluating several scenarios composed of specific control measures designed to bring the HGA area into attainment.

Additionally, several enhancements were made to the modeling process, including the following:

- Use of CAMx, a freely-available advanced photochemical model with capabilities similar to those of the UAM-V.
- New biogenic emissions based on a comprehensive survey of biomass in the HGA and BPA nonattainment areas.
- Revised and enhanced 2007 projected onroad mobile source emissions for the HGA nonattainment counties.
- New emissions growth projections for point and nonroad mobile sources based on, respectively, a TNRCC industry survey and the EPA's new Nonroad model.
- Emissions modeling using the SMOKE emissions modeling system.
- Future initial and boundary conditions derived from regional modeling conducted with CAMx (replacing similar initial and boundary conditions based upon UAM-V modeling).

Because some of these changes potentially could affect the model's ability to replicate observed ozone concentrations, the 1993 base case model performance was reevaluated after updating the emissions. A number of statistical and graphical analyses were performed to compare the model's predicted ozone concentrations with monitored data. The model's performance was similar to that seen in the previous round, and met EPA performance specifications for all four primary episode days. A set of diagnostic and sensitivity analyses were performed to ensure that the model responded as expected to perturbations in the input data, and these analyses showed that the model behaved as expected in all cases.

Overall, the enhancements resulted in relatively minor changes in the modeled predictions, but incorporation of these improvements lends additional credence to the analysis. This allows us to have additional confidence in the control strategy evaluations. Conversely, since only one episode was used in this analysis (other candidate episodes failed to meet EPA criteria for model performance), these results may not be universally applicable to all sets of conditions producing ozone exceedances in the region.

After establishing that the current model's performance was acceptable, emissions were projected from 1993 to 2007, and a number of controls were applied to form the future base. The modeled controls include previously adopted ROP reductions, NO<sub>x</sub> RACT, and several rules proposed or adopted at the national level, such as low-sulfur fuels and rules governing the manufacture of small engines. The future base was then modeled to establish a baseline against which control strategies could be evaluated.

Modeling was then conducted which confirmed the directional guidance established in the previous round of modeling; specifically, that a NO<sub>x</sub>-based reduction strategy is the best path to attainment. These model runs were also analyzed to determine approximately how much NO<sub>x</sub> reduction would be necessary to reach attainment, assuming that the reductions were applied uniformly across all sources in the nonattainment area. This analysis established across-the-board reduction targets which were similar to those determined in the previous modeling. However, ozone formation depends upon the release height, spatial location, and timing of releases of NO<sub>x</sub>, so across-the-board reduction modeling is not sufficient to evaluate specific controls. Additional model runs were then required to assess the effectiveness of specific reduction scenarios.

In all, seven modeling scenarios were investigated to test the efficacy of hypothetical control strategies in bringing the area to attainment. An eighth scenario was run for a second episode which primarily affected the adjacent BPA nonattainment area, but this run (Scenario V, plus several variations thereof) is not discussed in detail in this document.

A number of federal measures were common to all the reduction scenarios, and were included in the future base. The **Future Base** includes the following Federal Measures (common to all scenarios). All apply nationally except as noted:

*Onroad Mobile Sources:*

- Heavy-duty diesel standards
- Phase II RFG in the HGA eight-county nonattainment area
- FMVCP
- Texas motorists' choice I/M program in Harris County
- National low emission vehicles standards
- Federal low sulfur gasoline
- Tier II vehicle emission standards

*Nonroad Mobile Sources:*

- Heavy duty diesel standards
- Locomotive standards
- Compression ignition standards for vehicles and equipment
- Spark ignition standards for vehicles and equipment
- Commercial marine vessel standards
- Recreational marine standards

Additional measures were then applied to create the seven scenarios as follows:

### **Scenario I**

Adds the following State Measures to the **Future Base**:

*Stationary Sources*, eight-county nonattainment area:

Tier II point source controls (flue-gas cleanup)

### **Scenario II**

Adds the following State Measures to **Scenario I**:

*Stationary Sources*, Central and East Texas Counties (excluding HGA nonattainment counties):

50% reduction of all utilities (permitted and grandfathered)

30% reduction from remaining grandfathered sources

*Onroad Mobile Sources*, Central and East Texas counties (excluding HGA nonattainment counties):

cleaner burning gasoline

*Nonroad Mobile Sources*, Central and East Texas counties (excluding HGA nonattainment counties):

cleaner burning gasoline

### Scenario III

Adds the following State Measures to the **Future Base**:

*Stationary Sources*, eight-county nonattainment area:

Tier III point source controls (flue-gas cleanup plus burner modification)

