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

POST-1999 RATE-OF-PROGRESS AND ATTAINMENT DEMONSTRATION SIP FOR THE HOUSTON/GALVESTON OZONE NONATTAINMENT AREA

INSPECTION/MAINTENANCE SIP FOR THE HOUSTON/GALVESTON OZONE NONATTAINMENT AREA

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION
P.O. BOX 13087
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AUGUST 9, 2000

RULE LOG NO. 2000-011-SIP-AI

SECTION V: LEGAL AUTHORITY

A. General

The commission has the legal authority to implement, maintain and enforce the national ambient air quality standards.

The first air pollution control act, known as the Clean Air Act of Texas, was passed by the Texas Legislature in 1965. In 1967, the Clean Air Act of Texas was superceded by a more comprehensive statute, the Texas Clean Air Act (TCAA), found in Article 4477-5, Vernon's Texas Civil Statutes). The Legislature amended the TCAA in 1969, 1971, 1973, 1979, 1985, 1987, 1989, 1991, 1993, 1995, 1997 and 1999. In 1989, the TCAA was codified as Chapter 382 of the Texas Health & Safety Code.

Originally, the TCAA stated that the Texas Air Control Board (TACB) is the state air pollution control agency and is principal authority in the state on matters relating to the quality of air resources. In 1991, the Legislature abolished the TACB effective September 1, 1993 and its powers, duties, responsibilities and functions were transferred to the TNRCC. With the creation of the TNRCC, the authority over air quality is found in both parts of the Texas Water Code and the TCAA. Specifically, the authority of the TNRCC is found in Chapters 5 and 7. Chapter 5, Subchapters A - F, and H - J and L, include the general provisions, organization and general powers and duties of the TNRCC, and the responsibilities and authority of the Executive Director. This Chapter also authorizes the TNRCC to implement action when emergency conditions arise, and to conduct hearings. Chapter 7 gives the TNRCC enforcement authority.

The TCAA specifically authorizes the TNRCC to establish the level of quality to be maintained in the state's air and to control the quality of the state's air by preparing an developing a general, comprehensive plan. The TCAA, Subchapters A - D, also authorize the TNRCC to collect information to enable the commission to develop an inventory of emissions; conduct research and investigations; enter property and examine records; to prescribe monitoring requirements; to institute enforcement proceedings; to enter into contracts and execute instruments; to formulate rules; to issue orders taking t\into consideration factors bearing upon health, welfare, social and economic factors, and practicability and reasonableness; to conduct hearings; to establish air quality control regions; to encourage cooperation with citizens' groups and other agencies and political subdivisions of the state as well as with industries and the Federal Government; to establish and operate a system of permits for construction or modification of facilities.

Local government authority is found in Subchapter E of the TCAA. Local governments have the same power as the TNRCC to enter property and make inspections. They also may make recommendations to the Commission concerning any action of the TNRCC that affects their territorial jurisdiction, may bring enforcement actions, and may execute cooperative agreements with the TNRCC or other local governments. In addition, a city or town may enact and enforce ordinances for the control and abatement of air pollution not inconsistent with the provisions of the TCAA, the rules or orders of the Commission.

B. Applicable Law

The following statutes and rules provide necessary authority to carry out the SIP. A copy of the statutes is submitted with the plan. The rules listed below have previously been submitted as part of the SIP.

Statutes

TEXAS HEALTH & SAFETY CODE, Chapter 382	September 1, 1999
TEXAS WATER CODE	September 1, 1999

Chapter 5:
Subchapter A: General Provisions
Subchapter B: Organization of the Texas Natural Resource Conservation Commission
Subchapter C: Texas Natural Resource Conservation Commission
Subchapter D: General Powers and Duties of the Commission
Subchapter E: Administrative Provisions for Commission
Subchapter F: Executive Director
Subchapter H: Delegation of Hearings
Subchapter I: Judicial Review
Subchapter J: Consolidated Permit Processing
Subchapter L: Emergency and Temporary Orders

Chapter 7, Enforcement §§7.002, 7.004, 7.005, 7.032, 7.073, 7.177, 7.179, 7.180 and 7.181.

Rules
All of the following rules are found in Title 30, Texas Administrative Code, as of the following effective dates:

Chapter 35, Subchapters A-C, K: Emergency and Temporary Orders and Permits; Temporary Suspension or Amendment of Permit Conditions	December 10, 1998
Chapter 39, Public Notice, §§ 39.201; 39.401; 39.403(a) and (b)(8)-(10); 39.405(f)(1) and (g);39.409; 39.411 (a), (b)(1)-(6) and (8)-(10) and (c)(1)-(6) and (d); 39.413(9), (11), (12) and (14); 39.418(a) and (b)(3) and (4); 39.419(a), (b),(d) and (e); 39.420(a), (b) and (c)(3) and (4); 39.423 (a) and (b); 39.601; 39.602; 39.603; 39.604; and 39.605	September 23, 1999
Chapter 55, Request for Contested Case Hearings; Public Comment, §§ 55.1; 55.21(a) - (d), (e)(2), (3) and (12), (f) and (g); 55.101(a), (b), (c)(6) - (8); 55.103; 55.150; 55.152(a)(1), (2) and (6) and (b); 55.154; 55.156; 55.200; 55.201(a) - (h); 55.203; 55.205; 55.206; 55.209 and 55.211	October 20, 1999
Chapter 101: General Air Quality Rules	July 23, 2000
Chapter 111: Control of Air Pollution from Visible Emissions and Particulate Matter (formerly known as Regulation I)	September 16, 1996
Chapter 112: Control of Air Pollution from Sulfur Compounds (formerly knows as Regulation II)	March 5, 1972
Chapter 113, §113.120, Subchapter A: Control of Air Pollution from Toxic Materials	July 9, 2000
Chapter 114: Control of Air Pollution from Motor Vehicles (formerly known as Regulation IV)	April 21, 2000
Chapter 115: Control of Air Pollution from Volatile Organic Compounds	

(formerly known as Regulation V) December 2, 1999

Chapter 116 (except Subchapters H & I): Permits for New Construction or Modification
(formerly known as Regulation VI) January 11, 2000

Chapter 117: Control of Air Pollution from Nitrogen Compounds
(formerly known as Regulation VII) November 21, 1999

Chapter 118: Control of Air Pollution Episodes (formerly known as Regulation VIII) March 5, 1972

Chapter 122, § 122.122: Potential to Emit September 20, 1993

SECTION VI. CONTROL STRATEGY

A. Introduction (Revised)

B. Ozone (Revised)

1. *Dallas/Fort Worth* (No change since April 2000 revision)
   - Chapter 1: General
   - Chapter 2: Emissions Inventory
   - Chapter 3: Photochemical Modeling
   - Chapter 4: Data Analysis
   - Chapter 5: Rate-of-Progress
   - Chapter 6: Required Control Strategy Elements
   - Chapter 7: Future Attainment Plans
2. *Houston/Galveston* **(Revised)**
   - Chapter 1: General **(Revised)**
   - Chapter 2: Emissions Inventory **(Revised)**
   - Chapter 3: Photochemical Modeling **(Revised)**
   - Chapter 4: Data Analysis (No change)
   - Chapter 5: Rate-of-Progress **(Revised)**
   - Chapter 6: Required Control Strategy Elements **(Revised)**
   - Chapter 7: Future Attainment Plans **(Revised)**
3. *Beaumont/Port Arthur* (No change since April 2000 revision)
   - Chapter 1: General
   - Chapter 2: Emissions Inventory
   - Chapter 3: Photochemical Modeling
   - Chapter 4: Data Analysis
   - Chapter 5: Rate-of-Progress
   - Chapter 6: Required Control Strategy Elements
   - Chapter 7: Future Attainment Plans
4. *El Paso* (No change since July 1996 revision)
5. *Regional Strategies* (No change since April 2000 revision)
   - Chapter 1: General
   - Chapter 2: Control Strategy Elements
   - Chapter 3: Photochemical Modeling

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

I. Site Specific (No change.)

J. Mobile Sources Strategies

1. *Inspection/Maintenance* **(Revised)**
   - Chapter 1: General **(Revised)**
   - Chapter 2: Applicability **(Revised)**
   - Chapter 3: I/M Performance Standards **(Revised)**
   - Chapter 4: Network Type and Program Evaluation **(Revised)**
   - Chapter 5: Adequate Tools and Resources
   - Chapter 6: Test Frequency and Convenience
   - Chapter 7: Vehicle Coverage **(Revised)**
   - Chapter 8: Test Procedures and Standards and Test Equipment **(Revised)**
   - Chapter 9: Quality Control
   - Chapter 10: Waivers and Time Extensions
   - Chapter 11: Motorist Compliance Enforcement **(Revised)**
   - Chapter 12: Motorist Compliance Enforcement Program Oversight
   - Chapter 13: Quality Assurance
   - Chapter 14: Enforcement Against Contractors, Stations, and Inspectors
   - Chapter 15: Data Collection
   - Chapter 16: Data Analysis and Reporting
   - Chapter 17: Inspector Training and Licensing or Certification
   - Chapter 18: Public Information and Consumer Protection
   - Chapter 19: Improving Repair Effectiveness
   - Chapter 20: Compliance with Recall Notices
   - Chapter 21: On-Road Testing **(Revised)**
   - Chapter 22: State Implementation Plan Submission **(Revised)**
   - Chapter 23: Attachment A - Modeling and Technical Supplement **(Revised)**
2. *Transportation Control Measures* (No change since May 2000 revision)
3. *Vehicle Miles Traveled* (No change since May 2000 revision)
4. *Clean Gasoline* (No change from June 1999 revision)

LIST OF ACRONYMS

ACT - Alternative Control Techniques
AFV - Alternative Fuel Vehicle
AIRS - Aerometric Information Retrieval System
APA - Administrative Procedure Act
ARACT - Alternate Reasonably Available Control Technology
ARPDB - Acid Rain Program Data Base
ASC - Area Source Categories
ASE - Alliance to Save Energy
ASM - Acceleration Simulation Mode
ATA - Airline Transport Association
ATC - Air Traffic Control
BACT - Best Available Control Technology
BEIS - Biogenic Emissions Inventory System
BEIS-2 - Biogenic Emissions Inventory System, version2
BELD - Biogenic Emissions Land Cover Database
BIF - boilers and industrial furnaces
BIOME - Biogenic Model for Emissions
BPA - Beaumont/Port Arthur
Cal LEV - California Low Emission Vehicle
CAM - Compliance Assurance Monitoring
CAMS - Continuous Air Monitoring Station
CAMx - Comprehensive Air Model with Extensions
CARB - California Air Resources Board
CARE - Clean Air Responsibility Enterprise
CB-IV HC - Carbon Bond IV Hydrocarbon
CFR - Code of Federal Regulations
CEMS - Continuous Emissions Monitoring System
CMAQ - Congestion Mitigation and Air Quality
CMSA - Consolidated Metropolitan Statistical Area
CNG - Compressed Natural Gas
CO - Carbon Monoxide
COAST - Coastal Oxidant Assessment for Southeast Texas
CTG - Control Technique Guidelines
DART - Dallas Area Rapid Transit
DERC - Discrete Emission Reduction Credit
DFW - Dallas/Fort Worth
DFWN - Dallas/Fort Worth North
DFWRTM - Dallas/Fort Worth Regional Travel Model
DOW - Day of Week
DPS - Department of Public Safety
DRI - Desert Research Institute
DV - Design Value
EDFW - Extended Dallas/Fort Worth
EGAS - Economic Growth Analysis System
EGF - Electric Generating Facilities
EGR - Exhaust Gas Recirculation

EI - Emissions Inventory
EIQ - Emissions Inventory Questionnaire
ELP - El Paso
EPA - U.S. Environmental Protection Agency
EPN - Emission Point Number
ERC - Emission Reduction Credit
ERG - Eastern Research Group
ETR - Employer Trip Reduction
FAA - Federal Aviation Administration
FACA - Federal Advisory Committee Act
FCAA - Federal Clean Air Act
FMVCP - Federal Motor Vehicle Control Program
FR - Federal Register
FTE - Full Time Equivalent Employee
FTP - File Transfer Protocol
g/hp-hr - Grams Per Horsepower-Hour
GIS - Geographic Information System
GloBEIS - Global Biogenic Emissions Inventory System
g/mi - Grams Per Mile
GSE - Ground Support Equipment
GVWR - Gross Vehicle Weight Rating
HAP - Hazardous Air Pollutant
HAXL - Houston Air Excellence in Leadership
HB - House Bill
HC - Hydrocarbon
HDD - Heavy-duty Diesel
HDDV - Heavy-duty Diesel Vehicle
HDEWG - Heavy Duty Engine Working Group
HDV - Heavy-duty Vehicle
HGA - Houston/Galveston
H-GAC - Houston-Galveston Area Council
HON - Hazardous Organic NESHAPS
HOV - High Occupancy Vehicle
hp - Horsepower
HPMS - Highway Performance Monitoring System
HRM - Houston Regional Monitoring
ICI - Industrial, Commercial, and Institutional
IIG - Interim Implementation Guidance
IIP - Interim Implementation Plan
I/M - Inspection and Maintenance
INIT - Initial Condition Tracer
ITWS - Integrated Terminal Weather System
IWW - Industrial Wastewater
KG/HA - Kilograms/hectare
KM - Kilometer
LDT - Light-duty Truck
LED - Low Emission Diesel
LEV - Low Emission Vehicle
LNG - Liquefied Natural Gas

LSG - Low Sulfur Gasoline
m - Meter
MACT - Maximum Achievable Control Technology
MDERC - Mobile Discrete Emission Reduction Credit
MERC - Mobile Emission Reduction Credit
METT - Mass Emissions Transient Testing
MMBtu - Million British Thermal Unit
MPA - Metropolitan Planning Area
MY - Model Year
NAAQS - National Ambient Air Quality Standard
NCDC - National Climatic Data Center
NCTCOG - North Central Texas Council of Governments
NEGU - Non-electric Generating Units
NESHAPS - National Emission Standards for Hazardous Air Pollutants
NEVES - Nonroad Engine and Vehicle Emission Study
NHSDA - National Highway System Designation Act
NLEV - National Low Emission Vehicle
NNSR - Nonattainment New Source Review
NO_x - Nitrogen Oxides or Oxides of Nitrogen
NO_y - Nitrogen Species
NSR - New Source Review
NWS - National Weather Service
O_3 - Ozone
OAQPS - Office of Air Quality Planning and Standards
OBD - On-Board Diagnostics
OSAT - Ozone Apportionment Technology
OTAG - Ozone Transport Assessment Group
OTAQ - Office of Transportation and Air Quality
PAMs - Photochemical Assessment Monitoring Sites
PCV - Positive Crankcase Ventilation
PEI - Periodic Emissions Inventory
PM_{10} - Particulate Matter less than 10 microns
ppb - Parts Per Billion
ppm - Parts Per Million
ppmv - Parts Per Million by Volume
PSDB - Point Source Database
PSIA - Pounds per Square Inch Absolute
PSR -
QA/QC - Quality Assurance/Quality Control
RACT - Reasonably Available Control Technology
RAQPC - Regional Air Quality Planning Committee
RAZ - Regional Analysis Zone
RCTSS - Regional Computerized Traffic Signal System
RFG - Reformulated Gasoline
REMI - Regional Economic Modeling, Inc.
RFO - Request for Offer
ROP - Rate-of-Progress
RPM - Revolutions Per Minute

RSD - Remote Sensing Device
RVP - Reid Vapor Pressure
SAE - Society of Automotive Engineers
SAIMM - Systems Applications International Meteorological Model
SB - Senate Bill
SCAQMD - South Coast Air Quality Management District [Los Angeles area]
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
SITWC - Spark Ignition Three-Way Catalyst
SO_2 - Sulfur Dioxide
SO_x - Sulfur Compounds
SOCMI - Synthetic Organic Chemical Manufacturing Industry
SOS - Southern Oxidants Study
SULEV - Super-Ultra-Low Emission Vehicle
TAC - Texas Administrative Code
TACB - Texas Air Control Board
TAFF - Texas Alternative Fuel Fleet
TCAA - Texas Clean Air Act
TCF - Texas Clean Fleet
TCM - Transportation Control Measure
TIP - Transportation Implementation Plan
TMC - Texas Motorist's Choice
TMO - Transportation Management Organization
TNMOC - Total nonmethane organic compounds
TNRCC - Texas Natural Resource Conservation Commission (commission)
TPOD - Tons Per Ozone Day
TPY - Tons Per Year
TSP - Total Suspended Particulate
TTI - Texas Transportation Institute
TxDOT - Texas Department of Transportation
UAM - Urban Airshed Model
USDA - United States Department of Agriculture
USGS - United States Geological Survey
UTM - Universal Transverse Mercator
VAVR - Voluntary Accelerated Vehicle Retirement
VERP - Voluntary Emission Reduction Permit
VID - Vehicle Identification Database
VIN - Vehicle Identification Number
VIR - Vehicle Inspection Report
VMAS - Vehicle Mass Analysis System
VMEP - Voluntary Mobile Source Emissions Reduction Program
VMT - Vehicle Miles Traveled
VNR or VNRAT- VOC-NO_x ratios
VOC - Volatile Organic Compound
VRF - Vehicle Repair Form
WOE - Weight of Evidence

ZEV - Zero Emission Vehicle

VI: Ozone Control Strategy

A. INTRODUCTION

This introduction is intended to provide the reader with a broad overview 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 the SIP specified in 40 CFR 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_2 and NO_x, 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 an 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 VOCs 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 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. In 1982 the state submitted a revision to the Texas SIP 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 were 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_x 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 would result in an additional 3.0% reduction of either NO_x or VOC, of which up to 2.7% may be reductions in NO_x. Underlying this substitution provision is the recognition that NO_x 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_x 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_x 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 would 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 required 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 intended to achieve a 3% per year reduction of VOC and/or NO_x until the year 2007, and additional reductions as needed to demonstrate modeled attainment. The plan was also required to carry an additional 3% of contingency measures to be implemented if the nonattainment area fails to meet a deadline. To use NO_x reductions for all or part of the Post-96 controls or the contingency measures required a demonstration using UAM showing that NO_x controls would be beneficial in reducing ozone.

On November 9, 1994, the state submitted a SIP revision designed to meet the 3% per year ROP requirements for the years 1997-1999. This Post-96 ROP SIP revision detailed how the BPA and HGA

nonattainment areas intended 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_x, 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_x reductions might increase ozone concentrations, on April 12, 1995 the state received a temporary §182(f) exemption from all NO_x requirements, including RACT, I/M, NO_x NSR, and transportation conformity requirements. Permanent §182(f) exemptions from all NO_x 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_x, 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% per year from the 1990 baseline EI for the years 1997, 1998, and 1999.
- UAM modeling 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 database, 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, EPA proposed a limited approval/limited disapproval for the Texas 15% ROP SIP revision. 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 it believed that the plan failed 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% of reductions if needed because a milestone is missed) along the same lines as the 15% action. 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. EPA further stated that it was not making a determination at this time about whether the state had met its requirements regarding RACT, or any other underlying FCAA Amendments of 1990 requirements. Finally, 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 it 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, onroad 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 6 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_2 SIP regarding emissions in Harris County. The SIP revision was required by EPA because of exceedances of the SO_2 NAAQS in 1986, 1988, and 1990. An EPA study conducted by Scientific Applications International Corporation also predicted SO_2 exceedances. On April 22, 1991, the EPA declared that portions of Harris County were potentially in nonattainment of the SO_2 NAAQS. Consequently, the HRM Corporation volunteered to find reductions in SO_2 in order to prevent being redesignated to nonattainment. HRM's efforts resulted in finding voluntary SO_2 reductions. These reductions were adopted in 13 commission Agreed Orders and were included as part of the June 29, 1994 SIP revision. The EPA approved the Harris County SO_2 SIP on March 6, 1995 (60 FR 12125).