Adds the following Local Measures to the **Future Base**:

*Onroad Mobile Sources*, eight-county nonattainment area:

California RFG fuel standards

California diesel fuel standards

Additional transportation control measures

*Nonroad Mobile Sources*, eight-county nonattainment area:

California RFG fuel standards

California diesel standards

California recreational vehicle standards

*Area Sources*

Low NO<sub>x</sub> standards for new water heaters and furnaces

## Scenario IV

Adds the following State Measures to **Scenario III**:

*Stationary Sources*, Central and East Texas counties (excluding HGA nonattainment counties):

50% reduction of all utilities (permitted and grandfathered)

30% reduction from remaining grandfathered sources

*Onroad Mobile Sources*, Central and East Texas counties (excluding HGA nonattainment counties):

cleaner burning gasoline

*Nonroad Mobile Sources*, Central and East Texas counties (excluding HGA nonattainment counties):

cleaner burning gasoline

## Scenario VI

Adds the following Local Measures to **Scenario IV**:

*Onroad Mobile Sources*, eight-county nonattainment area:

IM240 I/M program

## Scenario VII

Adds the following Local Measures to **Scenario IV**:

*Onroad Mobile Sources*, eight-county nonattainment area:

55 miles/hour maximum speed limit

### **Scenario VIII**

Adds the following Local Measures to **Scenario IV**:

*Onroad Mobile Sources*, eight-county nonattainment area:

IM240 Inspection and Maintenance program

55 mile/hour maximum speed limit

The future base alone represents a significant level of reduction over the 1993 base case, including all adopted rules such as 1999 ROP reductions and NO<sub>x</sub> RACT, as well a number of anticipated federal measures affecting on- and off-road mobile sources.

Scenario I significantly reduces point source NO<sub>x</sub> emissions from the future base by applying Tier 2 reductions (flue-gas cleanup, such as selective catalytic reduction) to major NO<sub>x</sub> sources in the eight-county area.

Scenario III reduces point source NO<sub>x</sub> emissions even further by adding Tier 1 reductions (burner modification) to the Tier 2 controls of Scenario I (together, Tier I and Tier 2 point source controls constitute Tier 3). Scenarios III also includes several measures proposed by local stakeholders, including cleaner fuels and congestion relief. Some other proposed reductions listed above, such as

California recreational vehicle standards and low-NO<sub>x</sub> water heaters, were considered but not found to offer significant reductions over existing standards or proposed federal standards.

Scenarios II and IV emissions are identical to Scenarios I and III, respectively, within the eight-county nonattainment area. The difference is that these scenarios apply the proposed Central and East Texas NO<sub>x</sub> reductions for utilities and grandfathered non-utility sources in the (excluding the H-G eight-county nonattainment area), as well as cleaner gasoline in Central and East Texas attainment counties (Most Texas nonattainment counties already have federal reformulated gasoline ).

Scenario V was developed for the Beaumont-Port Arthur nonattainment area modeling, and is not discussed here.

Scenario VI, VII, and VIII add on-road mobile source reductions to Scenario IV. Scenario VI adds an I/M 240 program in all eight H-G nonattainment area counties, Scenario VII assumes a 55 mile-per-hour maximum speed limit in the eight counties, and Scenario VIII assumes both.

Each of the seven scenarios modeled resulted in significant improvements in projected air quality compared to both the 1993 base case and the 2007 future base. Figure 3-1 compares area-wide, peak modeled, 1-hour ozone concentrations for both the 1993 and 2007 bases and the seven scenarios. Figures 3-2 and 3-3 show two more comprehensive metrics; area of exceedance, and area-hours of exceedance, respectively. Note that both the area and area-hours respond better to the control scenarios than does the peak ozone.

Since modeled peak ozone is substantially above the 125 parts/billion standard for even Scenario VIII, the most stringent control scenario, additional control scenarios were considered. Several variants of Scenario VI were considered, as described below. Similar modeling was conducted using Scenarios IV and VIII as bases, but these results are not reported here. Although Scenario VIII represents slightly more reduction than Scenario VI, Figures M-1, M-2, and M-3 all show that the incremental improvement in ozone is very marginal. Since the difference between Scenarios VI and VIII is highly controversial (55 mph speed limit), yet only minimally reduces modeled ozone pollution, the commission has decided to drop Scenario VIII from further consideration at this time.

Figure 3-4 shows the NO<sub>x</sub> emissions by category for September 8, a typical weekday. Point source emissions are seen to be very significantly reduced, onroad mobile emissions somewhat reduced, and the nonroad mobile source emissions almost constant across the scenarios, including the 1993 base case. Thus, the primary focus of the additional control scenarios was on mobile sources, both onroad and nonroad.

The additional control scenarios are defined as follows:

### **Scenario VIa**

Updates **Scenario VI** as follows:

*Regional reductions*, applied to pollutants transported into the modeling domain:

Account for widespread NO<sub>x</sub> reductions resulting from EPA's NO<sub>x</sub> SIP call.

*Onroad Mobile Sources*, entire modeling domain:

Update Tier II, low sulfur assumptions based on new information from EPA.

*Onroad Mobile Sources*, eight-county nonattainment area:

Increase I/M compliance rate due to registration denial

### **Scenario VIb**

Adds the following Federal Measures to **Scenario VIa**:

*Nonroad Mobile Sources*, eight-county nonattainment area:

Reduce NO<sub>x</sub> emissions from all categories by 50%

### **Scenario VIc**

Adds the following Federal Measures to **Scenario VIb**:

*Onroad Mobile Sources*, entire modeling domain:

Assume Tier II penetration at 2015 level (accelerated fleet turnover)

### **Scenario VI d**

Adds the following Federal Measures to **Scenario VIc**:

*Point Sources, Gulf of Mexico:*

Tier III point source controls

*Nonroad Mobile Sources, Gulf of Mexico:*

Reduce NO<sub>x</sub> emissions from all categories by 50%

Adds the following State Measure to **Scenario VIc**:

*Area Sources, Central and East Texas Counties (excluding HGA and BPA nonattainment counties):*

Stage I refueling

#### **Scenario VIe**

Adds the following State Measure to **Scenario VIc**:

*Stationary sources, Central and East Texas counties (excluding HGA nonattainment counties):*

90% reduction of all utilities (permitted and grandfathered)

30% reduction from remaining grandfathered sources

*Area Sources, Central and East Texas Counties (excluding HGA and BPA nonattainment counties):*

Stage I refueling

#### **Scenario VIg**

Adds the following State Measures to **Scenario VIc**:

*Nonroad Mobile Sources*, HGA nonattainment counties:

Shift construction activity from 7 a.m.-7 p.m. to noon-midnight

*Area Sources*, Central and East Texas Counties (excluding HGA and BPA nonattainment counties):

Stage I refueling

Note that Scenario VIa does not specifically apply additional control measures. Rather, it adjusts Scenario VI to account for new information on the Tier II/federal low sulfur proposal and to account for the NO<sub>x</sub> SIP call. Additionally, it adjusted the I/M compliance rate from 84% to 96%, since higher compliance is expected in the future due to the implementation of registration denial. In effect, these modifications could have been applied to the future base, but time constraints prevented re-running the future base and Scenarios I through VIII.

Scenario VIb applies a 50% across-the-board reduction to area and nonroad mobile source NO<sub>x</sub> emissions in Scenario VIa. Clearly, reductions in this category are important in demonstrating attainment, although it is unclear whether these emissions are accurately characterized in the base (hence future) modeling inventories. Some evidence indicates that the area and nonroad mobile source NO<sub>x</sub> emissions may be overstated in the modeling inventory, so this scenario may be thought of as an emissions sensitivity analysis. However, if the emissions are accurately characterized, then this scenario represents the application of unspecified controls to the sources in this category. In fact, proposed federal (and, for ships, international) regulations will eventually bring about very large reductions in this category, but this will not occur until many years beyond HGA's 2007 attainment date. A program designed to promote highly accelerated fleet turnover in heavy equipment might be employed to bring about some early reductions. The Commission staff, along with several interested

stakeholders, are currently studying the sources in this category, and hope to more accurately characterize the emissions in modeling for SIP submittal in 2000.

Scenario VIc adds the assumption of a 2015 implementation of federal Tier II and heavy-duty vehicle standards to Scenario VIb, but does not account for VMT growth between 2007 and 2015. Again, programs designed to accelerate fleet turnover might be employed to bring additional reductions by 2007.

Scenario VIId is designed to test the effectiveness of reductions in the Gulf of Mexico. It also adds the assumption of Stage I refueling in the Central and East Texas counties, a program which was inadvertently left out of earlier model runs. These reductions were applied to Scenario VIc.

Scenario VIe is designed to test the effectiveness of more stringent reductions applied to electric utility sources in Central and East Texas. It also includes Central and East Texas Stage I refueling. These reductions were applied to Scenario VIc.

Scenario VIIf tests the effectiveness of delaying the start of construction activity by five hours. It also includes Central and East Texas Stage I refueling. These reductions were applied to Scenario VIc.