On May 14, 1997, the commission adopted an additional revision to the Harris County SO_2 SIP to incorporate modifications to two of the 13 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 commission 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 intends 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 reapply for an extension of the NO_x §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_x control programs. Among them is a requirement for all major NO_x sources within the area to implement RACT. The state has adopted a revised compliance date of November 15, 1999 for this program.

The commission, in a committal SIP revision adopted on June 3, 1998, and submitted to EPA on June 23, 1998, agreed to implement OBD checks as part of the I/M program by the federal deadline of January 1, 2001.

On July 29, 1998, the commission adopted regulations and a revision of the TCF SIP to set forth the LEV requirements for mass transit fleets in each of the serious and above nonattainment areas, and for local government and private fleets operated primarily within the serious and above nonattainment areas. These rules satisfy the state requirements to adopt rules to implement SB 681.

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_x RACT rules in Chapter 117 applicable to major sources of NO_x, and amendments to Chapter 116 reinstating nonattainment new source review for NO_x. The governor submitted 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.

On February 24, 1999 the commission adopted a SIP revision for the DFW area which was submitted to EPA on March 16, 1999. This SIP was not only intended to demonstrate how the DFW area would attain the standard through the submission of an updated emissions inventory and photochemical modeling, but to also include a 9% ROP target calculation in order to satisfy EPA's requirement of reasonable further progress in emission reductions for the DFW area for the years 1997-99. The reductions toward ROP were short of the 9% target and the SIP lacked required modeled control strategies; therefore, a follow-up

SIP was developed. More information about the follow-up submittal is addressed later in this introduction.

On May 12, 1999 the commission adopted a revision to the SIP for the Northeast Texas region which would make certain local ozone precursor emission reductions federally enforceable. This revision was submitted to EPA on June 4, 1999. Four affected companies (Norit Americas, Inc.; La Gloria Oil and Gas Company; Eastman Chemical Company, Texas Eastman Division; and ARCO Permian) in the Northeast Texas region voluntarily agreed to be subject to the implementation of enforceable emission reduction measures pursuant to Part A, Sections 2-5 of the Northeast Texas Flexible Attainment Region (FAR) Memorandum of Agreement. The FAR approach allows time for the area's control program to work, similar to contingency measures in a post-1990 maintenance agreement, prior to EPA issuing a call for a SIP revision or nonattainment redesignation. The MOA required the immediate implementation of control measures through the use of Agreed Orders, which are included in the SIP revision to make them federally enforceable.

On June 30, 1999 the commission adopted a revision to the SIP in order to incorporate cleaner gasoline rules. The cleaner gasoline is required to have a lower RVP outside the DFW and HGA areas, and a limit on the amount of sulfur in each gallon of gasoline. The RVP required in this SIP revision is 7.8 psi starting May 1, 2000. The RVP limit would be in effect every summer from May 1st through October 1st. A 7.8 psi RVP fuel is expected to reduce evaporative emissions from automobiles, off-highway gasoline powered equipment, and all gasoline storage and transfer operations. Evaporative VOC emissions from automobiles will be reduced by at least 14%. The sulfur cap requirement is 150 ppm per gallon of gasoline, starting January 1, 2004. Low sulfur gasoline is expected to reduce NO_x emissions from today's cars by 8.5% according to the EPA complex model. The rules would further provide for counties or large cities to opt into these regulations earlier than required provided that certain conditions are met. If EPA were to adopt sulfur regulations to require compliance by January 1, 2004, the commission's rules would no longer apply, allowing the federal sulfur rules to take precedence. However, areas that choose to opt-in early would continue to follow the sulfur requirements of their early compliance plan until EPA actually implemented its regulations, unless otherwise specified in the commission order.

On July 28, 1999 the commission adopted a site-specific revision to the SIP which provides for the redesignation to attainment of that portion of Collin County currently designated as nonattainment for the lead NAAQS. The revision also provides a maintenance plan for the area to ensure continued compliance. As part of the maintenance plan, the revision establishes a new contingency plan through an agreed order and replaces Agreed Board Orders 92-09(k) and 93-12 and Board Order 93-10. The revision also provides for a commitment by the commission to keep the existing monitoring network in place until the end of the maintenance period.

On October 15, 1999 the commission adopted a revision to the SIP for the DFW ozone nonattainment area. This SIP was developed in order to address the shortfall in the reductions towards the 9% ROP target and the lack of modeled control strategies from the February 24, 1999 revision. Potential emission reduction credits were reviewed that were not claimed in the February 1999 SIP in order to make up the ROP shortfall. The focus was on VOC reductions because fewer VOC reductions would be needed to make up the shortfall compared to NO_x emission reductions. The ROP lacked about 20% of the VOC reductions needed, which amounted to 5.87 tpd. Making complete the 9% ROP portion of the SIP should allow certain transportation projects to avoid being put on hold. Elements have been identified that were not previously considered that would bring SIP emission reduction credits in order to complete the 9%

ROP requirements for the years 1996-99. These technical corrections were included in the October 1999 revised SIP.

In November 1998, the HGA 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. As the HGA modeling protocol evolved, the state eventually selected and modeled seven 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. This modeling showed a gap in reductions necessary for attainment of the 1-hour ozone standard. The commission adopted these revisions to the SIP on October 27, 1999.

In January 1997 the commission proposed a program that, for the first time in Texas' air pollution control history, extended beyond the confines of the urbanized areas. The concept of the regional strategy was developed as a result of several major occurrences. These events include the COAST Study, participation in the OTAG process, deployment of intensive aircraft monitoring by Baylor University, and the development of regional photochemical modeling. While Texas was not involved in the OTAG SIP call requiring mandatory statewide NO_x reductions, the commission realized the importance of the role of transported ozone and/or its precursors and the need for a statewide comprehensive plan in order to assist the areas that are struggling to attain the ozone standard. The impact on several states from the smoke and haze episodes from fires in Central America during the summer of 1998 helped reinforce the fact that air pollution is capable of traveling hundreds of miles.

The purpose of the regional strategy was to reduce ozone causing compounds in the eastern half of the state in order to help reduce background levels of ozone in both nonattainment areas as well as those areas close to noncompliance for the new 8-hour ozone standard. Components of the regional strategy included support for the NLEV program, cleaner burning gasoline and stage I vapor recovery, voluntary involvement in the permitting of grandfathered facilities, and reductions from major stationary sources.

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. There is also mounting technical data which suggests that the DFW area is impacted by transport and high regional background levels of ozone. A modeling demonstration has been developed and shows that the air quality in the DFW area is influenced at times from the HGA area. This demonstration, if approved by the EPA, would allow EPA to determine that the area should not be bumped up from serious to severe under the conditions of the July 16, 1998 transport guidance. If approved by the EPA the new attainment date for the DFW area would be no later than November 15, 2007, the attainment date for HGA.

As a result of the transport demonstrations for BPA and DFW, the development of SIPs in Texas will be, for the first time ever, on a coordinated timeline. This coordinated planning effort will include three of the state's four 1-hour ozone nonattainment areas as well as future 8-hour ozone areas. While there is uncertainty with the 8-hour ozone standard due to a pending court case, EPA's original plan calls for designations of 8-hour areas in 2000, SIP submittals by 2003, and attainment of the 8-hour standard by 2007. This statewide comprehensive planning with 2007 as a target date will allow Texas to utilize its

resources in the most efficient manner to develop control strategies to reduce air pollution not only in the urbanized areas but regionally as well.

The challenges associated with reducing pollution levels to comply with the federal standards are very great, especially in the state's two largest urban areas - DFW and HGA. Commission staff worked very closely with local entities to develop recommendations that will get the respective areas into attainment. Future attainment relies on not only the development of local and state control measures, but on future federal rules involving new technologies as well. These especially involve cleaner fuels and cleaner engines for both on-road as well as off-road mobile sources. Unfortunately, many of these federal measures will not be available until the 2004 timeframe and then time will be required to provide for turnover before they will become effective at reducing pollution levels. This would make it very difficult for any large urban nonattainment area to comply before the 2007 timeframe. As a result of federal measures, state regulations, and local initiatives it is estimated that emissions in the eastern and central part of the state that contribute to the production of ground level ozone will be reduced by approximately 100 tpd by 2001; approximately 1200 tpd by 2003; approximately 1400 tpd by 2005; and approximately 1500 tpd by 2007. Texas is committed to implementing these strategies as quickly as practicable.

In the April 2000 SIP revision for HGA the state made the following enforceable commitments : 1) to quantify the shortfall of NO_x reductions needed for attainment; 2) to list and quantify potential control measures to meet the shortfall of NO_x reductions needed for attainment; 3) to adopt the majority of the necessary rules for the HGA attainment demonstration by December 31, 2000, and to adopt the rest of the rules as expeditiously as practical, but no later than July 31, 2001; 4) to submit a Post-99 ROP analysis by December 31, 2000; 5) to perform a mid-course review by May 1, 2004; and 6) to perform new mobile source modeling, using MOBILE6, within 24 months of the model's release. In addition, if a transportation conformity analysis is to be performed between 12 months and 24 months after the MOBILE 6 release, transportation conformity will not be determined until Texas submits an MVEB which is developed using MOBILE 6 and which the EPA finds adequate. Finally, if any of the measures adopted in the SIP pertain to motor vehicles, the commission commits to recalculate and resubmit a MVEB by December 31, 2000.

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 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. The SIP revision, adopted by the commission on October 27, 1999 and submitted to EPA by November 15, 1999, contained results of photochemical modeling demonstrating transport from HGA to BPA, and, following EPA's transport guidance, demonstrating that BPA attains the 1-hour ozone standard. In addition, the November 1999 SIP revision contained adopted rules for IWW and batch process sources to ensure that VOC emission limits for these sources meet EPA's guidelines for RACT. Furthermore, the SIP revision included adopted rules establishing NO_x RACT emission limits for gas-fired, lean-burn stationary internal combustion engines. These NO_x rules represented "Phase I" of a two-part revision to the BPA attainment demonstration SIP.

The April 2000 SIP revision represented "Phase II" of the BPA attainment demonstration SIP, and contained adopted rules specifying NO_x emission limits for electric utility boilers, industrial boilers, and industrial process heaters. In accordance with EPA guidance, implementation of these NO_x emission

limits represented a reasonable level of control, necessary for an approvable attainment demonstration. Modeling of these Phase II reductions showed that the BPA area attains the 1-hour ozone standard, using WOE analyses.

The DFW area's attainment deadline as a serious ozone nonattainment area was November 15, 1999. In March 1999 the state submitted an attainment demonstration to EPA, however this SIP submittal did not contain the necessary rules to bring the DFW area into attainment by the November 1999 deadline. As a result, EPA issued a letter of findings that the March 1999 submittal was incomplete. This findings triggered an 18-month sanctions clock effective May 13, 1999.

The state now has mounting technical data which suggests that DFW is significantly impacted by transport and regional background levels of ozone. The reductions from the strategies needed for the HGA area and the regional rules discussed are a necessary and integral component in the strategy for DFW's attainment of the 1-hour ozone standard. The April 2000 SIP contained a modeling demonstration which showed that the air quality in the DFW area is influenced at times from the HGA area. This demonstration, if approved by EPA, would allow EPA to determine that the DFW area should not be bumped up to a more severe classification. It would also allow DFW to have until no later than November 15, 2007, the attainment date for HGA, to reach attainment.

In order to develop local control strategy options to augment federal and state programs, the DFW area established a North Texas Clean Air Steering Committee made up of local elected officials and business leaders. Specific control strategies were identified for review by technical subcommittee members. In addition, the NCTCOG hired an environmental consultant to assist with the analysis and evaluation of control strategy options. The consultant was responsible for presenting the findings of the technical subcommittees to the NCTCOG air quality policy and steering committees for final approval prior to being submitted to the state. A WOE argument was developed for DFW which consisted of several elements which, taken together, formed a compelling argument that attainment will be achieved by 2007.

On April 19, 2000 the state adopted a revision to the Northeast Texas FAR SIP. The Flexible Attainment Region Agreement requires that contingency measures be implemented as a result of exceedances of the National Ambient Air Quality Standard for ozone. As outlined in the FAR Action Plan under Part B, Contingent Measures, in the event of a subsequent violation the SIP must be revised to include quantifiable and enforceable control measures. Through the use of Agreed Orders these measures were adopted and included in the Northeast Texas FAR SIP to make them federally enforceable.

On May 3, 2000 the state adopted a revision to the TCM and VMT portions of the SIP. This revision required TCM project-specific descriptions and estimated emissions reductions to be included in the SIP and allowed nonattainment area metropolitan planning organizations to substitute TCMs without a SIP revision if the substitution results in equal or greater emission reductions.

Background on the Current Proposed Revision

The development of the current attainment demonstration SIP for the HGA area has proved to be an extremely challenging effort, due to the magnitude of reductions needed for attainment and the shortage of readily available control options. The emission reduction requirements included as part of this SIP revision represent substantial, intensive efforts on the part of stakeholder coalitions in the HGA area, in partnership with the commission. These coalitions, involving local governmental entities, elected officials, environmental groups, industry, consultants, and the public, as well as the commission and

EPA, have worked diligently to identify and quantify control strategy measures for the HGA attainment demonstration.

In order for the state to have an approvable attainment demonstration, the EPA has indicated that the state must adopt those strategies modeled in the November 1999 SIP submittal, and then adopt sufficient measures to close the remaining gap in NO_x emissions. The modeling included in this proposal indicates an emissions gap such that an additional 78 tpd of NO_x reductions is necessary for an approvable attainment demonstration. The HGA nonattainment area will need to ultimately reduce NO_x by more than 750 tons per day to reach attainment with the 1-hour ozone standard. In addition, a VOC reduction of about 25% will also have to be achieved.

The current SIP revision contains rules and photochemical modeling analyses in support of the HGA ozone attainment demonstration. In addition, this SIP contains post-1999 ROP plans for the milestone years 2002 and 2005, and for the attainment year 2007. The SIP also contains commitments to implement further measures, if needed, in support of the HGA attainment demonstration, as well as a commitment to perform and submit a mid-course review. The current attainment demonstration SIP, containing adopted rules and other control measures necessary for attainment, will be submitted to EPA by December 31, 2000. Implementation of the rules and other control measures contained in this SIP revision will close the gap and achieve attainment of the 1-hour ozone standard in the HGA area by November 15, 2007, the date required for attainment.

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CHAPTER 1: GENERAL

1.1 BACKGROUND

The HGA ozone nonattainment area is classified as Severe-17 under the FCAA Amendments of 1990 (42 United States Code (USC) §§7401 et set.), and therefore is required to attain the 1-hour ozone standard of 0.12 ppm by November 15, 2007. The HGA area, defined by Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, has been working to develop a demonstration of attainment in accordance with 42 USC §7410. On January 4, 1995, the state submitted the first of its Post-1996 SIP revisions for HGA.

The January 1995 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_x waiver allowed by §182(f) of the FCAA. The January 1995 SIP and the NO_x waiver were based on early base case episodes which marginally exhibited model performance 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.

Around the same time as the 1995 submittal, EPA policy regarding SIP elements and time lines went through changes. Two national programs in particular resulted in changing deadlines and requirements. The first of these programs was 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 initiative impacting the SIP planning process has been the revisions 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 the area attained. The FCAA requires that HGA attain the standard by November 15, 2007.

EPA issued revised draft guidance for areas such as 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_x 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; and
- 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 seven 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 for which the stakeholders requested evaluation included options such as California type fuel and vehicle programs as well as an ASM-equivalent I/M program. Other scenarios incorporated the estimated reductions in emissions that were expected to be achieved throughout the modeling domain as a result of the implementation of several voluntary and mandatory statewide programs adopted or planned independently of the SIP. It should be made clear that the commission did not propose that any of these strategies be included in the ultimate control strategy submitted to EPA in 2000. The need for and effectiveness of any controls which may be implemented outside the 8-county area will be evaluated on a county by county basis.

The SIP revision was adopted by the commission on October 27, 1999 and submitted to EPA by November 15, 1999, and contained the following elements:

- Photochemical modeling of potential 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 seven specific modeling scenarios reflecting various combinations of federal, state, and local controls in HGA. Additional scenarios H1 and H2 build upon Scenario VIf;
- Identification of the level of reductions of VOC and NO_x 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_x reductions to attain the standard;
- A schedule committing to submit by April 2000 an enforceable commitment to conduct a mid-course review; and

- A schedule committing to submit modeling and adopted rules in support of the attainment demonstration by December 2000.

As the result of an agreed settlement between several environmental groups and EPA, in November 1999 EPA informed the state that an additional SIP revision was required in order to quantify additional potential reductions to fill the shortfall or "gap" needed for attainment. This "gap closure" SIP, submitted by the commission in April 2000, contained the following enforceable commitments by the state:

- To quantify the shortfall of NO_x reductions needed for attainment;
- To list and quantify potential control measures to meet the shortfall of NO_x reductions needed for attainment;
- To adopt the majority of the necessary rules for the HGA attainment demonstration by December 31, 2000, and to adopt the rest of the shortfall rules as expeditiously as practical, but no later than July 31, 2001;
- To submit a Post-99 ROP plan by December 31, 2000;
- To perform a mid-course review by May 1, 2004; and
- To perform modeling of mobile source emissions using MOBILE6, to revise the on-road mobile source budget as needed, and to submit the revised budget within 24 months of the model's release. In addition, if a conformity analysis is to be performed between 12 months and 24 months after the MOBILE6 release, the state will revise the MVEB so that the conformity analysis and the SIP MVEB are calculated on the same basis.

The development of the current attainment demonstration SIP for the HGA area has proved to be an extremely challenging effort, due to the large magnitude of reductions needed for attainment and the shortage of readily available control options. The emission reduction requirements included as part of this SIP revision represent substantial, intensive efforts on the part of stakeholder coalitions in the HGA area, in partnership with the commission. These coalitions, involving local governmental entities, elected officials, environmental groups, industry, consultants, and the public, as well as the commission and EPA, have worked diligently to identify and quantify control strategy measures for the HGA attainment demonstration.

In order for the state to have an approvable attainment demonstration, the EPA has indicated that the state must adopt those strategies modeled in the November 1999 SIP submittal, and then adopt sufficient measures to close the remaining gap in NO_x emissions. EPA has not provided guidance to implement Section 185 of the FCAA Amendments of 1990. The commission believes that further coordination with EPA is necessary to assure an acceptable implementation method. The modeling included in this proposal indicates an emissions gap such that an additional 78 tpd of NO_x reductions is necessary for an approvable attainment demonstration. The HGA nonattainment area will need to ultimately reduce NO_x by more than 750 tons per day to reach attainment with the 1-hour ozone standard. In addition, a VOC reduction of about 25% will also have to be achieved.

The current SIP revision contains rules and photochemical modeling analyses in support of the HGA ozone attainment demonstration. In addition, this SIP contains post-1999 ROP plans for the milestone years 2002 and 2005, and for the attainment year 2007. The SIP also contains commitments to implement further measures, if needed, in support of the HGA attainment demonstration, as well as a commitment to perform and submit a mid-course review. The current attainment demonstration SIP, containing adopted rules and other control measures necessary for attainment, will be submitted to EPA by December 31, 2000. Implementation of the rules and other control measures contained in this SIP revision will close the gap and achieve attainment of the 1-hour ozone standard in the HGA area by November 15, 2007, the date required for attainment.