Figures 3-5, 3-6, and 3-7 show peak ozone, area of exceedance, and area-hours for the additional control scenarios. These results indicate that a 50% reduction in area/nonroad NO<sub>x</sub> emissions, coupled with the assumption of a 2015 implementation of Tier II and federal heavy-duty standards (Scenario VIc), brings the area near to attainment of the 1-hour ozone standard, although attainment is not quite reached on any day. Regional reductions in the Gulf of Mexico (Scenario VIId) and in the Central and

East Texas area (Scenario VIId) are helpful, but neither significantly affect peak ozone. The construction activity time shift (Scenario VIIf) does significantly reduce peak ozone and the other metrics tabulated in Table 21 of Appendix B, and in fact brings one day (September 11) below the standard and another day (September 9) very close.

Prior to the next round of modeling for the HGA area, due by the end of 2000 along with adopted rules for the area, the Commission staff plan to engage in a number of activities designed to reduce the uncertainty in the modeling inventory. These activities include, but are not limited to, the following: investigating the magnitude and spatial/temporal distribution of nonroad mobile sources, improving growth modeling for point and nonroad sources, and applying Mobile6 to develop refined estimates of federal programs for onroad sources. The results of this work will enhance the control strategy evaluation process and help to develop cost-effective control strategies which will result in attainment of the ozone NAAQS.

## **Weight of Evidence Analyses**

EPA has allowed the use of corroborative information, known as “weight of evidence (WOE),” to support the demonstration of attainment. This determination involves the use of supplementary analyses to determine whether attainment of the standard is likely, even though there may be minor exceptions to the required statistical tests. Appendix B, Section 7.0 discusses observation-based determinations and meteorological analysis that support the demonstration of attainment of the one-hour ozone standard in HGA. As shown in Table 3-1, attainment is modeled in Scenario VI. Applying the WOE analyses provides corroborative evidence that the HGA area achieves attainment.

<b>Table 3-1. Results of Additional Control Scenario Modeling</b>												
<b>Scenario</b>	<b>Peak daily O<sub>3</sub> (ppb)</b>				<b>Exceedance area (km<sup>2</sup>)</b>				<b>Exceedance-hours (km<sup>2</sup>-hrs)</b>			
	<b>9/8</b>	<b>9/9</b>	<b>9/10</b>	<b>9/11</b>	<b>9/8</b>	<b>9/9</b>	<b>9/10</b>	<b>9/11</b>	<b>9/8</b>	<b>9/9</b>	<b>9/10</b>	<b>9/11</b>
1993 base	182	180	178	186	9,856	7,696	11,488	7,456	43,584	31,328	51,360	28,144
2007 fut. base	171	166	165	171	7,280	4,352	8,880	5,424	26,128	16,464	28,096	19,376
VI	168	156	159	155	3,728	1,968	3,072	3,312	10,000	6,224	7,600	8,944
VIa	165	154	157	153	3,504	1,824	2,752	3,120	8,608	5,456	6,576	8,032
VIb	155	143	148	141	2,096	1,120	1,328	1,952	4,080	2,800	2,912	3,728
VIc	143	131	132	127	1,008	496	352	256	1,760	864	496	256
VI d	143	131	132	126	912	496	304	208	1,648	864	432	208
VIe	143	130	132	126	976	448	352	160	1,696	672	464	160
VI f	138	127	130	123	800	192	192	0	1,200	224	272	0

A complete description of the modeling conducted for this SIP is found in Appendices A through L.

The TNRCC contact for modeling data inquiries related to the HGA SIP is Mr. Chris Kite, who can be reached by phone at (512) 239-1959, or by e-mail at [CKITE@tnrcc.state.tx.us](mailto:CKITE@tnrcc.state.tx.us).

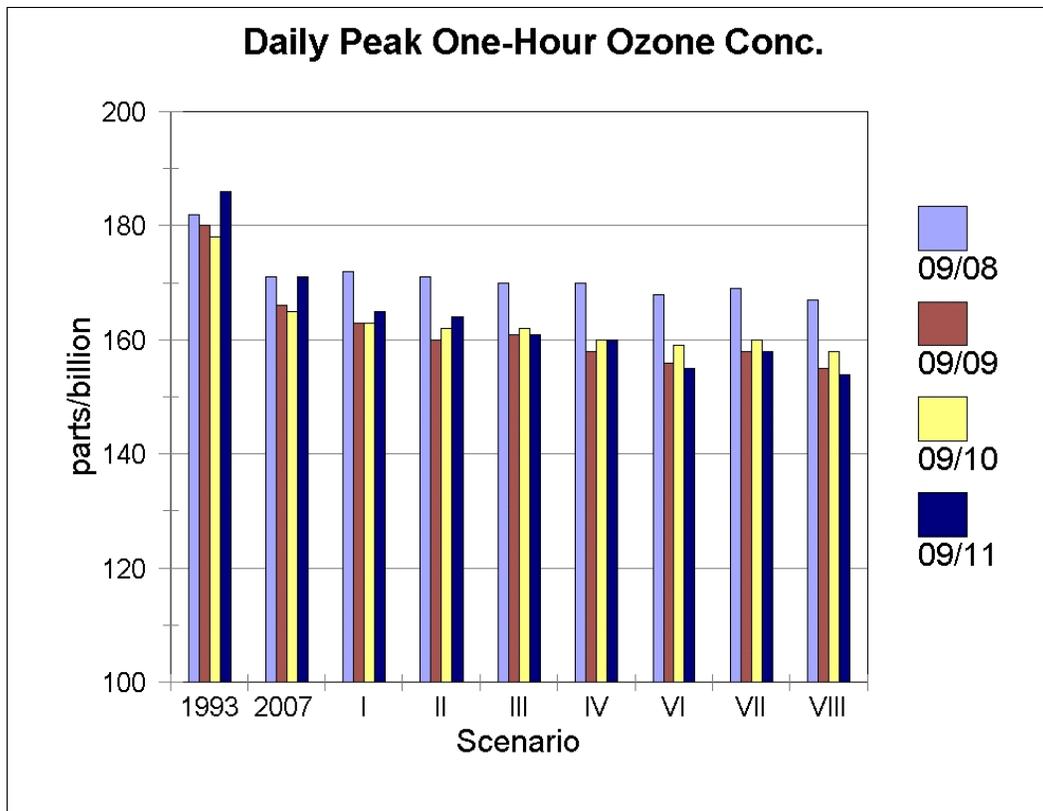


Figure 3-1: Daily peak ozone for original control scenarios

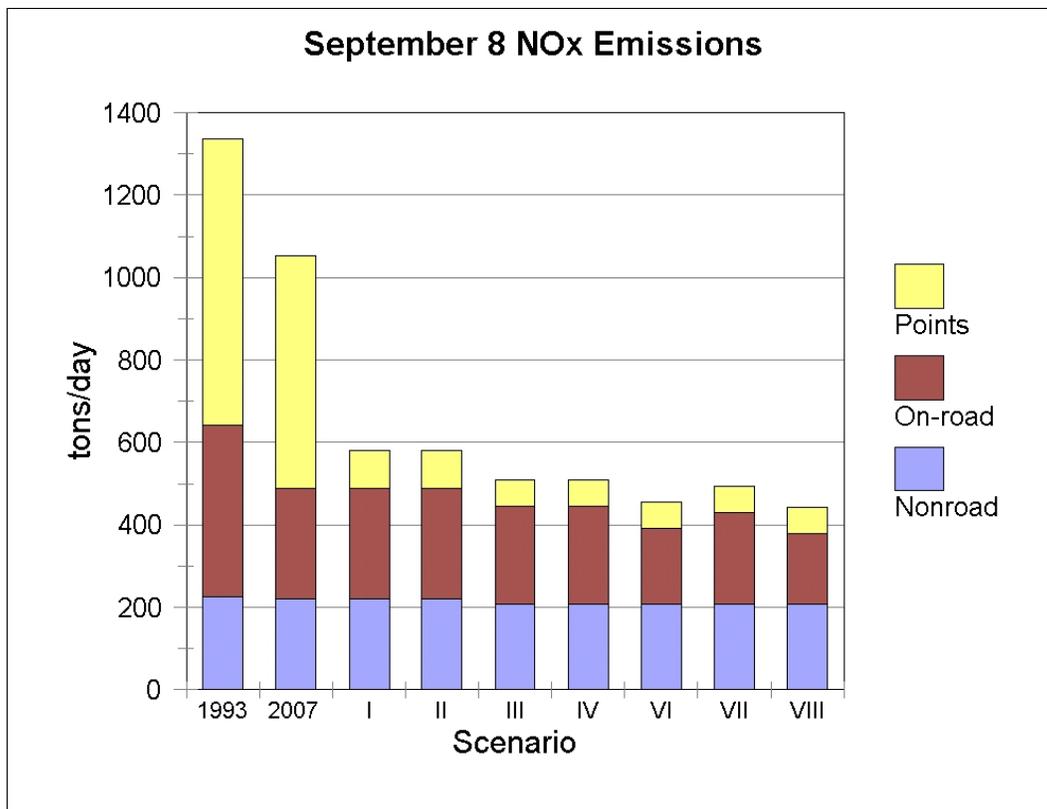


Figure 3-4: September 8 NO<sub>x</sub> emissions for original control scenarios

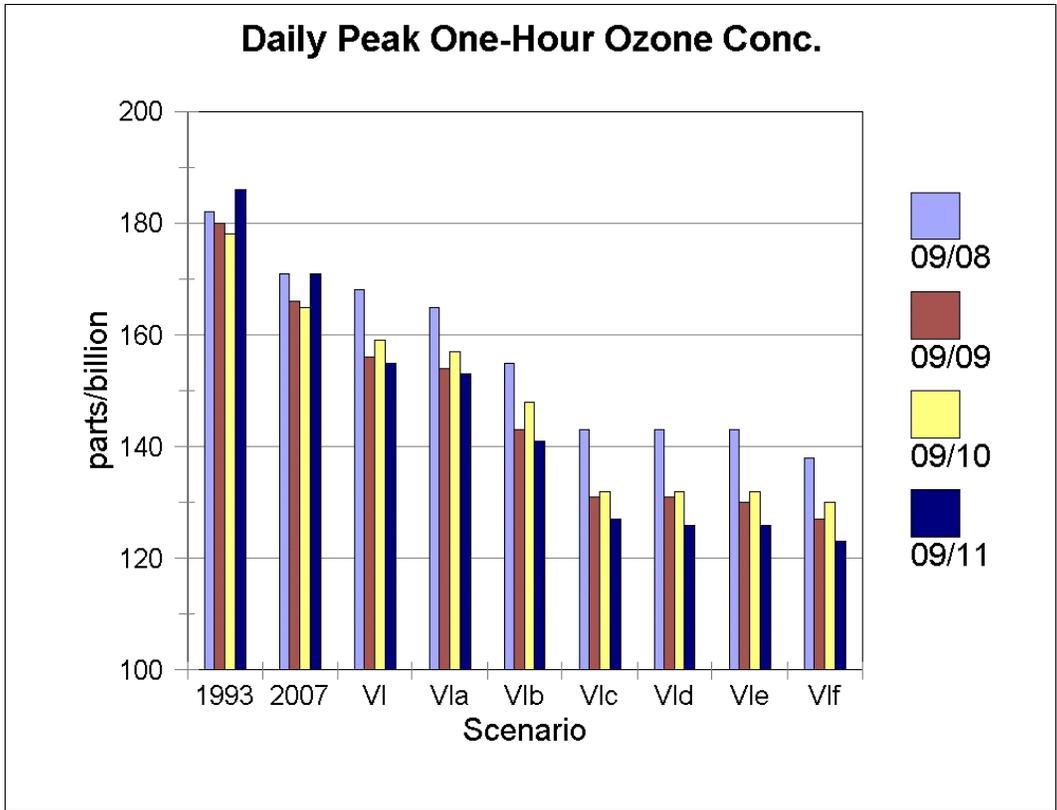


Figure 3-5: Daily peak ozone for additional control scenarios

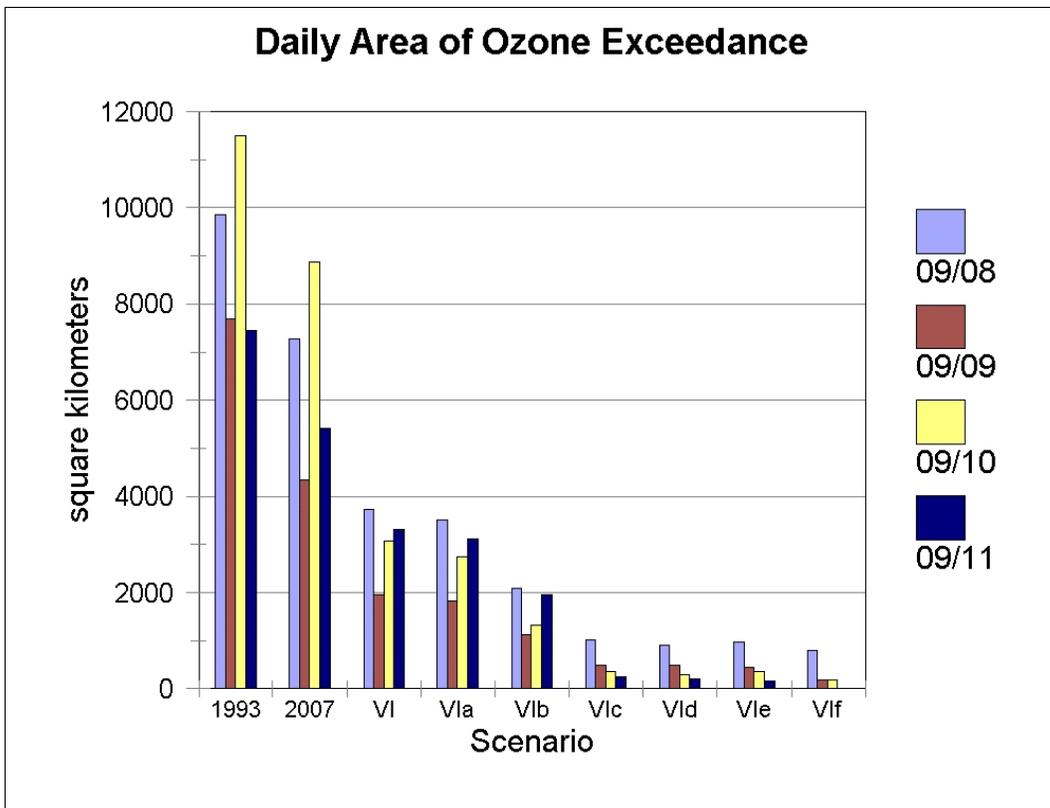


Figure 3-6: Ozone exceedance area for additional control scenarios

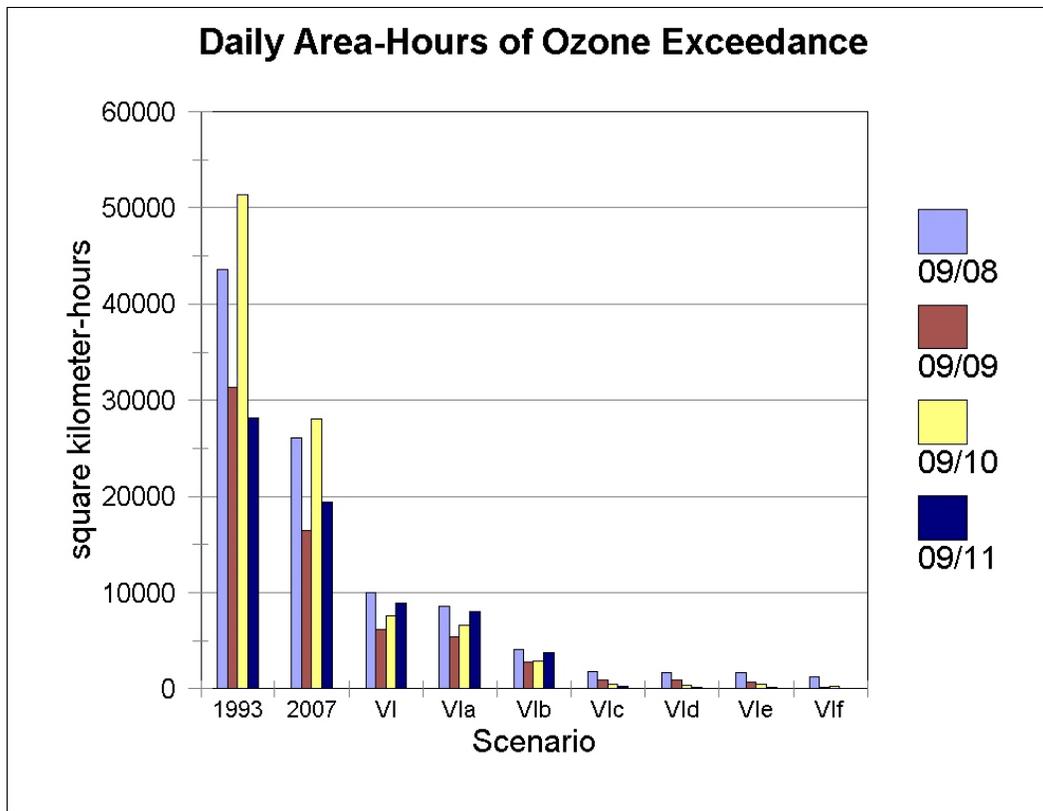


Figure 3-7: Area-hours of ozone exceedance for additional control scenarios

## **CHAPTER 4: DATA ANALYSIS**

(No updates.)

## CHAPTER 5: RATE OF PROGRESS

(No updates.)

## CHAPTER 6: REQUIRED CONTROL STRATEGY ELEMENTS

This SIP evaluates, through photochemical modeling, the effects of various control strategies on predicted ozone levels. These control strategies have been identified and selected for modeling through an intensive process of stakeholder input, staff research, and consultation with the commission's modeling contractor. Inclusion of a control strategy in the modeling does not necessarily imply a commitment on the part of the state or local stakeholders to actually implement the strategy. However, the modeling results will form the basis for the state's next step in the attainment demonstration, that of developing and adopting rules by late December 2000 to achieve reductions necessary for attainment.