1.2 PUBLIC HEARING INFORMATION

The commission will hold public hearings at the following times and locations:

CITY	DATE	TIME	LOCATION
Conroe	September 18, 2000	10:00 a.m.	Lone Star Convention Center 9055 Airport Road (FM 1484)
Lake Jackson	September 18, 2000	7:00 p.m.	Lake Jackson Civic Center 333 Highway 332 East
Houston	September 19, 2000	10:00 a.m.	George Brown Convention Center 1001 Avenida De Las Americas
Houston	September 19, 2000	7:00 p.m.	George Brown Convention Center 1001 Avenida De Las Americas
Katy	September 20, 2000	9:00 a.m.	VFW Hall 6202 George Bush Drive
Pasadena	September 20, 2000	6:00 p.m.	East Harris County Community Center 7340 Spencer
Beaumont	September 21, 2000	10:00 a.m.	Southeast Texas Regional Airport Media Room 6000 Airline Drive
Amarillo	September 21, 2000	2:00 p.m.	City Commission Chambers City Hall 509 E. 7th Street
Texas City	September 21, 2000	6:00 p.m.	Charles T. Doyle Convention Center 21st Street at Phoenix Lane
Dayton	September 22, 2000	10:00 a.m.	Dayton High School 2nd Floor Lecture Room 3200 N. Cleveland
El Paso	September 22, 2000	11:00 a.m.	El Paso City Council Chambers 2 Civic Center Plaza, 2nd Floor

Arlington	September 22, 2000	2:00 p.m.	North Central Texas Council of Governments 2nd Floor Board Room 616 Six Flags Drive, Suite 200
Austin	September 25, 2000	10:00 a.m.	TNRCC 12100 N. I-35, Building E, Room 201S
Corpus Christi	September 25, 2000	2:00 p.m.	Port of Corpus Christi Main Building 1st Floor Conference Room 222 Power Street

The hearings are structured for the receipt of oral or written comments by interested persons. Individuals may present oral statements when called upon in order of registration. Open discussion will not be permitted during the hearings; however, agency staff members will be available to discuss the proposal one hour prior to each hearing and will answer questions before and after the hearings. A four-minute time limit will be established at each hearing to ensure that every interested person has a chance to speak. We would appreciate your cooperation in adjusting your comments accordingly.

Written comments will also be accepted via mail, fax, or e-mail. All comments should be submitted to Heather Evans, Office of Environmental Policy, Analysis, and Assessment, P.O. Box 13087, MC 205, Austin, Texas 78711-3087 or fax number (512) 239-4808. Electronic comments should be sent to siprules@tnrcc.state.tx.us. The public comment period will close on September 25, 2000.

1.3 SOCIAL AND ECONOMIC CONSIDERATIONS

For a detailed explanation of the social and economic issues involved with any proposed strategies, please refer to the preambles that precede each rule package accompanying this SIP.

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.

CHAPTER 2: EMISSIONS INVENTORY

2.1 OVERVIEW

The 1990 Amendments to the FCAA require that EIs be prepared for ozone nonattainment areas. Because ozone is photochemically produced in the atmosphere when VOCs are mixed with NO_x and CO[1] in the presence of sunlight, it is important that the agency compile information on the important sources of these precursor pollutants. It is the role of the EI 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 budgets. The total inventory of emissions of VOC, NO_x, and CO for an area is summarized from the estimates developed for five general categories of emissions sources, which are each explained below.

While the November 1999 SIP for HGA was being developed, the commission, HGA stakeholders, and consultants recognized the need to improve and refine certain portions of the EI for the attainment demonstration SIP. In the November 1999 SIP, the commission committed to the following:

- Identification and examination of the accuracy of some key assumptions used in the inventory development, including spatial and temporal allocations
- Identification and critical review of growth assumptions used to project the inventory to 2007

As a result, work was completed on a number of intensive EI projects, which are summarized briefly in this section and discussed in more detail in the appendices. Specifically, new EIs for airport GSE, HDD construction equipment, and commercial marine vessels were prepared by HGA stakeholders and submitted to the commission staff, which performed additional photochemical modeling with the revised data. The modeling results were then used to redefine the gap list for the HGA attainment demonstration. Chapter 3, Photochemical Modeling, contains a detailed description of the modeling work performed, using the revised EI data.

2.2 POINT SOURCES

Major point sources are defined for inventory reporting purposes in nonattainment areas as industrial, commercial, or institutional 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 include CO, SO_x, PM_{10}, or lead. For the attainment areas of the state, any company which emits a minimum of 100 tpy of any criteria pollutant must complete an inventory. Additionally, any source which generates or has the potential to generate at least 10 tpy of any single HAP or 25 tpy of aggregate HAP is also required to report emissions to the commission.

To collect emissions and industrial process operating data for these plants, the commission mails EIQs to all sources identified as having triggered the level of emissions. Companies are asked to report not only emissions data for all emissions generating units and emission points, but also the type and, for a representative sample of sources, the amount of materials used in the processes which result in emissions.

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[1]CO plays a relatively minor role in ozone formation compared with VOC and NO_x.

Information is also requested in the EIQ on process equipment descriptions, operation schedules, emissions control devices currently in use, abatement device control efficiency, and stack parameters such as location, height, and exhaust gas flow rate. All data submitted via the EIQ is then subjected to rigorous quality assurance procedures by the technical staff of the Industrial Emissions Assessment Section and entered into the PSDB by the Data Services Section.

2.3 AREA SOURCES

To capture information about sources of emissions that fall below the point source reporting levels and are too numerous or too small to identify individually, calculations have been performed to estimate emissions from these sources on a source category or group basis. 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 or 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 ASCs, while other activity data include amount of gasoline sold in an area, employment by industry type, and acres of cropland.

2.4 ON-ROAD MOBILE SOURCES

On-road mobile sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on public roadways in the nonattainment area. Combustion related-emissions are estimated for vehicle engine exhaust; evaporative hydrocarbon emissions are estimated for the fuel tank and other evaporative leak sources on the vehicle. Emission factors have been developed using the EPA's mobile emissions factor model, MOBILE5a_h. Various inputs are provided to the model to simulate the vehicle fleet driving in each particular nonattainment area. Inputs include such parameters as vehicle speeds by roadway type, vehicle registration by vehicle type and age, percentage of vehicles in cold start mode, percentage of miles traveled by vehicle type, type of I/M program in place, and gasoline vapor pressure. All of these inputs have an impact on the emission factor calculated by the MOBILE model, and every effort is made to input parameters reflecting local conditions. To complete the emissions estimate the emission factors calculated by the MOBILE model must then be multiplied by the level of vehicle activity, VMT. The level of vehicle travel activity is developed from travel demand models run by the Texas Department of Transportation or the local council of governments. The travel demand models have been validated against a large number of ground counts of traffic passing over counters placed in various locations throughout each county. Estimates of VMT are often calibrated to outputs from the federal Highway Performance Monitoring System, which is a model built from a smaller number of traffic counters. Finally, roadway speeds, which are required for the MOBILE model's input, are calculated by a post-processor to the travel demand model.

2.5 NON-ROAD MOBILE SOURCES

Non-road mobile sources are a subset of the area source category. This subcategory includes aircraft operations, marine vessels, recreational boats, railroad locomotives, and a very broad category of off-highway equipment that includes everything from 600-horsepower engines mounted on construction equipment to 1-horsepower string trimmers. Calculation methods for emissions from non-road 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 non-road category except aircraft, locomotives, commercial marine vessels, diesel construction equipment, and airport support equipment were originally developed by a contractor to EPA's Office of Transportation Air Quality as a 1990 emissions inventory. Emissions were then projected to later years based on EPA's Economic Growth Analysis System (EGAS) model. Aircraft emissions were estimated from landings and takeoff data for airports used in conjunction with a suitable aircraft emissions model (FAAED or EDMS). Locomotive emissions were developed from fuel use and track mileage data obtained from individual railroads.

Emissions from airport GSE, HDD construction equipment, and commercial marine vessels were estimated with new methods involving the use of local survey data. These methods included use of the EPA's new NONROAD model for calculating emissions from construction equipment and airport GSE. The methodologies for preparing these inventories for airport GSE, HDD construction equipment, and commercial marine vessels are addressed in Appendices A, B, and C, respectively.

2.6 BIOGENIC SOURCES

Biogenic sources are another subset of area source which includes 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 (PCBEIS-2). Emissions from biogenic sources are subtracted from the inventory prior to determining any required reductions for a rate of progress plan. However, the biogenic emissions are important in determining the overall emissions profile of an area and therefore are required for regional air quality dispersion modeling.

2.7 EMISSIONS SUMMARY

The September 8, 1993 base case emissions inventory summary for the HGA ozone nonattainment area is shown in Figures 2.7-1 (VOC) and 2.7-2 (NO_x). It is evident from the pie charts that for NO_x, the greatest man-made contribution is from point sources, and for VOC, from biogenic sources. Contributions from biogenic emissions are included in the summary, although the SIP control strategies are limited to the reduction of man-made emissions only. The contributions from VOC sources in the 1993 base case inventory include the following: on-road mobile sources 9%; area and non-road sources 14%; point sources 19%; and biogenic sources 58%. The contributions from NO_x sources in the 1993 base case inventory are as follows: on-road mobile sources 32%; area and non-road sources 12%; point sources 54%; and biogenic sources 1%.

The 2007 future base emission inventory for the HGA area is summarized in Figures 2.7-3 (VOC) and 2.7-4 (NO_x). The 2007 future base emissions inventory is an estimation that is projected forward from the 1993 base case inventory, using specific procedures approved by the EPA. The contribution from VOC sources in the 2007 base case inventory are as follows: on-road mobile sources 5%; area and non-road sources 14%; point sources 14%, and biogenic sources 67%. Contribution from NO_x is as follows: on-road mobile sources 24%; area and non-road sources 14%; point sources 60%; and biogenic sources 2%.

Figure 2.7-1 1993 VOC Emissions in HGA

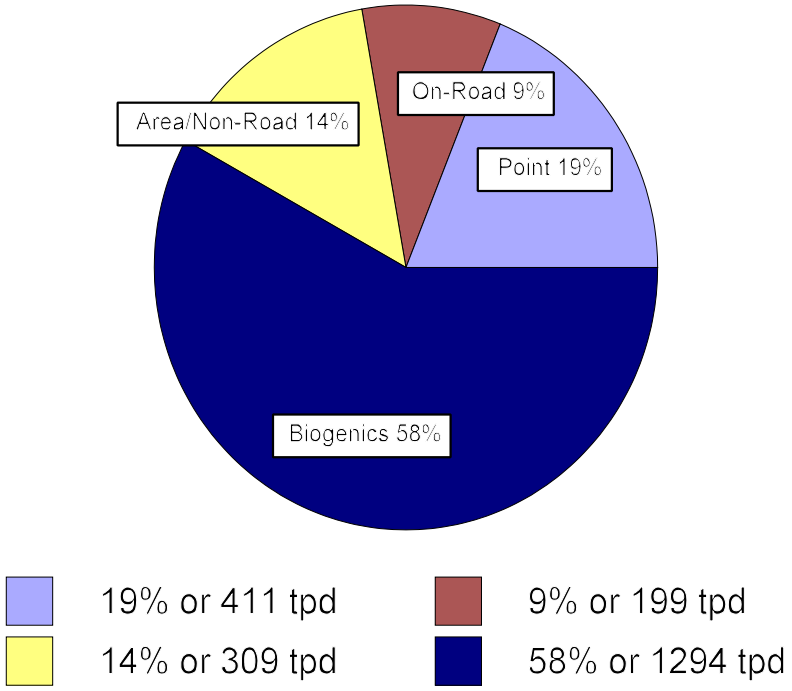


Figure 2.7-2 1993 NOx Emissions in HGA

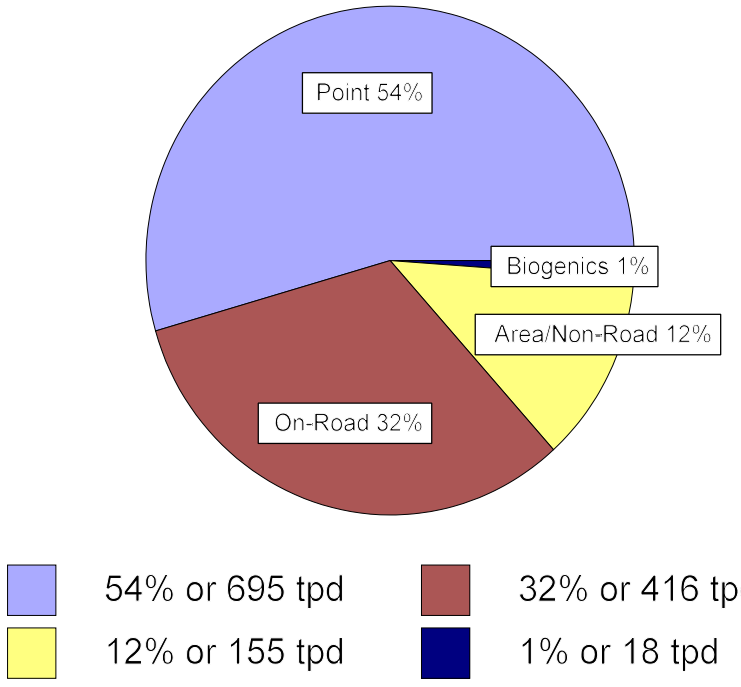


Figure 2.7-3 2007 VOC Emissions in HGA

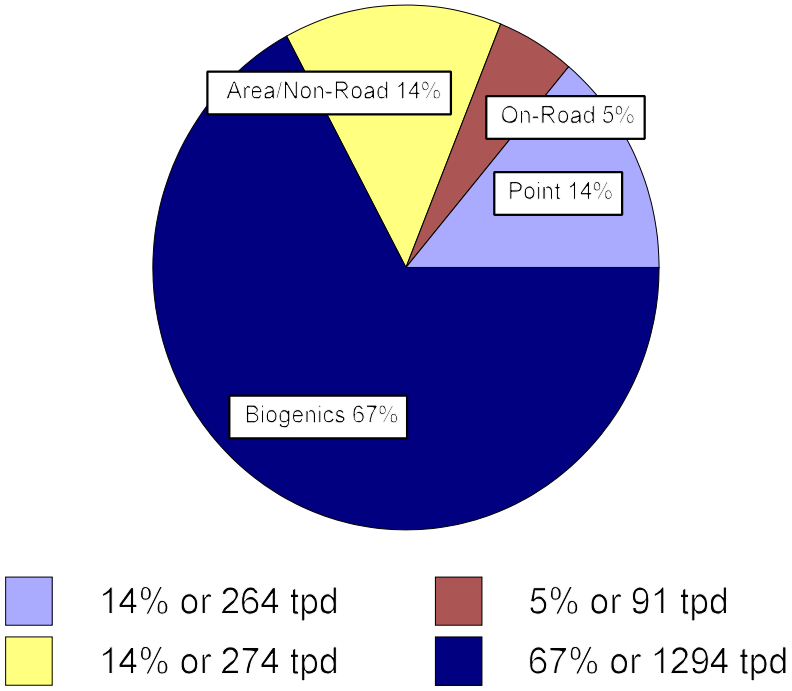
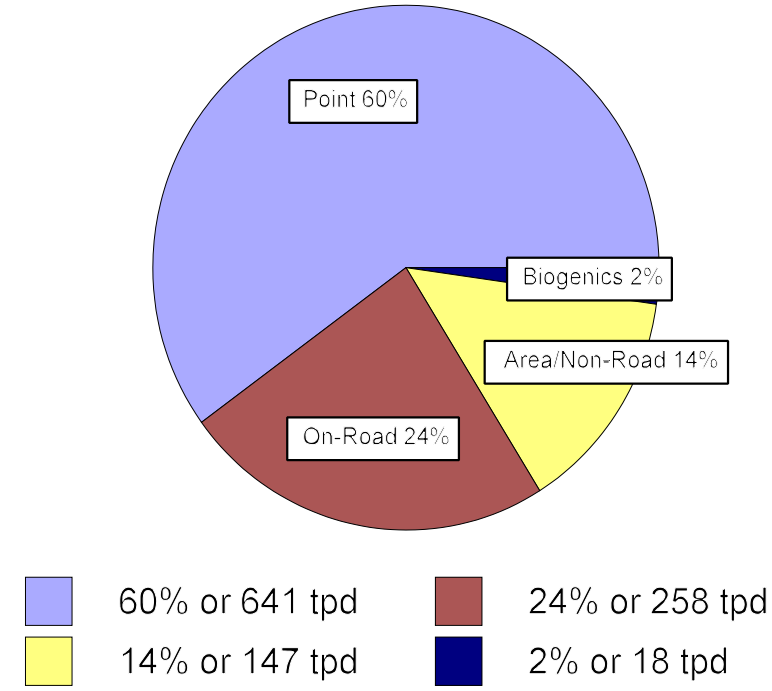


Figure 2.7-4 2007 NOx Emissions in HGA



2.8 TRANSPORTATION CONFORMITY

Transportation conformity is required by §176(c) of the FCAA. The FCAA requires that transportation plans, programs, and projects conform to SIPs in order to receive federal transportation funding and project approvals. Conformity to a SIP means that transportation activities will not cause or contribute to new air quality violations, increase the frequency or severity of existing violations, or delay timely attainment of the NAAQS. EPA's transportation conformity rule (40 CFR Parts 51 and 93) contains criteria and procedures for making conformity determinations for transportation plans, programs, and projects. The Texas transportation conformity rule (30 TAC §114.260) adopts EPA's rule by reference, contains Texas specific consultation procedures and is the enforcement mechanism for transportation conformity requirements in Texas. Currently, the 2022 MTP and the 2000-2002 TIP conform to the May 1998 ROP SIP.

2.9 MOTOR VEHICLE EMISSIONS BUDGETS

EPA requires all ROP and attainment demonstration SIPs to establish motor vehicle emissions budgets for transportation conformity purposes. A motor vehicle emission budget is the on-road mobile source allocation of the total allowable emissions for each applicable criteria pollutant or precursor, as defined in the SIP. Transportation conformity determinations must be performed using the budget test, once EPA determines the budget(s) adequate for transportation conformity purposes. In order to pass the budget test, areas must demonstrate that the estimated emissions from transportation plans, programs and projects do not exceed the motor vehicle emissions budget(s).

The motor vehicle emissions budgets for the 8-county HGA nonattainment area are established listed in the Tables 2.9-1 and 2.9-2. These budgets represent the 2007 projected on-road mobile source VOC and NO_x emissions that demonstrate attainment.

Table 2.9-1
2002, 2005, and 2007 ROP Motor Vehicle Emission Budgets for HGA

	VOC (tpd)	NO_x (tpd)
2002 ROP budget	123.24	242.20
2005 ROP budget	101.11	208.88
2007 ROP budget	94.81	197.79

Table 2.9-2
2007 Attainment Demonstration Motor Vehicle Emission Budgets for HGA

	NO_x (tpd)	VOC (tpd)
2007 on-road emissions projection (after modeling of base control measures)	194	75
2007 on-road gap control measures	–31.27	–5.91
2007 budget	162.73	69.09

CHAPTER 3: PHOTOCHEMICAL MODELING

3.1 BACKGROUND

The commission and its predecessor, the TACB, have submitted a number of SIP revisions for the HGA ozone nonattainment area based on photochemical modeling. The first of these SIP revisions was submitted to the EPA in 1994, but was based on limited observational data and used (by current standards) rather primitive modeling tools including the Urban Airshed Model version IV (UAM-IV) and the Colorado State University Meteorological Model. The modeling analysis in that SIP indicated that reducing NO_x emissions by as much as 50% would significantly increase peak ozone in the HGA area (this phenomenon is sometimes called a "NO_x disbenefit"). The TACB asked for, and was granted, a conditional waiver from implementing NO_x RACT rules in HGA under the provisions of §182(f) of the 1990 FCAA Amendments.

In the summer of 1993, TACB, along with several public and private partners, conducted an ambitious field study designed to collect data which would allow ozone formation along the Texas Gulf Coast to be better understood and more accurately simulated. The study was known as the COAST. The TACB, and later the commission, began a second round of photochemical modeling which incorporated the COAST data and utilized the variable-grid version of the UAM called UAM-V and an improved meteorological model known as the Systems Applications International Meteorological Model. The SIP revision submitted in 1998 used this modeling to conclude that VOC reductions alone would be insufficient to bring the HGA area into attainment of the ozone NAAQS, and that NO_x reductions would be necessary, even though the modeling still predicted a moderate NO_x disbenefit until reductions of over 50% were achieved. No specific controls were modeled in that round of modeling, but across-the-board reductions were tested, and it was concluded that NO_x reductions of around 85% would be necessary to reach attainment. The commission received a one-year extension of the conditional §182(f) waiver for HGA, and the waiver expired on December 31, 1997.

On October 27, 1999, the commission adopted another SIP revision in which specific control strategies were evaluated. However, no rules were adopted at that time. This modeling incorporated some revisions to the emissions data, and used CAMx instead of UAM-V. Several combinations of controls were tried, but none were able to demonstrate attainment except under certain assumptions which proved unacceptable to EPA. As a result, the final control strategy (called Strategy H2) still showed modeled peak ozone concentrations substantially above the NAAQS.

Because several other areas were faced with a similar situation, the EPA developed guidance for determining how much additional reduction would be necessary to reach attainment (the "gap"), and for identifying measures to fill the gap. In order for the state to have an approvable attainment demonstration, the EPA has indicated that the state must adopt those strategies modeled in the November 1999 SIP submittal, and then adopt sufficient measures to close the remaining gap in NOx emissions. The modeling included in this proposal indicates an emissions gap such that an additional 78 tpd of NO_x reductions is necessary for an approvable attainment demonstration. The HGA nonattainment area will need to ultimately reduce NO_x by more than 750 tpd to reach attainment with the 1-hour ozone standard. In addition, a VOC reduction of about 25% will also be achieved.

The current modeling application represents the third phase of modeling based on the COAST study, so is henceforth referred to as the "Phase 3 Modeling." The modeling submitted in the 1999 SIP revision will be referred to as "Phase 2 Modeling." Both the 1999 and 2000 HGA SIP revisions can be obtained at http://www.tnrcc.state.tx.us/oprd/sips.html.

3.2 INTRODUCTION

Photochemical modeling was performed for the current SIP revision, primarily to incorporate better inventory data and improved modeling methodology into the process. The modeling described in this document supplants the modeling discussed in the 1999 SIP revision, and will be used to re-calculate the gap described in the April 2000 SIP revision. Because much of the modeling input data and setup were documented in the 1998 and 1999 SIP revisions, this document primarily details those items that have changed since the last round of modeling. Significant changes for the current SIP revision include:

- Use of CAMx-2 (version 2 of CAMx), which incorporates several enhancements to the previous version, as well as providing a number of new features.
- Merging of the regional modeling domain with the COAST domain into a single SuperCOAST domain. This change allows modeling to be conducted in one step instead of two as was done previously.
- Improved biogenic emissions estimates, using the new GloBEIS model.
- Updated emissions from construction equipment, based on activity data collected from extensive surveys.
- Updated emissions from ships, with emissions from stacks treated as elevated point sources.
- Updated emissions from airport GSE.
- New spatial surrogates based on demographic projections provided by the H-GAC. These new surrogates allow emissions from certain sources to be allocated more realistically in simulations of the 2007 attainment year.
- Revised attainment year point source emissions based on more current inventory data.
- New growth estimates for area and non-road mobile sources based on H-GAC demographic data.
- Updated control factors for control strategy modeling.

Because the Phase 3 modeling builds upon modeling already performed in Phase 2, this SIP will not discuss in detail the portions of the modeling analysis unchanged from the Phase 2 work documented in the 1999 SIP revision. Rather, this document will discuss how the modeling analysis has changed from the Phase 2 analysis, then will describe the control strategy modeling performed to demonstrate attainment of the ozone NAAQS. Specifically, the interested reader should refer to the 1998 and 1999 SIP documentation for detailed discussions of episode selection, meteorology, initial and boundary conditions, and the definition of the modeling domain and subdomains.

3.3 THE 1993 PHASE 3 BASE CASE

This section describes the changes made to the previous base case, and provides a comparison of base-case model performance.

3.3.1 CAMx Version 2

For phase 3 of the HGA modeling, the commission migrated from version 1 to version 2 (release 2.03) of CAMx, noted as CAMx-2 (note: in this document, the term "CAMx" is understood to refer to version 2, unless stated otherwise). CAMx-2 offers several enhancements over the original version. For information on CAMx, the reader is referred to the CAMx web site at http://www.camx.com.

3.3.2 The SuperCOAST Modeling Domain

As described in the 1998 and 1999 SIP revisions, earlier modeling was conducted in two steps. First, a regional model was run, then results of this regional model run were post-processed to develop initial and lateral boundary conditions for the COAST modeling domain. These boundary and initial conditions were then used in subsequent modeling for the HGA area. Because many of the modeling analyses involved relatively minor changes on a regional scale, it was not necessary to re-run the regional model each time the COAST modeling was revised. However, on several occasions it was decided that the regional model needed to be re-run and new boundary conditions developed for COAST. Merging the regional and COAST modeling domains into a single modeling domain removes the need to perform this extra step.

The merged modeling domain, called SuperCOAST, consists of a large 16 km × 16 km coarse grid (same as the regional modeling domain used formerly), with a single nested 4 km × 4 km fine grid which covers the HGA and BPA nonattainment counties (same as the fine grid domain used in the previous COAST domain modeling). Figure 3.3-1 shows the SuperCOAST domain with the nested grid. Shown for reference purposes only is the boundary of the original COAST domain. Appendix D describes how the COAST and regional meteorology and emissions were combined to provide input to the SuperCOAST modeling.

3.3.3 Revised Biogenic Emissions

Since the previous modeling analysis for the HGA area, the commission has adopted the newest model in the BEIS line, called Global BEIS or GloBEIS. This model is based upon recent work by Guenther et al. 1995, 1998, 1999, 2000. GloBEIS represents several advances over the model formerly used, BIOME. In addition, the commission contracted with Environ, Inc. to develop a comprehensive land-use database for Texas and the surrounding states (including northern Mexico). This database incorporates land-use and biomass data collected in several field studies across eastern Texas, and updates data for surrounding areas using the most current information available. Note that the previous modeling for HGA already used the most current land-use and biomass within the HGA and surrounding areas, so the only changes in the HGA (and BPA) areas are due to the use of the GloBEIS model instead of BIOME.

Important features of the revised biogenics estimates include:

- Correction of some errors present in the BEIS2 model (Guenther et al. 1998, 1999);
- Incorporation of recent developments in the biogenic field (Guenther et al. 2000; Lamb et al. 1999) that have occurred since the last revision of BEIS2 in November 1997;
- Use of the most recent land use and vegetation distribution data for Texas (Wiedinmyer et al. 2000; Yarwood et al. 1999), for the surrounding U. S. states (Kinnee et al. 1997), and for northern Mexico (Mendoza-Dominguez et al. 1999);
- More complete VOC speciation than used by either BEIS2 or BIOME (Guenther et al. 2000);

- Estimation of biogenic CO emissions (Guenther et al. 2000).

Table 3.3-1 compares the results of GloBEIS and the biogenic emissions estimates used in the 1998 and 1994 SIP modeling analyses.

Table 3.3-1. Biogenic Emissions for HGA 8-county Nonattainment Area, September 10, 1993

Model used for estimate	VOC (tpd)	NO_x (tpd)
GloBEIS (Phase 3 Modeling)	1,308	18
BIOME (Phase 2 Modeling)	1,578	20
BIOME (Phase 1 Modeling)	1,448	20

The primary reason for the decrease in biogenic VOC emissions compared with Phase 2 is the change to a more accurate simulation of light attenuation within the tree canopy. As a result, the greatest changes in emissions occurred in the most dense stands of forest. While the overall emissions for the 8-county HGA area did not change dramatically, significant local changes were seen. See Appendix E for a more detailed discussion of GloBEIS and the biogenic emissions changes from the previous SIP modeling application.

3.3.4 Revised Diesel Construction Equipment Emissions

The Phase 3 base case introduces additional emissions inventory improvements which represent the culmination of years of effort by commission staff and their contractors. Most importantly, this new base case replaces the emissions for diesel-powered construction equipment with updated emissions developed from an extensive bottom-up activity survey conducted by ERG under contract to the commission. Emissions were updated within the 8-county HGA nonattainment area only.

There are several reasons to believe that the construction equipment NO_x emissions used in previous modeling analyses were significantly overstated, as follows:

- Ambient VOC/NO_x ratios at monitors in the HGA area are significantly larger than inventory-derived VOC/NO_x ratios. Reducing surface-level emissions of NO_x is consistent with reducing the discrepancy between the ambient and inventory-derived ratios.

- Comparing the HGA construction emissions on a per capita basis with the Los Angeles air basin reveals that emissions per person are nearly three times as high in HGA as in the Los Angeles area. Again, reducing construction equipment emissions substantially would lead to closer agreement between the inventories.

- During and following the comment period for the 1998 SIP amendment, several stakeholders expressed their belief that the construction equipment emissions were overstated. The cooperation of a large number of stakeholders was essential in developing the revised emissions estimates used in the current modeling.

The revised emissions were generated using EPA's NONROAD model, but with much of the default inputs replaced with results of the bottom-up survey. Since the survey estimated activity in 1998, it was necessary to back-cast the emissions to 1993. While the NONROAD model could have been used to

perform the back-casting, its growth assumptions are very generic and do not account for the strong differential growth experienced among the HGA nonattainment counties. Therefore, the NONROAD model was run for 1993, but using the 1998 activity data. This measure accounts for the effects of any federal measures that were in place in 1998 but not in 1993. Then, county growth factors acquired from H-GAC were used to back-cast the emissions to 1993 levels (see Table 3.3-2).

Table 3.3-2 1998 to 1993 Back-casting Factors by County (from H-GAC)

County	1998-1993 Back-Casting Factor	County	1998-1993 Back-Casting Factor
Brazoria	0.90397	Harris	0.92063
Chambers	0.89757	Liberty	0.86035
Fort Bend	0.78971	Montgomery	0.77150
Galveston	0.90266	Waller	0.82747

The new base case reduces 1993 construction equipment NO_x emissions from 103.3 tpd to 42.4 tpd, and reduces VOC emissions from 12.7 tpd to 6.0 tpd. Development of this improved inventory is documented in Appendix B.

3.3.5 Revised Commercial Marine Vessel Emissions

A second major change to the Phase 3 base case emissions was the use of updated emissions from commercial vessels. The Port of Houston Authority worked closely with commission emissions inventory staff to perform a bottom-up study which inventoried the types and numbers of vessels traversing the various shipping lanes within the Galveston Bay system and in the segment of Intracoastal Waterway within the HGA nonattainment area. The Port's contractor, Starcrest, Inc. then applied EPA-approved emission factor estimates to the activity data to produce emissions along each segment of the waterway system. Emissions from docked vessels (also called as "dwelling" or "hotelling" emissions) were also calculated. Overall, the commercial vessel NO_x emissions in the HGA nonattainment counties were reduced from 46.4 tpd in the previous modeling to 32.3 tpd in the current application. Commercial vessel emissions outside the HGA nonattainment counties were not changed from Phase 2. Appendix C provides details of the methodology used to develop the revised commercial vessel emissions.

In addition to refining the emissions estimates, commission staff developed an innovative new approach to modeling the emissions. Since ships emit hot exhaust gases from stacks which typically extend several meters above the water, ships would be modeled as elevated point sources if they were stationary. Because many vessels visit the ports in the HGA area, load or unload cargo, then leave the area, it is of course not possible to model vessels individually. However, it is possible to define a set of pseudo-stacks along the course of the shipping lanes and to assign various stack parameters to each stack based on the characteristics of the ships that travel the lanes. Commission staff assigned several pseudo-stacks at each of several locations along the waterways, with each representing a separate class of vessels. Details of methodology developed to elevate the commercial vessel emissions are provided in Appendix F.

3.3.6 Revised Airport Ground Support Equipment Emissions

During the public comment period for the 2000 DFW Attainment Demonstration SIP, the ATA noted that modeled emissions for airport GSE (baggage carts, pushback tractors, etc.) in the DFW area appeared to

be unreasonably large. The ATA conducted an inventory of equipment at DFW International Airport (as well as three smaller airports in the DFW area) and developed bottom-up estimates for airport GSE that were significantly lower than the values that had been used in the modeling. Because these revisions were based on sounder methodology than the data used previously, commission staff revised the DFW modeling to use these new emissions data in the DFW attainment demonstration. Subsequently, the ATA also provided updated emissions for the HGA area airports, and these revised inventory values were incorporated into the Phase 3 base case. The older inventory had consisted of 7.9 tpd of NO_x and 1.3 tpd of VOC emissions, while the revised NO_x emissions are now 4.0 tpd of NO_x for Bush Intercontinental, Houston Hobby, and Ellington Field, but the VOC emissions remained unchanged at 1.3 tpd. Details of the development of these revised emissions values are provided in Appendix A.

In the DFW attainment demonstration modeling, the commission used an innovative technique to treat some aircraft operation emissions as elevated point sources, similar to the method applied to commercial marine vessels as described above. However, the modeling staff were unable to obtain the necessary information from George Bush Intercontinental Airport staff, so emissions for aircraft operations were unchanged from the values used in Phase 2 modeling for HGA.

3.3.7 Revised Industrial Equipment Emissions

One final modification was made to the base inventory when it was discovered that the Phase 2 inventory included 3.7 tpd of NO_x emissions from 2-stroke forklifts, but only 1.5 tpd of VOC emissions from this category. Since 2-stroke equipment typically emits much more VOC than NO_x, (not to mention the scarcity of 2-stroke forklifts to begin with), clearly this type of equipment was incorrectly categorized in the modeling. To remedy this problem, commission staff used the NONROAD model to re-estimate emissions for the Industrial Equipment category. The same process described above for construction equipment was used (including using the same back-casting factors listed in Table 3.3-2), except that default NONROAD activity data were used. Overall, the weekday NO_x emissions for Industrial Equipment increased from 9.5 tpd to 15.3 tpd, and VOC emissions increased from 4.5 tpd to 4.9 tpd. Emissions outside the HGA nonattainment area did not change from Phase 2.

3.3.8 Base Case Emissions Comparison

Table 3.3-3 compares the Phase 3 modeling emissions for a typical weekday (Wednesday, September 8, 1993) with the Phase 2 emissions used in the previous modeling application.

Table 3.3-3: 1993 Base Case Emissions in the HGA 8-County Area for September 8

	NO_x (tpd)		VOC (tpd)	
Category	**Phase 2**	**Phase 3**	**Phase 2**	**Phase 3**
On-road mobile sources	416	416	199	199
Area/non-road mobile sources	226	155	318	309
Point sources	695	695	411	411
Biogenic sources	19	18	1608	1294
Total	1356	1284	2536	2213

3.3.9 Base Case Model Performance

Table 3.3-4 shows model performance for the Phase 3 base case and compares it with performance for the Phase 2 modeling. Performance is based only on monitors in the 8-county HGA nonattainment area. All model performance statistics for both the Phase 2 and Phase 3 base case meet EPA recommended standards for all four days.

Table 3.3-4. CAMx Phase 3 Base Case Ozone Performance Statistics for September 8-11, 1993 (Statistics for Phase 2 base case are shown in *italics*)

Episode Date	Normalized Bias (±5–15%)		Normalized Gross Error (30–35%)		Unpaired Peak Accuracy (±15–20%)		Domain-wide Peak Ozone (ppb)		
							Simulated		Observed
9/8/93	1.8	*9.2*	22.6	*24.8*	-12.7	*-15.0*	187	*182*	214
9/9/93	2.6	*11.4*	29.1	*28.2*	-10.4	*-7.9*	175	*180*	195
9/10/93	-13.0	*-4.2*	26.1	*24.4*	6.2	*9.7*	172	*178*	162
9/11/93	-2.9	*8.4*	20.4	*23.6*	-3.9	*-1.8*	182	*186*	189

As seen in Table 3.3-4, model performance for the Phase 3 base case is similar to that for the Phase 2 base case, except for a tendency towards more negative bias. Interestingly, the modeled peak on September 8 (187) is higher than was modeled in Phase 2 (182), while the modeled peak on each of the other three primary episode days is smaller than in Phase 2. Figure 3.3-2 shows modeled peak ozone concentrations for the four primary episode days for the entire SuperCOAST domain, and Figure 3.3-3 shows modeled peak ozone concentrations for the HGA/BPA 4 km × 4 km fine grid area.

3.4 THE 2007 FUTURE BASE CASE

Since the Phase 3 base case modeling shows acceptable performance, we now proceed to the next step in the modeling process, which is to construct a future base case for the 2007 attainment year. Like the 1993 base case, the Phase 3 future base modeling incorporates several enhancements from Phase 2. Besides changes incorporated into the new base case, the future case features:

- Updated growth assumptions for most area and non-road sources, based on projections developed by the H-GAC.
- New spatial allocation of construction equipment emissions, using projections developed by H-GAC for RAZs.
- Updated point source emissions using the 2007 inventory developed for the 2000 DFW SIP. This inventory incorporates reductions to large point sources expected under the Regional Strategy SIP (adopted in April 2000) and under SB 7.
- Revised emission adjustment factors for several federal measures included in the Phase 2 future base.

3.4.1 2007 Future Base Emissions for Area and Non-road Mobile Sources

Growth for area and most non-road mobile sources was revised to use population growth factors instead of the econometric forecasts used in Phase 2. This approach has several advantages over the previous approach: 1) By the use of population growth factors, growth is based on current forecasts consistent with those used for planning by local governmental bodies; 2) the growth factors are easy to apply, since they affect all categories of area and non-road emissions equally; and 3) the growth factors were provided at no cost to the commission. The disadvantage is that growth among the various emission categories is no longer distinct, and some categories (such as oil and gas production) do not necessarily correlate well with population, although these categories tend to be fairly insignificant contributors to the overall emissions inventory.

For area sources (such as architectural coatings, vehicle refueling, and similar stationary non-point source categories), plus locomotives and aircraft operations, the 1993 emissions were grown using growth factors listed in Table 3.4-1. Following the application of growth factors, the emissions for these categories were controlled using the same control factors used in the Phase 2 future base.