The modeling conducted to date does not show attainment on every day of the modeled episode. Only Scenario VI<sub>f</sub>, applied on September 11, 1993, results in attainment with a modeled ozone value of 123 ppb. The three preceding episode days gave modeled results ranging from 127 ppb to 138 ppb. The following conclusions may be made concerning the modeling:

- ◆ The most stringent scenario modeled, Scenario 6<sub>f</sub>, results in reductions of 803 tpod of NO<sub>x</sub> and 73 tpod of VOC from the 2007 future base. In spite of these large reductions across all sectors of the inventory, there is still a NO<sub>x</sub> shortfall and additional reductions may be needed to reach the estimated target emissions level of 230 tpod NO<sub>x</sub> needed for attainment.
- ◆ Control strategies resulting in sizable NO<sub>x</sub> reductions were modeled for point sources (up to 90% reduction) and onroad mobile sources (up to 56% reduction).

- ◆ For area and nonroad mobile sources, which make up 21% of the total anthropogenic NO<sub>x</sub> inventory, conventional control strategies were more difficult to identify. For this reason, a 50% across-the-board reduction in this category was modeled to test model sensitivity. The results showed modeled attainment on September 11, 1993.
  
- ◆ Until more stringent control strategies can be implemented for nonroad mobile sources, it appears that attainment of the one-hour ozone standard in HGA area will be very difficult. This is highlighted by the total 2007 area/nonroad mobile source NO<sub>x</sub> inventory of 222 tpod, compared to the estimated emissions target level of 230 tpod needed for attainment.

In light of the conclusions stated above, the commission has begun an intensive data-gathering and research process, involving regional stakeholders, to refine emissions inventory figures and develop more stringent control strategies for nonroad mobile sources. As discussed in Chapter 2, the commission EI staff and stakeholders have focused on the largest two categories of nonroad mobile sources: construction equipment and commercial marine vessels. Although a substantial amount of work for these source categories was accomplished in the short time available, additional work remains to be done. Commission staff, regional stakeholders, and the modeling contractor intend to continue their efforts through the summer and fall of 1999, and incorporate additional information into the SIP before its adoption in October 1999. There is a significant amount of work that needs to take place prior to December 2000. Control strategies will be evolving throughout the course of next year and strategies may be heavily modified or even dropped as the modeling and other analyses are refined.

## CHAPTER 7: FUTURE ATTAINMENT PLANS

The work described in this SIP concerning modeling, emissions inventory, and control strategy development will continue through the summer and fall of 1999, concluding with the anticipated adoption of the SIP in late October 1999. Commission staff will continue to work closely with the coalition of HGA regional stakeholders and with EPA to identify further sources of reductions to support the attainment demonstration.

The state commits to submit, by the end of December 2000, additional modeling and adopted rules showing attainment of the 1-hour zone standard in HGA by November 15, 2007. In order to accomplish this goal, the following tasks will be performed:

- ◆ Maintain frequent contact with HGA stakeholders to develop and refine control strategies
- ◆ Hold meetings with affected stakeholders in the point, area, onroad mobile and nonroad mobile source categories to gather input and plan future rule requirements.
- ◆ Continue modeling by the commission's contractor to test and further refine control strategies
- ◆ Draft rule requirements, conduct public hearing, and respond to comments
- ◆ Keep EPA informed of the state's progress in developing rules in support of the attainment demonstration

Major milestones associated with these tasks are summarized in Table 7-1. Some dates are approximate at this point, and will be updated when more current information becomes available.

**Table 7-1**

**Schedule for Submitting HGA SIP and Adopted Rules**

**(DRAFT)**

<b>Action</b>	<b>Completion Date</b>
Additional modeling performed by contractor	March 1, 2000
Final testing of control strategy performed by contractor	April 1, 2000
Rule proposal developed	June 1, 2000
SIP and rules proposal filed with Chief Clerk	June 30, 2000
Proposal presented at commission agenda	July 19, 2000
Hearing notice published in newspapers	July 28, 2000
Proposal published in Texas Register	August 4, 2000
Public hearing	August 28, 2000
Close of 30-day comment period	September 4, 2000
Analysis of testimony	October 31, 2000
SIP and rules filed with Chief Clerk	November 22, 2000
Adoption by commission	December 6, 2000
Rule effective date	December 27, 2000
SIP and Phase II rules submitted to EPA	December 29, 2000