Table 3.4-1 1993-2007 Growth Factors by County (from H-GAC)

County	1993-2007 Growth Factor	County	1993-2007 Growth Factor
Brazoria	1.25267	Harris	1.19935
Chambers	1.27507	Liberty	1.40621
Fort Bend	1.69792	Montgomery	1.76776
Galveston	1.25782	Waller	1.53489

A slightly different approach was followed with the diesel construction and industrial equipment emissions. For these emission categories, a 2007 inventory was developed by a process similar to that discussed in the last section for developing the 1993 base case emissions. For the future inventory, NONROAD was run for 2007, again using 1998 activity data from the bottom-up survey. Then, these emissions were grown from 1998 to 2007 using H-GAC's population projections. The growth factors for these categories are provided in Table 3.4-2. The revised 2007 NO_x emissions from construction equipment are now 32.1 tpd, compared with 101.8 tpd in the Phase 2 future base. Emissions of VOC declined from 11.9 tpd to 5.5 tpd. Industrial equipment NO_x emissions are now 15 tpd, compared with 8.9 tpd in Phase 2, and VOC emissions are now 4.6 tpd, compared with 3.0 tpd in Phase 2.

Table 3.4-2 1998-2007 Growth Factors by County (from H-GAC), Used for Diesel Construction and Industrial Equipment Emissions

County	1998-2007 Growth Factor	County	1998-2007 Growth Factor
Brazoria	1.13237	Harris	1.10416
Chambers	1.14447	Liberty	1.20983
Fort Bend	1.34087	Montgomery	1.36383

Galveston	1.13538	Waller	1.27008

Emissions for airport GSE for 2007 were supplied by the ATA and incorporated directly into the future base. Phase 3 future emissions of NO_x were modeled at 5.35 tpd, and VOC emissions at 1.3 tpd. The equivalent Phase 2 emissions for airport ground-support equipment were 8.3 tpd of NO_x and 1.3 tpd of VOC.

The 2007 commercial shipping emissions were provided by the Port of Houston Authority, so these emissions were used directly in the 2007 future base. As in the base case, emissions were treated as elevated point sources. The same federal/international controls applied in the Phase 2 modeling were also applied here. The revised 2007 commercial shipping NO_x emissions are 41.7 tpd (compared with 49.8 tpd in the Phase 2 future base), and the revised VOC emissions are 0.8 tpd (compared with 6.4 tpd in Phase 2).

Finally, emissions from the remaining non-road sources (lawn and garden, pleasure boats, etc.) were not changed from the Phase 2 modeling. These sources were grown using the default growth assumptions of the NONROAD model.

Area and non-road mobile source emissions for areas outside the 8-county HGA nonattainment area were unchanged from Phase 2, except that Stage I refueling and cleaner gasoline (modeled in Phase 2 as control strategy items) were applied to counties in East and Central Texas, because these measures were adopted by the commission in the spring of 2000.

3.4.2 New Spatial Allocation for Construction Equipment Emissions

In Phase II modeling, non-road and area sources were allocated spatially using a number of gridded spatial surrogates developed by SAI or by commission staff. With a few exceptions, these surrogates were created from USGS digital data which divided the region into Land Use/Land Cover (LULC) categories such as water, industrial, or agriculture. In Phase 2 modeling, construction emissions were allocated to land areas classified as industrial, residential, or commercial.

The approach taken in Phase 2 provides a reasonable allocation scheme in the 1993 base case, but may not accurately reflect the spatial distribution of emissions in the attainment year of 2007, since the urban area has expanded (and is expected to expand further) into areas that were not residential, commercial, or industrial in 1993. Thus, using 1993 surrogates for 2007 emissions may artificially concentrate the emissions into the former urban area, which can in turn affect the model's future ozone forecasts.

Ideally, future surrogates would be built from LULC data analogous to data used in the base case, but unfortunately such data are not available. Instead, the commission acquired population and employment projections for RAZs from H-GAC, and used these data to develop a new surrogate for allocating construction activity. The commission modeling staff plans to eventually develop new future surrogates for several additional categories of area and non-road mobile source emissions, but due to time constraints was limited to only developing a surrogate for construction activity at this time.

Because the revised construction equipment emissions were developed for four separate categories of activities (see Appendix B), the commission emissions inventory staff developed a composite surrogate that was used to allocate the aggregate construction emissions. The four categories are as follows: heavy highway, industrial, residential/commercial, and municipal/utility. Industrial activity is primarily defined as emissions associated with refinery turnarounds, and was allocated among 13 specific RAZs identified

as containing large industrial areas, including Freeport, Texas City, Bayport, and the Houston Ship Channel. The remaining three categories are primarily associated with providing infrastructure to population and employment centers. In each case, some activity is associated with developing new facilities, while the remainder is associated with maintaining or replacing existing facilities. To allocate activity in these three categories, the modeling and emissions inventory staff devised a procedure to account for both maintenance and growth, and also to account for both residential population and employment.

Population growth was estimated in each RAZ by taking the difference between the 2008 population forecast in that RAZ minus the 2006 forecast. Similarly, employment growth was estimated by subtracting the 2006 employment forecast from the 2008 forecast. Taken together, these growth estimates predict where new growth (both residential and commercial building) will occur in 2007. These growth estimates by RAZ are clearly related to residential/commercial construction, but are also indirectly related to both heavy highway and municipal/utility, since the latter two categories provide the facilities required to serve employment and population centers (roads, water mains, etc.). Additionally, a significant amount of activity is related to total population and employment, since existing facilities must be periodically repaired or replaced.

Because the staff was unable to locate information detailing how much activity relates to new construction versus repair and replacement, nor how much relates to employment versus population, it was assumed that each of the following four factors each accounted for 25% of the activity in each county:

- Population
- Employment
- 2006-2008 change in population
- 2006-2008 change in employment

These four factors were thus equally weighted to develop the allocation scheme for heavy highway, residential/commercial, and municipal/utility construction emissions. The result was then merged with the industrial allocation to provide the final construction equipment allocation. Figure 3.4-1 shows the 2007 construction equipment emissions for September 8, after being processed into a gridded model-ready emissions file.

3.4.3 2007 Future Base Emissions for On-Road Mobile Sources

The basis of the 2007 on-road mobile source emissions inventory used in the Phase 3 modeling was consistent with that used for the Phase 2 modeling. Under contract to the commission in 1998, the TTI developed a link-based gridded mobile source emissions inventory for the 8-county HGA nonattainment area. Development of this inventory is documented in Appendix G of the Phase 2 HGA SIP, dated October 27, 1999. The title of the report is *Development of Gridded Mobile Source Emissions Estimates for the Houston-Galveston Nonattainment Counties FY2007 in Support of the COAST Project, Technical Note, December 1998.* This TTI inventory summarized below in Table 3.3-3 will be referred to as either the "mobile baseline" or simply the "baseline." The manner in which the baseline was adjusted constitutes the differences between Phases 2 and 3 of the photochemical modeling.

Table 3.4-3 On-Road Mobile Source Baseline Emissions for 2007 (tpd) for Wednesday, September 8

County	Baseline NO_x Emissions	Baseline VOC Emissions
Brazoria	17.1	7.4
Chambers	6.0	2.1
Fort Bend	23.1	10.6
Galveston	12.6	6.1
Harris	190.6	79.2
Liberty	5.7	2.3
Montgomery	22.9	9.6
Waller	4.2	1.6
8-County Total	282.3	118.8

This baseline inventory had been modeled by TTI using MOBILE5a_h, yet the analyses for some of the on-road mobile source control strategies under review required the use of the more current MOBILE5b. Consequently, both MOBILE5a_h and MOBILE5b were run with identical inputs to develop factors for adjusting the baseline inventory to become equivalent to MOBILE5b. The net result was a 4.3 tpd reduction of NOX emissions in the 8-County from 282.3 to 278 tpd. 8-County VOC emissions were reduced by 23.9 tpd from 118.8 to 94.9 tpd. Table 3.4-4 below summarizes the result of applying this adjustment to the modeling inventory. A more complete description of this adjustment can be found in an ERG memo which is included as Appendix G of this SIP.

Table 3.4-4 MOBILE5b Adjustments to On-Road Mobile Source Baseline Inventory for 2007 (tpd) for Wednesday, September 8

Counties	Unadjusted Baseline Inventory		MOBILE5b Adjustments		Registration Adjusted Baseline	
	NO_x	VOC	NO_x	VOC	NO_x	VOC
Harris	190.6	79.2	-3.1	-16.5	187.5	62.6
Brazoria, Fort Bend, Galveston, Montgomery	75.8	33.7	-0.9	-6.3	74.8	27.3
Chambers, Liberty, Waller	15.9	6.0	-0.2	-1.1	15.7	4.9
Total	282.3	118.8	-4.3	-23.9	278.0	94.9

The most significant change to the mobile inventory between Phases 2 and 3 involved the manner in which an I/M program was originally modeled in the baseline inventory for Harris County in 2007. The

MOBILE5 input file for Harris County in 2007 had been prepared in accordance with EPA *MOBILE5 Information Sheet #6, Effect of the New National Low Emission Vehicle (NLEV) Standard for Light-Duty Gasoline Fueled Vehicles, EPA 520-F-98-027, July 1998*. Mobile modeling performed in accordance with recommendations from this memo resulted in a significant overestimate of the I/M benefits in Harris County for NLEV vehicles. This overestimate was not known at the time that the Phase 2 modeling was conducted. A recent analysis performed under contract to the commission by ERG determined that this I/M benefit had been overestimated by 22.5 tpd of NO_x and 7.7 tpd of VOC. This analysis is documented in Appendix G of this SIP. Subsequent to the MOBILE5b adjustment discussed above, these I/M benefit changes resulted in an increase in the on-road mobile source baseline inventory for Harris County from 187.5 to 210 tpd of NO_x and from 62.6 to 70.3 tpd of VOC. Since no I/M program was modeled in the seven remaining nonattainment area counties in the original 2007 baseline inventory, similar I/M benefit adjustments do not apply outside of Harris County.

The most recently available vehicle registration distribution data was used when the baseline mobile source inventory was modeled in 1998. Since that time, however, the vehicle registration distribution has changed significantly due to the increased purchase of new vehicles during the last few years, resulting in a relatively "newer" overall fleet. Projection of this newer 1999 vehicle registration distribution data into 2007 results in a newer, cleaner vehicle fleet. By comparing MOBILE5 modeling runs utilizing both the older and newer registration distributions, ERG was able to determine the amount by which the baseline inventory should be adjusted to account for the updated vehicle registration data. These adjustments are summarized in Table 3.4-5 and are detailed further in the aforementioned ERG memo in Appendix G.

Table 3.4-5 Vehicle Registration Distribution Updates to Baseline Inventory for 2007 (tpd)

Counties	MOBILE5 & I/M Adjusted Baseline		Registration Adjustments		Registration Adjusted Baseline	
	NO_x	VOC	NO_x	VOC	NO_x	VOC
Harris	210.0	70.3	-9.8	-1.0	200.2	69.3
Brazoria, Fort Bend, Galveston, Montgomery	74.8	27.3	-1.0	+0.6	73.8	28.0
Chambers, Liberty, Waller	15.7	4.9	-0.5	0.0	15.1	4.9
Total	300.5	102.6	-11.4	-0.4	289.1	102.2

The final step in development of the mobile source base case inventory for 2007 was to account for the benefits which will accrue from penetration of 2004-and-newer Tier 2 vehicles into the on-road fleet. Benefits which will accrue from implementation of the Tier 2 vehicle program were not accounted for in the original baseline inventory, because MOBILE5 does not have the capability to model Tier 2 vehicles. A recent ERG analysis summarized in Table 3.4-6 indicates the amounts by which the mobile inventory should be adjusted to account for these benefits. The Tier 2 benefits in the 8-county area also include an additional 5.92 tpd of VOC, as referenced in a May 30, 2000 letter from EPA to the TNRCC to account for evaporative emission controls on Tier 2 vehicles which will be equivalent to California LEV standards.

Table 3.4-6 Tier 2/Low Sulfur Benefits to On-Road Mobile Source Fleet for 2007 (tpd)

Counties	Registration Adjusted Baseline		Tier 2 Adjustments		Tier 2 Adjusted Baseline	
	NO_x	VOC	NO_x	VOC	NO_x	VOC
Harris	200.2	69.3	-23.1	-7.6	177.1	61.7
Brazoria, Fort Bend, Galveston, Montgomery	73.8	28.0	-7.2	-2.8	66.6	25.2
Chambers, Liberty, Waller	15.1	4.9	-1.3	-0.6	13.8	4.4
Total	289.1	102.2	-31.6	-10.9	257.5	91.3

It should be noted that commission staff performed an in-house analysis of the Tier 2 benefits to be accrued based on the EPA *MOBILE5 Information Sheet #8, Tier 2 Benefits Using MOBILE5, April 2000*. However, commission staff believe that the ERG analysis summarized above is more representative of the Texas vehicle fleet, due to the fact that the EPA method referenced above relies only on national default data. More detail on the ERG analysis is provided in the aforementioned memo contained in Appendix G. The revised base case emission estimates used for modeling purposes are contained in the two right-hand columns of the above table. For the 8-county HGA area, these estimates are 257.5 tpd of NO_x and 91.3 tpd of VOC.

3.4.4 2007 Future Base Emissions for Point Sources

In Phase 2, the 1993 base case point source emissions (based largely on the COAST special inventory) were grown to 2007 using observed emission trends for sources in the COAST domain (except Louisiana and offshore sources). Since the inventory has changed substantially since 1993, both in terms of actual emissions changes (new sources, shutdowns, process changes, controls, etc.) and in terms of improved reporting, the commission decided to use a more current inventory for the basis of the 2007 projections. Also, in the 2000 DFW Attainment Demonstration, the commission used an innovative approach for developing future inventories which involves searching through the Commission permit database to locate planned new sources within 100 miles of the DFW nonattainment area. It was planned to apply this approach to the HGA point sources as well.

In early June of 2000, commission modeling staff began the process of analyzing the permit data to inventory planned sources within 100 miles of HGA. Unlike the DFW area, which has few existing and planned point sources, the Texas Gulf Coast area has many thousands of existing sources and a correspondingly larger number of new permits. Besides identifying planned new sources and major modifications, modeling staff also identified planned shutdowns and performed extensive quality assurance. Despite the assistance of four contract personnel, it was impossible to complete processing the permit data in time to include all the newly-permitted sources in the Phase 3 future base. Modeling staff were able to account for those sources in the 100-mile radius which were outside the nonattainment area, but the Phase 3 future base did not include newly-permitted sources in the nonattainment counties. Note that new sources outside the nonattainment area are especially important, since they are not required to offset emission increases with reductions, while new sources in the HGA nonattainment area are subject to an offset requirement of 1.3 to 1. Appendix H provides details of the process used to identify and record the newly-permitted sources, and also provides a list of the sources along with their relevant characteristics.

For the Phase 3 future base, the 2007 inventory developed for the DFW Attainment Demonstration was modified and used in the current modeling. This inventory used emissions data from the Commission's Point Source Data Base for 1996 to develop a 1996 base year inventory for all Texas sources, then projected these emissions to 2007 using growth factors developed by EPA Region VI. Emissions for electric generation facilities were then replaced with 1997 summertime peak (specifically June 15, 1997 to July 15, 1995) average emissions, since these emissions were the basis for the rules developed for the DFW attainment demonstration. Newly-permitted sources within a 100-mile radius of the DFW nonattainment area were included, along with the sources identified in the HGA area described above. Only elevated point source emissions were replaced with the DFW-based future emissions. Ground-level point sources were the same as in the Phase 2 modeling.

In the DFW modeling analysis, the HGA and BPA point sources were modeled with across-the board reductions, so in adapting this inventory for HGA these reductions were removed. Instead, point sources in HGA and BPA were controlled in accordance with the current requirements of Chapter 117. In BPA, this represents the level of control in the 2000 BPA Attainment Demonstration, but represents only modest reductions in the HGA area (additional reductions will be modeled as a control strategy in the following section). The 2000 DFW and BPA SIP revisions can be obtained at http://www.tnrcc.state.tx.us/oprd/sips.html.

Commission staff plan to complete cataloging the permit data and build a new 2007 inventory based on the 1997 point source inventory before the end of July, 2000. This updated inventory may be included in the finally adopted SIP revision as a result of comments received by the commission during the public comment period.

3.4.5 2007 Future Base Emission Summary

Table 3.4-6 summarizes the 2007 future base emissions for Phase 3, and also provides a comparison with Phase 2. Biogenic emissions are not reported, since they did not change from the base case.

Table 3.4-7: 2007 Future Base Emissions in the HGA 8-County Area for September 8

	NO_x (tpd)		VOC (tpd)	
Category	**Phase 2**	**Phase 3**	**Phase 2**	**Phase 3**
On-road mobile sources	267	258	103	91
Area/non-road mobile sources	222	147	263	274
Point sources	564	641	243	264
Total anthropogenic emissions	1053	1046	609	629

3.4.6 Future Base Model Results

Table 3.4-8 summarizes modeled peak ozone for the Phase 3 future base, compared with the analogous results from the Phase 2 modeling. Figure 3.4-2 provides isopleth plots of peak modeled ozone for each of the four episode days in the 4 km × 4 km fine grid area.

Table 3.4-8 Future Base Peak Modeled Ozone in the HGA 8-County Area, Phase 2 and Phase 3

Episode Day	Peak Modeled Ozone (ppb)	
	Phase 2	Phase 3
September 8	171.1	170.9
September 9	166.0	159.7
September 10	164.9	153.5
September 11	170.6	160.5

Although peak modeled ozone remained nearly the same as in the base case on September 8, it decreased significantly on the three remaining episode days. Particularly, peak ozone on September 10 decreased by over 11 ppb from Phase 2.

3.5 THE 2007 CONTROL STRATEGY CASE

This section describes the changes made to the final control strategy described in the Phase 2 SIP, and later used to calculate the "gap" (the amount of NO_x reductions remaining to reach attainment). The modification to the 2007 controlled inventory consist of modifications to the rules proposed in Strategy H2 of the Phase 2 modeling, as well as adjustments to several reduction factors based on newer information.

3.5.1 Reductions to Area and Non-road Mobile Sources in the 2007 Control Case

Table 3.5-1 shows the controls modeled in the 2007 control case. Differences between the current control case and Phase 2 Strategy H2 are indicated.

Table 3.5-1 Controls Applied to Area and Non-road Mobile Sources in Phase 3 Control Strategy

Measure	Geographic Area	NO_x Reduction (tpd)	VOC Reduction (tpd)	Compared with Phase 2 Strategy H2
Cleaner Gasoline (15 ppm sulfur)[1]	East and Central Texas	2.3 tons in 8 HGA Counties	-7.1 tons in 8 HGA Counties	California Reformulated Gasoline in 8-county area
Texas Clean Diesel	Statewide	4.3 tons in 8 HGA Counties	2.2 tons in 8 HGA Counties	California Diesel in 8-county area
Delay construction and landscaping activities until after noon	8-county area	0.0	0.0	Construction activity only
VMEP (split 1/3 non-road, 2/3 on-road)	8-county area	8.0[2]	0.0	All VMEP was taken from non-road

[1]The reductions modeled for 15 ppm sulfur gasoline were the same as those used for California RFG in the Phase 2 modeling, since Commission staff were unable to quantify the benefits of 15 ppm sulfur gas relative to nonroad engines in time to include in the Phase 3 modeling. Commission staff modify the benefits modeled for low sulfur gasoline when more information becomes available.

[2]VMEP is calculated as 3% of the reduction required to reach attainment (i.e. future base total NO_x emissions minus the attainment target). Although the required reduction in Phase 3 is slightly larger than that from Phase 2, the VMEP was not changed from the 24 tpd used previously.

Note that the regional Texas Clean Gasoline and Stage I refueling rules are now included in the future base. Also, low-NO_x water heaters were listed as a measure in the Phase 2 modeling (although no reductions were assumed at that time). This measure has been moved to the gap list, so was not modeled here.

3.5.2 Reductions to On-road Mobile Sources in the 2007 Control Case

Table 3.5-2 shows the on-road mobile source controls modeled in the 2007 control case. Differences between the current control case and Phase 2 Strategy H2 are indicated. Greater detail on the development of these reductions is documented in an ERG memo contained in Appendix G.

Table 3.5-2 2007 Controls Applied to On-Road Mobile Sources in Phase 3 Control Strategy

Measure	Geographic Area	NO_x Reduction (tpd)	VOC Reduction (tpd)	Compared with Phase 2 Strategy H2
ASM & OBDII I/M Program	8-county area	42.0	16.5	IM240 modeled instead of ASM
Cleaner Gasoline (15 ppm sulfur)	Eastern and central Texas	1.1 tons in 8 HGA Counties	0.1 tons in 8 HGA Counties	California Reformulated Gasoline in 8-county area
Texas Clean Diesel	Statewide	4.1 tons in 8 HGA Counties	0	California Diesel in 8-county area
VMEP (split 1/3 non-road, 2/3 on-road)	8-county area	16.0	0	All VMEP was taken from non-road

3.5.3 Reductions to Point Sources in the 2007 Control Case

Point source NO_x emissions in the HGA 8-county area were assumed to be reduced by 90% from the future uncontrolled base level (i.e. the future base, but without applying the Chapter 117 rules). The commission modeling staff intends to model the specific rules included elsewhere in this SIP revision, but must wait for the 2007 future base point sources to be completed. These regulations will reduce overall point source emissions by about 90%, but the level of control will vary from source to source, depending on its type and current level of control.

Since the point sources used in the modeling described here are preliminary, the modeled ozone concentrations (and resulting gap) must be considered approximate. However, in any case the point

sources form a relatively small part of the 2007 controlled NO_x inventory after being reduced by about 90%. Thus, even if the uncontrolled 2007 base point source inventory changes significantly, the effect on the controlled 2007 inventory will be minor. The resulting effects on the peak ozone prediction and gap are therefore expected to be minor as well.

3.5.4 Summary of 2007 Controlled Emissions

Table 3.5-3 below summarizes emissions for the 2007 control case. Phase 2 emissions are also presented for comparison.

Table 3.5-3 2007 Control Case Emissions in the HGA 8-County Area for September 8

	NO_x (tpd)		VOC (tpd)	
Category	**Phase 2 (Strategy H2)**	**Phase 3**	**Phase 2 (Strategy H2)**	**Phase 3**
On-road mobile sources	195	194	79	75
Area/non-road mobile sources	148	134	257	280
Point sources	64	67	243	264
Total anthropogenic emissions	407	395	579	619

Comparing Table 3.5-3 with Table 3.4-6 shows an overall NO_x reduction of 62% from the 2007 future base, and a VOC reduction of 1.6% from the 2007 future base. Since the future base already includes substantial reductions to NO_x and VOC (NO_x RACT, NLEV, Tier 2/low sulfur, Tier 2/3 offroad diesel standards, etc.) the actual level of reduction from an uncontrolled future base is much greater. Because of the process used to estimate future on- and nonroad mobile source emissions, it is difficult to determine the uncontrolled 2007 emission levels. However, the modeling conducted for the 1998 HGA SIP revision used a largely uncontrolled future base. That modeling established that a NO_x reduction of up to 85%, together with a VOC reduction of 25%, would be sufficient to reach attainment. The 1998 modeling future base inventory consisted of 1468 tpd of NO_x emissions and 1052 tpd of VOC emissions. Compared with the 1998 future base, the Phase 3 control case represents a NO_x reduction of 73% and a VOC reduction of 41%.

3.5.5 Future Control Case Model Results

Table 3.5-4 summarizes modeled peak ozone for the Phase 3 control case, compared with the analogous results from the Phase 2 modeling. Figure 3.5-1 provides isopleth plots of peak modeled ozone for each of the four episode days in the 4 km × 4 km fine grid area.

Table 3.5-4 Future Control Case Peak Modeled Ozone in the HGA 8-County Area, Phase 2 and Phase 3

Episode Day	Peak Modeled Ozone (ppb)	
	Phase 2 (Strategy H2)	Phase 3
September 8	152.3	146.4
September 9	141.1	134.7
September 10	146.5	139.9
September 11	140.4	132.6

Comparing the Phase 3 control strategy results with Phase 2 Strategy H2, it is seen that the inventory enhancements result in a significant reduction in peak ozone on every episode day. The Phase 3 control strategy represents a great improvement in air quality over the base and future base cases, but still does not meet the ozone NAAQS of 125 ppb. The next section uses these results to recalculate the gap, in terms of NO_x tpd, which must be filled in order to demonstrate attainment of the NAAQS.

3.6 GAP CALCULATION

In October of 1999, EPA published a draft document titled *Guidance for Improving Weight of Evidence Through Identification of Additional Emission Reductions, Not Modeled.* This document provides two methods for calculating the gap: Method One relates modeled ozone peak values to emission reductions, and Method Two relates the observed design value to emission reductions. Unfortunately, neither method can be successfully applied in the HGA area (as discussed in the April 19, 2000 HGA SIP revision), so an alternative approach is necessary. EPA Region 6 developed a variant on Method One which uses a second-order polynomial, instead of the linear relationship assumed in Method One, to approximate the relationship between peak ozone and reductions of NO_x emissions. The relationship was fitted using three control scenarios modeled in Phase 2, namely Scenarios VI, VIb and VIc. The relation is given below:

$$\%NO_X = -0.010949 \times OC^2 + 2.62 \times OC - 74.62 \qquad (1)$$

where

$\%NO_x$ is the percent reduction of NO_x from the Phase 2 future base total anthropogenic NO_x emissions, and

OC is the peak modeled ozone concentration of any of the episode days.

For a specific control strategy (say H2), the modeled peak ozone concentration and the associated NO_x reduction form an ordered pair (OC, $\%NO_x$) which will not generally lie on the relation described by equation (1). In fact, because Strategy H2 includes the construction time shift (which provides modeled ozone benefits with no associated reduction in emissions), it is expected that this strategy will lie a considerable distance from the relation. The solution is to translate equation (1) so that it passes through (OC, $\%NO_x$) for a particular strategy, then use the translated relation to calculate the remaining NO_x reduction necessary to reach attainment.

For strategy H2, the peak modeled ozone was 152 ppb with a NO_x reduction of 61.3%. Translating equation (1) to include this point yields

$$\%NO_X = -0.010949 \times OC^2 + 2.62 \times OC - 84.12 \quad (2)$$

Finally, the value of OC which would demonstrate attainment of the NAAQS (124.5 ppb) is inserted into equation (2) to yield a required NO_x reduction of 72.4%. Strategy H2 included a 61.3% reduction, so the gap in terms of % reduction is 11.1%. Since the Phase 2 future base had 1052 tpd of NO_x emissions, the final gap based on Phase 2 modeling is 117 tpd (Region VI used 124 ppb as the attainment target and calculated 118 tpd needed).

The original gap calculation was based on percentages relative to the Phase 2 future base, so it is not directly applicable to the Phase 3 modeling. However, equation (1) can be recalculated in terms of NO_x tons, which yields a relation that is independent of future base emissions. Table 3.6-1 gives peak modeled ozone and NO_x emissions for the four scenarios used to fit equation (1):

Table 3.6-1 Peak Modeled Ozone and NO_x, by Modeling Scenario

Scenario	Peak Modeled Ozone (ppb)	NO_x Emissions (tpd)
VI	168	456
VIb	155	330
VIc	143	249

Recalculating equation (1) using NO_x emissions (instead of $\%NO_x$) yields:

$$NO_X = 0.11769 \times OC^2 - 28.322 \times OC + 1892.4 \quad (3)$$

where NO_x now represents the modeled emissions corresponding to peak ozone concentration OC. Now, the Phase 3 control strategy model run predicted a peak ozone value of 146.4 ppb on September 8, with NO_x emissions of 395 tpd. Translating equation (3) to pass through the point (146.4, 395) yields the equation

$$NO_X = 0.11769 \times OC^2 - 28.322 \times OC + 2022.8 \quad (4)$$

Now, equation (4) is evaluated for OC=124.5, yielding a required NO_x emission level of 317 tpd. The gap is then 78.0 tpd NO_x.

It should be pointed out that the methodology employed in equations (3) and (4) is mathematically equivalent to that employed in equations (1) and (2). To demonstrate, the gap based on Strategy H2 will be recalculated using NO_x emissions rather than % NO_x reduction. Strategy H2 peak ozone was 152 ppb with emissions of 407 tpd. Translating equation (3) to pass through this ordered pair yields

$$NO_X = 0.11769 \times OC^2 - 28.322 \times OC + 1992.8 \quad (5)$$

Evaluating equation (5) for the ozone target of 124.5 ppb yields 291 tpd. Therefore, the gap calculated from (5) is 407 – 291 = 116 tpd. The one ton difference between this value and the 117 tpd calculated with equation (2) is due to using higher precision in the coefficients of equations (3) and (5) than were used in equations (1) and (2).

3.7 MODELING SUMMARY

The Phase 2 modeling presented in the 1999 HGA SIP revisions has been updated to include better emissions data than were previously available. The CAMx model used was upgraded to a newer version, and the COAST modeling domain was integrated with the regional modeling domain. Base case model performance was similar to that of Phase 2, with slightly higher peak ozone on September 8, but with lower peak ozone on the remaining episode days.

The modeling described here used the 2007 point source emissions developed for the DFW SIP. Commission staff are completing a revised future point source inventory for HGA which will include newly permitted sources in the area. This new inventory is expected to have only a minor impact on the peak ozone (hence the gap), since point sources make up the smallest component of the controlled future inventory.

Several controls were reevaluated and more current reduction factors were used in Phase 3. The Phase 3 control strategy (similar to Phase 2 Strategy H2) was run using the newer modeling formulation, and peak ozone on September 8 was modeled at 145 ppb. The methodology developed by EPA Region 6 to calculate the gap was revised to model tons of NO_x instead of percent reduction. The gap was recalculated to be 78 tpd, compared with 118 tpd calculated from the Phase 2 modeling.

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CHAPTER 4: DATA ANALYSIS

(No updates or revisions.)

CHAPTER 5: RATE OF PROGRESS

The FCAA Amendments of 1990 require that areas classified moderate or above with respect to the ozone NAAQS submit ROP plans demonstrating continued progress toward achieving the standard. The ROP plan must demonstrate that specific reductions of emissions of VOC and/or NO_x from the 1990 baseline have been achieved, accounting for growth that occurred after 1990, accompanied by rules to implement these reductions. In addition, 3% contingency measures must be adopted, to be implemented in the event that milestone reductions fail to occur.

The first of these plans, the 15% ROP, was submitted by the state in November 1993 (Phase I) and May 1994 (Phase II). The 15% ROP documented 15% VOC reductions, net of growth, from 1990 to 1996, along with adopted rules and other measures. The next plan, the post-1996 ROP, was submitted by the state in November 1994 and revised in July 1996 and May 1998. The post-1996 ROP demonstrated an additional 3% reduction per year, or 9% net of growth, from 1996 to 1999, accompanied by adopted rules and other measures. Since the FCAA allows NO_x reductions to be substituted for VOC reductions only for the post-1996 ROP plans, in its May 1998 revision the state documented reductions of 6% for VOC and 3% for NO_x. The VOC and NO_x reductions are calculated from these pollutants' respective emissions inventories. Of the 3% required contingency measures, 2% (or two-thirds of the total) was met by VOC reductions, and 1% (or one-third of the total) was met by NO_x reductions.

The current SIP revision contains post-1999 ROP plans for the milestone years 2002 and 2005, and for the attainment year 2007. The 2002 ROP documents 3% per year, or 5% NO_x and 4% VOC reductions occurring from 1999 to 2002; the 2005 ROP documents 3% per year, or 9% NO_x reductions occurring from 2002 to 2005; and the 2007 ROP documents 3% per year, or 6% NO_x reductions occurring from 2005 to 2007 (attainment year). Each of these post-1999 ROP plans also contains adopted regulations and other measures needed to achieve the Post-1999 ROP requirements up to the attainment date and to attain the 1-hour ozone standard.

Table 5.1-1 through 5.1-8 contain the 2002, 2005, and 2007 ROP calculations and the emission reduction estimates. Each of the above-referenced plans demonstrates compliance with the ROP requirements, and in fact goes beyond the 3% per year reduction requirement of the FCAA.

Table 5.1-1
2002 ROP Required NOx Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season NOx Tons Per Day
July 26, 2000

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	794.85	14.37	337.03	198.08	1344.33
2	Adjusted Base Year EI Relative to 1999	794.85	14.37	262.23	198.08	1269.53
3	Adjusted Base Year EI Relative to 2002	794.85	14.37	252.46	198.08	1259.76
4	5% of Adjusted Base Year EI Relative to 1999					62.99
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	9.77		9.77
6	1999 Target Level					1191.77
7	2002 Target Level [steps(6-5-4)]					1119.01
8	2002 Emissions Forecast (Grown)	712.78	20.23	311.50	173.07	1217.58
9	Inventory Adjustment(see note 4)				72.69	72.69
10	2002 Emissions Forecast with Adjustment(8+9)	712.78	20.23	311.50	245.76	1290.27
11	Total Reductions Required by 2002 with growth [steps (10-7)]					171.26
12	Creditable Reductions to date (include 1996&1999 ROP)	95.00	0.00	36.49	0.00	131.49
13	***NOx Reduction Required for 2002 ROP***					39.77

Notes:

1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-2
NOx ESTIMATES TOWARDS 2002 9% ROP SIP - HOUSTON/GALVESTON
5% of 2002 ROP Reductions from NO_x
July 26, 2000

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2002	2002 Baseline	Percent
Area Sources	14.37	1.1%	46.7%	21.08	1.6%
Point Sources	794.85	63.1%	-10.3%	712.78	55.2%
On-road Mobile Sources	252.46	20.0%	23.4%	311.50	24.1%
Off-road Mobile Sources	198.08	15.7%	24.1%	245.76	19.0%
Total	**1259.76**		2.5%	**1291.12**	

Estimated NOx Reductions for 2002 ROP and 2003 Contingency

	Baseline	Total Reduction 1990 to 2002	Cumulative Total Reductions from Previous ROPs	2002 ROP Reduction	Percent of Requirement
	TPD	TPD	TPD	TPD	
Federally Mandated Controls					
NO_x RACT		95.00	95.00	0.00	0.00%
Tier I/II, I/M, RFG, NLEV, HDDV	311.50	69.30	36.49	32.81	82.50%
Gasoline utility engine rule, Marine recreational & HDDV standards (non-road)	245.76	23.57	0.00	23.57	59.27%
Federal Controls Subtotal				56.38	141.77%
State and Local Controls					
NO_x Point Source	712.78	0.00	0.00	0.00	0.00%
State and Local Controls Subtotal				0.00	
Total 2002 Control Strategy Reductions				**56.38**	
Contingency Strategy					
2003 Tier I/II, I/M, RFG, NLEV, HDDV				19.78	0.00%

Target Assessment	
NOx Reduction Required for 2002 ROP (target)	39.77
Creditable Reductions	56.38
Excess (Shortfall)	**16.61**
Required Contingency	12.60
Required Target + Contingency	52.37
Total Reductions	76.16
Excess (Shortfall)	**23.79**

Notes:
1) NO_x reductions will comprise 1/3 of the required contingency measure amounts of 3% of the adjusted base year EI. VOC reductions will comprise 2/3 of the required contingency measure amounts of 3% of the adjusted base year EI.

2) The value for the required NO_x reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3) Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

4) Due to time constraints, the on-road inventory and control reduction values were calculated using 24-hour/facility type methodology instead of time-of-day/link methodology. These values will be recalculated by December 2000, using the latter methodology.

Table 5.1-3
2002 ROP Required VOC Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season VOC Tons Per Day
July 26, 2000

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	483.28	200.07	251.52	129.98	1064.85
2	Adjusted Base Year EI Relative to 1999	483.28	200.07	153.01	129.98	966.34
3	Adjusted Base Year EI Relative to 2002	483.28	200.07	145.77	129.98	959.10
4	4% of Adjusted Base Year EI Relative to 1999					38.36
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	7.24		7.24
6	1999 Target Level					772.08
7	2002 Target Level [steps(6-5-4)]					726.48
8	2002 Emissions Forecast (Grown)	518.85	167.13	189.97	154.87	1030.82
9	Inventory Adjustment (see note 4)				4.65	4.65
10	2002 Emissions Forecast with Adjustment(8+9)	518.85	167.13	189.97	159.52	1035.47
11	Total Reductions Required by 2002 with growth [steps (10-7)]					308.99
12	Creditable Reductions to date (include 1996&1999 ROP)	176.85	45.21	40.77	21.11	283.94
13	***Required VOC reductions for 2002 ROP***					25.05

Notes:
1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-4
VOC ESTIMATES TOWARDS 2002 9% ROP SIP - HOUSTON/GALVESTON
4% of 2002 ROP Reductions from VOC
July 26, 2000

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2002	2002 Baseline	Percent
Area Sources	200.07	20.9%	-16.5%	167.13	16.2%
Point Sources	483.28	50.4%	7.4%	518.85	50.3%
On-road Mobile Sources	145.77	15.2%	30.3%	189.97	18.4%
Off-road Mobile Sources	129.98	13.6%	19.1%	154.87	15.0%
Total	**959.10**		7.5%	**1030.82**	

Estimated VOC Reductions for 2002 ROP and 2003 Contingency

	Baseline	Total Reduction 1990 to 2002	Cumulative Total Reductions from Previous ROPs	2002 ROP Reduction	Percent of Requirement
	TPD	TPD	TPD	TPD	
Federally Mandated Controls					
HON		0.47	0.47	0.00	0.00%
Pulp & Paper, RFG - Tanks & RFG - Loading Racks		14.53	8.41	6.12	24.43%
*RE Floating Tanks		26.96	26.86	0.10	0.40%
Gasoline utility engine rule, Marine recreational & HDDV standards	154.87	50.69	14.84	35.85	143.11%
Tier I/II, I/M, RFG, NLEV, HDDV	192.54	85.82	59.86	25.96	103.63%
Federal Controls Subtotal				68.03	271.58%
Total 2002 Control Strategy Reductions				**68.03**	**271.58%**
Contingency Strategy					
2003 Tier I/II, I/M, RFG, NLEV, HDDV				11.90	62.04%

Target Assessment	
VOC Reduction Required for 2002 ROP(target)	25.05
Creditable Reductions	68.03
Excess (Shortfall)	**42.98**
Required Contingency	19.18
Required Target + Contingency	44.23
Total Reductions	79.93
Excess (Shortfall)	**35.70**

Notes:

1) NO_x reductions will comprise 1/3 of the required contingency measure amounts of 3% of the adjusted base year EI. VOC reductions will comprise 2/3 of the required contingency measure amounts of 3% of the adjusted base year EI.

2) The value for the required VOC reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3) Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

4) Due to time constraints, the on-road inventory and control reduction values were calculated using 24-hour/facility type methodology instead of time-of-day/link methodology. These values will be recalculated by December 2000, using the latter methodology.

Table 5.1-5
2005 ROP Required NOx Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season NOx Tons Per Day
July 26, 2000

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	794.85	14.37	337.03	198.08	1344.33
2	Adjusted Base Year EI Relative to 2002	794.85	14.37	252.46	198.08	1259.76
3	Adjusted Base Year EI Relative to 2005	794.85	14.37	248.07	198.08	1255.37
4	9% of Adjusted Base Year EI Relative to 2005					112.98
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	4.39		4.39
6	2002 Target Level					1119.01
7	2005 Target Level [steps(6-5-4)]					1001.64
8	2005 Emissions Forecast (Grown)	713.12	20.73	322.51	185.69	1242.05
9	Inventory Adjustment(see note 4)				77.99	77.99
10	2005 Emissions Forecast with Adjustment(8+9)	713.12	20.73	322.51	263.68	1320.04
11	Total Reductions Required by 2002 with growth [steps (10-7)]					318.40
12	Creditable Reductions to date(include 1996,1999&2002 ROP)	95.00	0.00	69.30	23.57	187.87
13	***NOx Reduction Required for 2005 ROP***					130.53

Notes:
1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-6
NOx ESTIMATES TOWARDS 2005 9% ROP SIP - HOUSTON/GALVESTON
9% of 2005 ROP Reductions from NOx
July 26, 2000

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2005	2005 Baseline	Percent
Area Sources	14.37	1.1%	46.7%	21.08	1.6%
Point Sources	794.85	63.3%	-10.3%	713.12	54.0%
On-road Mobile Sources	248.07	19.8%	30.0%	322.51	24.4%
Off-road Mobile Sources	198.08	15.8%	33.1%	263.68	20.0%
Total	**1255.37**		5.2%	**1320.39**	

Estimated NOx Reductions for 2005 ROP and 2006 Contingency

	Baseline TPD	Total Reduction 1990 to 2005 TPD	Cumulative Total Reductions from Previous ROPs TPD	2005 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
NOx RACT		95.00	95.00	0.00	0.00%
Tier I/II, I/M, RFG, NLEV, HDDV	322.51	113.63	69.30	44.33	33.96%
Gasoline utility engine rule, Marine recreational & HDDV standards (non-road)	263.68	48.56	23.57	24.99	19.15%
Federal Controls Subtotal				69.32	
State and Local Controls					
NOx Point Source	713.12	599.00	0.00	599.00	458.90%
State and Local Controls Subtotal				599.00	
Total 2005 Control Strategy Reductions				**668.32**	
Contingency Strategy					
2006 Tier I/II, I/M, RFG, NLEV, HDDV				8.22	21.83%

Target Assessment

NO_x Reduction Required for 2005 ROP(target)	130.53
Creditable Reductions	668.32
Excess (Shortfall)	**537.79**
Required Contingency	37.66
Req'd Targ+Conting	168.19
Total Reductions	676.54
Excess (Shortfall)	**508.35**

Notes:

1) NO_x reductions will comprise all of the required contingency measure amounts of 3% of the adjusted base year EI. None of the contingency requirement will be taken from VOC reductions.

2) The value for the required NOx reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3) Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

4) Due to time constraints, the on-road inventory and control reduction values were calculated using 24-hour/facility type methodology instead of time-of-day/link methodology. These values will be recalculated by December 2000, using the latter methodology.

Table 5.1-7
2007 ROP Required NOx Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season NOx Tons Per Day
July 26, 2000

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	794.85	14.37	337.03	198.08	1344.33
2	Adjusted Base Year EI Relative to 2005	794.85	14.37	248.07	198.08	1255.37
3	Adjusted Base Year EI Relative to 2007	794.85	14.37	246.37	198.08	1253.67
4	6% of Adjusted Base Year EI Relative to 2007					75.22
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	1.70		1.70
6	2005 Target Level					1001.64
7	2007 Target Level [steps (6-5-4)]					924.72
8	2007 Emissions Forecast (Grown)	713.46	20.43	331.48	194.08	1259.45
9	Inventory Adjustment (see note 4)				81.51	81.51
10	2005 Emissions Forecast with Adjustment(8+9)	713.46	20.43	331.48	275.59	1340.96
11	Total Reductions Required by 2002 with growth [steps (10-7)]					416.24
12	Creditable Reductions to date (include 1996, 1999, 2002, & 2005 ROP)	694.00	0.00	113.63	48.56	856.19
13	***NOx Reduction Required for 2007 ROP***					-439.95

Notes:

1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-8
NOx ESTIMATES TOWARDS 2007 6% ROP SIP - HOUSTON/GALVESTON
6% of 2007 ROP Reductions from NOx
July 26, 2000

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2007	2007 Baseline	Percent
Area Sources	14.37	1.1%	46.7%	21.08	1.6%
Point Sources	794.85	63.4%	-10.2%	713.46	53.2%
On-road Mobile Sources	246.37	19.7%	34.5%	331.48	24.7%
Off-road Mobile Sources	198.08	15.8%	39.1%	275.59	20.5%
Total	**1253.67**		7.0%	**1341.61**	

Estimated NO_x Reductions for 2007 ROP and 2008 Contingency

	Baseline TPD	Total Reduction 1990 to 2007 TPD	Cumulative Total Reductions from Previous ROPs TPD	2007 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
NOx RACT		95.00	95.00	0.00	
Tier I/II, I/M, RFG, NLEV, HDDV	331.48	133.69	113.63	20.06	
Gasoline utility engine rule, Marine recreational & HDDV standards (non-road)	275.48	65.76	48.56	17.20	
Federal Controls Subtotal				37.26	
State and Local Controls					
NO_x Point Source	713.46	599.00	599.00	0.00	0.00%
State and Local Controls Subtotal				0.00	
Total 2007 Control Strategy Reductions				**37.26**	
Contingency Strategy					
2008 Tier I/II, I/M, RFG, NLEV, HDDV				7.69	20.45%

Target Assessment

NOx Reduction Required for 2007 ROP(target)	0.00
Creditable Reductions	37.26
Excess (Shortfall)	**37.26**
Required Contingency	25.07
Req'd Targ+Conting	25.07
Total Reductions	37.26
Excess (Shortfall)	**12.19**

Notes:
1) NO_x reductions will comprise all of the required contingency measure amounts of 3% of the adjusted base year EI. None of the contingency requirement will be taken from VOC reductions.

2) The value for the required NO_x reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3) Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

4) Due to time constraints, the on-road inventory and control reduction values were calculated using 24-hour/facility type methodology instead of time-of-day/link methodology. These values will be recalculated by December 2000, using the latter methodology.

CHAPTER 6: REQUIRED CONTROL STRATEGY ELEMENTS

Table 6-1.1 HGA NO_x Reduction Estimates[1]

September 8, 1993 Base Case Emissions Inventory	1993 Base Case (tpd)	Percent of 1993 Total	2007 Future Base	2007 Controlled (tpd)	Percent of 2007 Total
On-road mobile sources	416	32%	258	194	47%
Area and non-road mobile sources	155	12%	147	134	32%
Point sources[1]	695	54%	641	67	16%
Biogenic sources	18	1%	18	18	4%
TOTALS	**1284**	**100%**	**1071**	**413**	**100%**

[1]Totals may not equal 100% due to round-off.
[2]Point source inventory subject to revision. See Chapter 3, Section 3.5.3 for explanation.

6.1 OVERVIEW

The development of the attainment demonstration SIP for the HGA area has proved to be an extremely challenging effort, due to the large magnitude of reductions needed for attainment and the shortage of readily available control options. The emission reduction requirements included as part of this SIP revision represent substantial, intensive efforts on the part of stakeholder coalitions in the HGA area, in partnership with the commission. These coalitions, involving local governmental entities, elected officials, environmental groups, industry, consultants, and the public, as well as the commission and EPA, have worked diligently to identify and quantify control strategy measures for the HGA attainment demonstration.

In preparing this attainment demonstration, the commission has drawn upon resources, both within the state and across the nation, to attempt to identify control measures that are effective and reasonable. Several leading-edge, innovative control technologies are now approaching an advanced state of development due to the role played by Texas stakeholders in "pushing the envelope" to develop ozone control technologies. The nonattainment areas in our state, as well as nonattainment areas in other parts of the country, will be the direct beneficiaries of this proactive approach in Texas.

As promising as these new technologies may be, however, they alone are not yet adequate to bring the HGA area into attainment. Ideally, this attainment demonstration would rely upon technical solutions that provided the cleanest possible automobiles and trucks, ships, locomotives, aircraft, construction equipment, etc., within a few years' time. Unfortunately, the current state of technology, coupled with the inevitable lag time to achieve significant equipment turnover, prevents this scenario from being a reality by 2007, the attainment year.

For this reason, the commission must implement measures that rely on behavioral changes, in addition to technological controls. The task of attaining the federal ozone standard within the schedule mandated by the FCAA leaves little choice but to leave no stone unturned in the search for additional reductions. The commission is willing to consider any and all alternatives to the proposed attainment demonstration rules,

as long as the reductions are achieved in the necessary quantity and within the proper time frame to guarantee attainment.

A problem with identifying alternative control strategies is federal preemption, prescribed by the FCAA, in controlling on-road and non-road vehicles, ships, locomotives, and aircraft, among other sources. As a result of these preemption requirements, Texas is prohibited from effectively addressing all of the sources of air pollution that must be reduced if attainment is to be achieved. This situation conflicts with the FCAA's presumed intention of having federal controls act in cooperation with state and local measures to reach attainment of air quality standards. For this reason, the state emphatically calls on EPA to accelerate its activities, which also happen to be mandated by the FCAA, in promulgating emission controls for these sources.

In order for the state to have an approvable attainment demonstration, the EPA has indicated that the state must adopt those strategies modeled in the November 1999 SIP submittal, and then adopt sufficient measures to close the remaining gap in NO_x emissions. The modeling included in this proposal indicates an emissions gap such that an additional 78 tpd of NO_x reductions is necessary for an approvable attainment demonstration.

The HGA nonattainment area will need to ultimately reduce NO_x by more than 750 tons per day to reach attainment with the 1-hour ozone standard. In addition, a VOC reduction of about 25% will also have to be achieved. Implementation of the rules and other control measures contained in this SIP revision will close the gap and achieve attainment of the 1-hour ozone standard in the HGA area by November 15, 2007, the date required for attainment. Table 6.1-2 provides a summary of the NO_x control strategies and reductions for the HGA attainment demonstration.

Table 6.1-2: Summary of Control Strategies and NO_x/VOC Estimated 2007 Reductions for the HGA Attainment Demonstration

Type of Measure	Description	NO_x	VOC
EXISTING FEDERAL MEASURES			
Federal on-road	- These reduction estimates reflect the difference of 1993 vs. 2007 on-road emissions, which consider the effect of federal controls and growth	158	108
Federal area/non-road	- These reduction estimates reflect the difference of 1993 vs. 2007 area and non-road emissions, which consider the effect of federal controls and growth	8	35
	Federal Measures Total	166	143
STATE			
A. Base Measures (November 1999 SIP) **1. State Rules**			

Point Source NO_x	- Requires a wide variety of minor and major stationary sources to meet new emission specifications and other requirements in order to reduce NO_x emissions - Requires overall NO_x reductions of 90% from these sources - Requires sources with a design capacity to emit 10 tpy or more to participate in the proposed mass emission cap and trade program	599	0.0
Emissions Banking and Trading Program	- Creates an overall NOx Mass Emission Cap and Trade Program for the HGA area. - Creates a partial bridge between the existing Emissions Banking and Trading Programs and the Mass Emission Cap and Trade Program to provide maximum flexibility in meeting the SIP requirements - Revises current open market rules currently located in 101.29 to: 1) consolidate banking and trading rules into one location (101, Subchapter H) 2) require registration of emission reduction credits within 180 days of the actual reduction 3) provide an improved mechanism for mobile sources to generate credits 4) guarantee that actual emission reduction are not double counted, ie, shown as a reduction in the SIP and banked for future use.	–	--
Inspection/ Maintenance	- Requires ASM or equivalent testing as well as OBD testing - Begins May 1, 2002 for Harris County - Begins May 1, 2003 for Brazoria, Fort Bend, Galveston, and Montgomery Counties - Begins May 1, 2004 for Chambers, Liberty, and Waller Counties	42.03	16.55
Construction Equipment Operating Restrictions	- Establishes a restriction on the use of HDD construction equipment from 6:00 a.m. - noon starting in April 2005 - Only applies during Daylight Savings Time each year (1st weekend in April through last weekend in October) - Exempts wet concrete operations and emergency operations - Provides an exemption from the rule if an alternative plan is submitted assuring equivalent emission reductions	8 tpd shifted (6.7 tpd equivalent NO_x reduction)	----

Cleaner Diesel Fuel	- By May 1, 2002, the fuel will have improved aromatics and cetane for all on-road sales statewide and for all on- and off-road sales in East/Central Texas - By May 1, 2004, sulfur will be reduced to 30 ppm in East/Central Texas for on- and off-road fuel - By May 1, 2006, all on-road fuel statewide will go to 15 ppm and off-road fuel will go to 15 ppm in East/Central Texas	6.84 (HGA on- and off-road)	0.0
Low Sulfur Gasoline	- Requires a low sulfur gasoline (15 ppm) - Enhances emissions performance of newer cars - Begins May 1, 2004	1.15	0.12
Lawn Service Equipment Operating Restrictions	- Restricts the use of small gasoline equipment between the hours of 6:00 a.m. - noon starting in 2005 - Only applies April 1 through October 31 each year	0.58 tpd shifted (7.7 tpd equivalent NO_x reduction)	---
VOC RACT	- Implements RACT requirements for batch processes, bakeries, and offset lithographic printers	--	--
2. Local Measures			
VMEP	- SIP control strategy (no rule required) - Numerous projects have been identified by the H-GAC for inclusion in the SIP such as telecommuting, bus fare promotions, alternative fuel programs, and ozone action days	24	0.0
	Base Measures Total	**687.42**	**16.67**
B. Gap Measures (April 2000 SIP) **1. State Rules**			
Accelerated Purchase of Tier 2/Tier 3 Diesel Equipment	- Requires the early retirement of older equipment and purchase of newer, cleaner off-road diesel equipment - Phased-in implementation beginning in December 2004 - Provides an exemption from the rule if an alternative plan is submitted assuring equivalent emission reductions	12.20	1.86

Residential and Commercial Air Conditioners	-	Requires new units to reduce ozone by at least 70% and retain a minimum efficiency of 50% for 15 years	13.00	---
	-	Begins January 1, 2002		
NO_x Reduction Systems	-	Requires a reduction system for locally registered (8 HGA counties) on-road pre-1997 diesel trucks over 10,000 pounds by May 1, 2004	16.25	0.0
	-	Requires a reduction system for locomotives and commercial marine vessels over 175 horsepower by May 1, 2004		
	-	Requires a reduction system for all locally registered on-road heavy duty pre-1997 gasoline powered trucks over 10,000 pounds by May 1, 2004		
Speed Limit Reduction	-	The speed limit on all roadways with a current maximum speed limit above 55 mph would be reduced to 55 mph in the 8-county area	18.27	1.40
	-	Starts May 1, 2002		
Diesel Emulsion	-	Requires retail on-road diesel fuels sales for heavy-duty vehicles over 10,000 pounds to be diesel emulsion fuels	10.7	0.0
	-	Requires off-road diesel equipment over 175 hp to use diesel emulsion fuels		
	-	Begins May 1, 2004		
Airport GSE	-	Requires GSE fleets to reduce emissions by 90% by 2005	5.09	0.0
	-	Phased-in implementation: 20%, 50%, 90%, in 2003, 2004, 2005 respectively		
	-	Allows for the implementation of alternative emission reduction measures which produce equivalent NO_x reductions		
California Spark-Ignition Engines	-	Requires manufacturers to ensure that all affected large spark ignition engines are certified to California LSI standards	2.80	7.58
	-	Exempts agriculture and construction equipment less than 175 hp, recreational equipment, stationary engines, marine vessels, and equipment on tracks		
	-	Statewide rule		
Vehicle Idling Restrictions	-	Limits idling for all vehicles over 14,000 pounds to five consecutive minutes	0.92	0.36
	-	Begins April 1, 2001		
	-	Only applies from April 1 through October 31 each year		

Gas-fired Water Heaters, Small Boilers, And Process Heaters	- Rule already adopted for statewide sales of water heaters, small boilers, and process heaters	0.50	0.0
2. Local Measures			
Energy Efficiencies for Buildings	- Local and/or legislative measure	2.00	---
TCMs	- SIP control strategy (no rules required). - Numerous projects have been identified by H-GAC for inclusion in the SIP, such as traffic signalization and bicycle/pedestrian projects.	2.73	4.51
	Gap Measures Total	84.46	15.71
	Gap	**78**	
	Surplus	**6.46**	

6.2 VOC RULE CHANGES

The commission recognizes that a number of the NOx gap measures also result in VOC reductions that have not been taken into account. The commission will be working with EPA to explore an appropriate mechanism to account for these associated reductions.

6.2.1 VOC RACT Fix-ups

The proposed revisions to Chapter 115 implement RACT requirements for batch processes, bakeries, and offset lithographic printers in the HGA ozone nonattainment area. The proposed revisions will ensure that RACT is in place for all major VOC sources in HGA.

6.3 NO_x RULE CHANGES

6.3.1 Point Source NO_x

The proposed changes to Chapter 117 require a wide variety of stationary sources of NO_x emissions in the HGA ozone nonattainment area to meet new emission specifications and other requirements in order to reduce NO_x emissions and ozone air pollution. The affected equipment types and processes include electric utility boilers and gas turbines, ICI boilers and gas turbines, duct burners used in turbine exhaust ducts, process heaters and furnaces, stationary internal combustion engines, fluid catalytic cracking units (including catalyst regenerators and associated CO boilers and furnaces), pulping liquor recovery furnaces, lime kilns, lightweight aggregate kilns, heat treating and reheat furnaces, magnesium chloride fluidized bed dryers, incinerators (including fume abaters), hazardous waste-fired BIFs at major sources in HGA, and stationary internal combustion engines and ICI boilers and process heaters at minor sources in HGA. Demonstrated control technology is available to achieve these NO_x reductions. The proposed rules will result in an estimated 90% reduction in NO_x emissions, or 599 tpd, from major sources of NO_x in HGA.

6.3.2 Emissions Banking and Trading Program

The proposed emissions banking and trading program has been designed to offer maximum flexibility to air emission requirements by allowing the generation and use of ERCs, MERCs, DERCs, and MDERCs. Flexibility has been built into the proposed rule to create incentives for the early or permanent retirement of VOC, NO_x and other criteria pollutants. The intent of the proposed rule is to streamline the emissions banking and trading program by combining the rules relating to stationary emission credits and mobile emission credits to achieve continuity within the two programs. Also, a NO_x mass emission cap and trade program is being established which creates a cap for sources of NO_x emissions in the HGA nonattainment area.

6.3.3 Inspection/Maintenance

The HGA area is expanding and revising the vehicle emissions I/M program as an additional control strategy option. Beginning January 1, 2001, Harris County will incorporate OBD testing into the current two-speed idle program. (It is expected that EPA will soon publish a notice of proposed rulemaking (NPRM) which will postpone the requirement to conduct OBD testing in I/M program areas for one year beginning January 1, 2001. The commission may adjust OBD test requirements based on information contained in the NPRM). Beginning May 1, 2002 Harris County will begin emissions testing utilizing OBD and ASM-2 or a vehicle emissions testing program that meets SIP emission reduction requirements and is approved by EPA. Beginning May 1, 2003, Galveston, Montgomery, Brazoria, and Fort Bend Counties will begin emissions testing utilizing OBD and ASM-2 or a vehicle emissions testing program that meets SIP emission reduction requirements and is approved by EPA. Chambers, Liberty, and Waller Counties will begin the OBD and ASM-2 program or a vehicle emissions testing program that meets SIP emission reduction requirements and is approved by EPA beginning May 1, 2004. Program expansion is essential for reduction of NO_x emissions to be able to demonstrate attainment with the NAAQS for ozone. The commission staff estimates that NO_x reductions in 2007 will be 42.03 tpd.

6.3.4 Construction Equipment Operating Restrictions

This strategy implements operating restrictions for HDD construction equipment rated 50 hp and greater, between the hours of 6:00 a.m. to noon during Daylight Savings Time, which begins on the first Sunday in April and ends on the last Sunday in October, starting April 3, 2005. The commission has developed this strategy to cover the entire 8-county HGA ozone nonattainment area. The involvement of all eight counties as part of the NO_x emission control strategy is necessary for the area to demonstrate attainment of the ozone NAAQS.

The commission developed these operating restrictions in the HGA area in order to limit ozone production, and to enable the counties in the HGA ozone nonattainment area to attain compliance with the NAAQS for ozone.

Commission staff has estimated that the construction equipment operating restrictions will shift approximately 8.0 tons per day of NO_x to the afternoon. By shifting the hours of operation for HDD construction equipment until after noon during the effective time period, the NO_x emissions will not mix in the atmosphere with other ozone-causing compounds until later in the day. Ozone is formed through chemical reactions between natural and man-made emissions of VOC and NO_x in the presence of sunlight. Higher ozone levels occur most frequently on hot summer afternoons. The critical time for the mixing of NO_x and VOCs is early in the day. By delaying the release of NO_x emissions from construction equipment until later in the day, production of ozone will be stalled until optimum conditions no longer apply thus avoiding the production of higher levels of ozone.

Units of state and local government within the HGA ozone nonattainment area that have ongoing construction projects may experience significant fiscal impacts from the adoption of this rule. According to TxDOT, TxDOT's Houston and Beaumont districts (which include Harris, Brazoria, Fort Bend, Galveston, Chambers, Liberty, Montgomery, and Waller counties) spent over $464 million during calendar year 1999 for road and bridge construction projects in the HGA area. Based on the TxDOT expenditures, an estimated 15-20% cost increase due to delays and extended construction schedules would add $70-93 million annually to TxDOT-related construction costs in the HGA area. Note, these figures only apply to TxDOT-related road and bridge construction costs. Because the proposed rule does not require additional control equipment or new technology, the commission does not anticipate significant economic impacts to affected agencies and businesses beyond the shift in work schedule and possible implications caused by potential construction delays attributable to the proposed amendments. Delaying use of HDD construction equipment until after noon may require affected state and local agencies and businesses to adjust their work schedules, and could cause extensions of construction time lines. The fiscal impact of potential delays would depend on the scope, magnitude, and time-critical nature of the construction projects.

Exemptions allow for the operation of any heavy-duty diesel construction equipment used exclusively for emergency operations to protect public health and the environment. In addition, HDD construction equipment used in the mixing, transporting, pouring, or processing of wet concrete is also proposed for exemption. Also, operators that submit an emissions reduction plan by May 31, 2002, which the executive director and the EPA approve by May 31, 2003, will be exempt from this rule and will be permitted to operate during the restricted time period. The emission reduction plan must describe in detail how the operator will modify his behavior or fleet of equipment to reduce NO_x emissions by the implementation date in 2005 by a target amount equivalent to the total NO_x reductions achieved by implementation of the rule from which the operator is applying for exemption. Owners or operators may submit plans to apply for exemption from either the Construction Equipment Operating Restrictions rule or the Accelerated Purchase of Non-road Heavy-duty Diesel Equipment rule, or from both rules. The owners/operators' plans must contain emission reductions equivalent to the total NO_x reductions achieved by the rule or rules from which they are applying for exemption.

Construction Industry Reduction Goal

The construction industries in the HGA contribute to the overall air quality challenges faced by the HGA area. They also will contribute, in substantial part, to the solution. It is possible to determine how much emissions come from non-road diesel construction equipment and then apply the emission reduction goals of the various programs to this inventory to arrive at an estimated overall goal for non-road diesel powered construction equipment in the 8-county HGA area. The commission has estimated this number to be 20.75 tons of NO_x per day. A photochemical model run was used to estimate the equivalent NO_x reductions achieved by a shift in the construction work day. This was determined to be equivalent to removing 6.7 tpd of NO_x from the inventory. The accelerated purchase of Tier 2/Tier 3 equipment as applied to the construction inventory was determined to be 10.62 tpd of NO_x. LED fuel again applied to just non-road construction equipment was estimated at 1.45 tpd NO_x, and finally, diesel emulsion fuel applied to non-road diesel construction equipment was 1.98 tpd of NO_x. Adding these measures together arrives at the 20.75 tpd estimated above.

Port Estimated Emission Reductions

There are a number of sea ports located in the HGA area. These ports contribute to the economy of the HGA area. They also contribute, in some part, to the air quality challenges the HGA area faces and will play a significant role in the air quality improvement plan. There are several measures, all of which may be quantified, which apply to the port industries. These measures can be added together to arrive at an

emissions reduction target for the HGA area port industries. The port industries contribute a little less than 3% (2.7%) of the overall non-road emissions in the HGA area. This fraction of the emissions inventory can be used to calculate the reduction amount from each proposed measure for which the port is responsible. The measures that apply to the port are: the construction equipment operating restriction, accelerated purchase of Tier 2/ Tier 3 diesel equipment, diesel emulsions, and low emission diesel fuel. Applying the emission reductions to the percentage of contribution of the port, the total number of reductions which are estimated to be the port's responsibility is 1.56 tpd of NO_x. See the following methodology:

HGA Ports Estimated Emissions Contributions	
Port Equipment Inventory	2.7 (based on TNRCC Non-road run and Port inventory data)
Total industrial Diesel Inventory	6.65
Total construction Diesel Inventory	31.60
Total industrial + construction inventory	38.25
Port Fraction	0.07

HGA Ports Estimated Emission Reduction Goal from Nonroad Cargo Handling Equipment		
	Updated NOx Reduction (tpd)	Proportional Maritime Share NO_x
Construction Equipment Operating Restriction	6.7	0.47
Accelerated Purchase of Tier 2/Tier 3 Equipment	11.48	0.81
Diesel Emulsions	2.08	0.15
LED Fuel	1.85	0.13
Total		**1.56**

6.3.5 Cleaner Diesel Fuel

This strategy implements a state LED fuel program requiring diesel fuel producers and importers, beginning May 1, 2002, to ensure that all diesel fuel used statewide for on-road use does not exceed 500 ppm sulfur, contains less than 10.0% by volume of aromatic hydrocarbons, and has a minimum cetane number of 48. Alternative diesel fuel formulations that achieve equivalent emission reductions may also be used. In addition, these same requirements must be met for all diesel fuel used for non-road use in the HGA, BPA and DFW ozone nonattainment areas and in an additional 95 East and Central Texas counties. The state LED fuel program also requires that, beginning May 1, 2004, the sulfur content be reduced to 30 ppm sulfur in both on-road and non-road diesel fuel in the HGA, BPA, and DFW ozone nonattainment areas, and in an additional 95 East and Central Texas counties, and then reduced again to 15 ppm sulfur beginning May 1, 2006. The fuel required by the state LED fuel program will have a lower aromatic

hydrocarbon content and a higher cetane number in each gallon of diesel than required by current federal regulations for on-road diesel.

The state LED fuel program will lower NO_x emissions from diesel fueled compression-ignition engines in the affected areas. Because NO_x emissions are precursors to ground-level ozone formation, reduced emissions of NO_x will result in ground-level ozone reductions. By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment statewide by 30 tpd, of which 6.84 tpd of reductions will be achieved in the HGA ozone nonattainment area.

The state LED fuel program will require LED fuel statewide for on-road use. In addition, the state LED fuel program will require LED fuel for both on-road and non-road use in the eight counties in the HGA ozone nonattainment area, which comprise Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties; the three counties of the BPA ozone nonattainment area, which comprise Hardin, Jefferson, and Orange Counties; the four counties of the DFW ozone nonattainment area, which comprise Collin, Dallas, Denton, and Tarrant Counties; and 95 additional East and Central Texas counties comprising Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bell, Bexar, Bosque, Bowie, Brazos, Burleson, Caldwell, Calhoun, Camp, Cass, Cherokee, Colorado, Comal, Cooke, Coryell, De Witt, Delta, Ellis, Falls, Fannin, Fayette, Franklin, Freestone, Goliad, Gonzales, Grayson, Gregg, Grimes, Guadalupe, Harrison, Hays, Henderson, Hill, Hood, Hopkins, Houston, Hunt, Jackson, Jasper, Johnson, Karnes, Kaufman, Lamar, Lavaca, Lee, Leon, Limestone, Live Oak, Madison, Marion, Matagorda, McLennan, Milam, Morris, Nacogdoches, Navarro, Newton, Nueces, Panola, Parker, Polk, Rains, Red River, Refugio, Robertson, Rockwall, Rusk, Sabine, San Jacinto, San Patricio, San Augustine, Shelby, Smith, Somervell, Titus, Travis, Trinity, Tyler, Upshur, Van Zandt, Victoria, Walker, Washington, Wharton, Williamson, Wilson, Wise, and Wood counties.

The state LED fuel program will require diesel fuel producers and importers that provide fuel to the affected area to register with the commission. In addition, the state LED fuel program will require diesel fuel producers and importers to test fuel samples for compliance and keep records of the test results. Diesel fuel producers and importers will also be required to submit a report to the commission for compliance on each blend batch and a quarterly summary report of the results from the fuel testing. All parties in the fuel distribution system (producers, importers, pipelines, rail carriers, terminals, truckers, and retailers) will be required to keep records of product transfer documents for two years. Retail fuel dispensing outlets will be exempt from all of the state LED fuel program's testing and recordkeeping requirements except for the keeping of product transfer documents.

SECTION 211(C)(4)(C) WAIVER REQUEST

Section 211(c)(4)(A) of the FCAA prohibits states from prescribing or attempting to enforce any "control or prohibition" of a "characteristic or component of a fuel or fuel additive" if the EPA has promulgated a control or prohibition applicable to such characteristic or component under section 211(c)(1). EPA regulates diesel fuel used in on-road applications in Title 40 CFR Section 80.29. Section 211(c)(4)(C) provides an exception to this prohibition for a nonidentical state standard contained in a SIP where the standard is "necessary to achieve" the primary or secondary NAAQS that the SIP implements. EPA can approve a SIP provision as necessary if the Administrator finds that "no other measures exist and are technically possible to implement, but are unreasonable or impracticable." Therefore, Texas is submitting this revision to the SIP as adequate justification and is requesting from EPA a waiver from Section 211(c)(4)(A) of the FCAA to implement a state LED fuel program in the areas defined in this SIP revision. Texas is requesting this waiver for the state regulation of on-road diesel fuel only, since EPA does not regulate diesel fuel used in non-road applications and as such, no waiver is required.

Waiver Requirements for Alternative Fuel Specifications

Under Section 211 (c)(4)(C) of the FCAA, EPA may approve a non-identical state fuel control as a SIP provision, if the state demonstrates that the measure is necessary to achieve the national primary or secondary NAAQS that the plan implements. EPA can approve a state fuel requirement as necessary only if no other measure exists that would bring about timely attainment, or if other measures exist but are unreasonable or impracticable.

If a state decides to pursue a state fuel requirement, the state must submit a SIP revision adopting the state fuel control and apply for a waiver from federal preemption. The state must include in its petition specific information showing the measure is necessary to meet the ozone NAAQS, based on the statutory requirements for showing necessity. The waiver request must:

Identify the quantity of reductions needed to reach attainment of the NAAQS;

- Identify possible other control measures and the quantity of reductions each would achieve;
- Explain in detail, with adequate factual support, which of those identified control measures are considered unreasonable or impracticable; and
- Show that even with the implementation of all reasonable and practicable measures, the state would need additional emissions reductions for timely attainment, and the state fuel measure would supply some or all of such additional reductions.

Determining Whether Other Measures are Unreasonable or Impracticable

In determining whether ozone control measures are unreasonable or impracticable, reasonableness and practicability are determined in comparison to the state-specific fuel control program.

While the basis for finding unreasonableness or impracticability is in part comparative, the state still must provide solid reasons why the other measures are unreasonable or impracticable and must demonstrate these reasons with adequate factual support. Reasons why a measure might be unreasonable or impracticable for a particular area include, but are not limited to, the following:

- Length of time to implement the measure;
- Length of time to achieve ozone reduction benefits;
- Degree of disruption entailed by implementation;
- Other implementation concerns, such as supply issues;
- Costs to industry, consumers, or the state;
- Cost-effectiveness; and
- Reliance on commercially unavailable technology.

A strong justification for finding a measure unreasonable or impracticable might rely upon the combination of several of these reasons.

THE NEED FOR THE STATE LOW EMISSION DIESEL PROGRAM

The commission has developed a NO_x control strategy consisting of a state LED fuel program that it believes is an essential element in the control strategy package needed for the HGA ozone nonattainment area to be able to demonstrate attainment of the ozone NAAQS. The fuel that is required by the state LED fuel program is a low aromatic hydrocarbon/high cetane diesel fuel which will be required statewide for use by on-road diesel fueled compression-ignition engines and for both on-road and non-road diesel fueled compression-ignition engines in the HGA, BPA, and DFW ozone nonattainment areas and in an additional 95 East and Central Texas counties. The state LED fuel program was originally developed as a NO_x control strategy for the DFW ozone nonattainment area, and state regulations were adopted to

implement this strategy in the DFW area. The state LED fuel program developed for this SIP revision is an expansion of the DFW program, but with additional requirements.

The commission's current understanding, based upon national studies as well as the commission's own studies, is that ozone must be controlled at two levels: the regional level and the urban level. Historically, the FCAA has limited states to addressing the ozone problem at the local level. Recently, however, this has begun to change. The EPA has started to incorporate the findings of the OTAG, the SOS, and the advice of stakeholders (e.g., the FACA Subcommittee on Ozone, Particulate Matter, and Regional Haze Implementation) into recent policy guidance, encouraging states to factor regional reductions into their control plans.

On a national level, the OTAG study and its findings are particularly noteworthy. OTAG was established by the EPA to work with states in the eastern portion of the country to develop strategies to address the regional ozone problem. Among the group's determinations were that ozone is pervasive; ozone and the compounds that form it are transported both at lower levels of the atmosphere and aloft from one day to the next; and reductions of ozone precursors over a large area are beneficial in lowering regional background levels of ozone.

The commission's own studies have provided evidence that there is regional transport of ozone and ozone precursors in Texas, and that regional reductions of ozone precursors are beneficial. The commission's own modeling studies have shown that pollutant sources across Texas contribute to regional background levels of ozone, and that regional reductions of ozone precursors will lower the regional ozone background levels. These studies and upper air monitoring have found that regional air pollution should be considered when studying air quality in Texas' ozone nonattainment areas. This work is supported by the OTAG study which is the most comprehensive attempt ever undertaken to understand and quantify the transport of ozone. Both the commission and OTAG study results point to the need to take a regional approach, such as that described in the regional control strategy adopted by the commission, to control air pollutants.

Lowering regional background ozone through a regional strategy will serve three purposes. It will give existing nonattainment areas the flexibility to design optimal local control strategies to help them attain the 1-hour and 8-hour ozone standards. It will help areas which are currently close to violating the standards to avoid actually violating. And, over the longer term, it will help keep the developing areas of the state from ever violating the standards.

The regional aspect of the state LED fuel program was developed to provide LED fuel for use in areas of the state that could potentially have a negative air quality impact on current ozone nonattainment areas, near nonattainment areas, and future areas of concern. For example: the HGA ozone nonattainment area currently needs every possible emission reduction to demonstrate attainment; the BPA nonattainment area's attainment goals are heavily influenced by transport from HGA; the DFW ozone nonattainment area is also impacted by transport and has little leeway to handle additional emissions based on their current attainment demonstration modeling; and several near-nonattainment areas for the new 8-hour standard are seeking immediate reductions to preclude a nonattainment area designation. All of these areas will benefit from the reductions attributed to the regional aspect of the state LED fuel program.

The main attractiveness of the fuel-based strategy is that it has a more immediate impact than other controls. Once the fuel is in the marketplace, it begins having an immediate air quality impact as both old and new vehicles and non-road equipment begin using the new fuel.

The fuel required by the state LED fuel program was chosen based upon the following reasons:

- Emissions performance;
- Effect on advanced technology vehicles and engines;
- Impacts on non-road emissions;
- Modeling;
- Distribution;
- Transport; and
- Length of time needed to achieve benefits.

Emissions Performance

State and federal modeling has shown that reductions in NO_x continue to contribute to reductions in ozone. The use of LED fuel will reduce emissions of NO_x from diesel fueled compression-ignition engines in the eight county HGA ozone nonattainment area. The statewide implementation of LED fuel for on-road use will help reduce emissions in the HGA ozone nonattainment area from on-road vehicles that are transiting the area but fueling outside of the nonattainment area counties. The LED fuel is also beneficial in that NO_x emission reductions will be seen in all diesel fueled compression-ignition engines in the HGA ozone nonattainment area - both old and new and from on-road and non-road applications.

Effect on Advanced Technology Vehicles and Engines

Through the NLEV program and agreements between the heavy-duty engine manufacturers and EPA, vehicle and engine manufacturers have made a commitment to introduce cleaner vehicles and engines to the nation earlier than what would have been required by the FCAA. The NO_x reductions from this federal action will not be enough to get Texas where it needs to be in relation to overall air quality. Improvements in diesel fuel quality alone will not be enough. However, an improvement in diesel fuel quality as the result of a state LED fuel program, combined with the advanced vehicle and engine technology, will bring Texas closer to achieving its overall air quality goals. In addition, the state LED fuel program will benefit engine retrofit efforts in the HGA, BPA, and DFW ozone nonattainment areas by providing lower sulfur diesel fuel to these areas beginning May 2004.

Impacts on Emissions from On-road Vehicles and Non-road Engines

By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment statewide by 30 tpd, of which 6.84 tpd of reductions will be achieved in the HGA ozone nonattainment area.

Modeling

The commission contracted with ERG to estimate the on-road and non-road NO_x emissions benefits associated with adopting the LED rule for the HGA, BPA, and DFW areas, the affected 95 East and Central Texas counties, as well as the state as a whole, for a typical ozone summer day in 2007. The modeling performed by ERG for this SIP revision assumed that state LED fuel will be similar to California diesel fuel (CA diesel) in terms of the specifications (sulfur content, aromatic content, and cetane). Thus the emission benefits for the state LED fuel (compared to CA diesel) are based upon the switch from current Federal diesel (industry standard) to CA diesel.

Modeling Methodology for the HGA and DFW Ozone Nonattainment Areas

CA diesel fuel benefits were evaluated relative to industry average on-road diesel fuel, as provided in EPA's HDEWG report. ERG compared the regression equations generated under the HDEWG study with those from the European Auto Oil study. Given similar inputs, these models tend to agree in their NO_x predictions, with less than a 2.0% difference. Selecting the HDEWG model, NO_x reductions are predicted

to be 5.7% for on-road engines with electronic controls (i.e., 1990 and later models for the most part). Note that the European Auto Oil equations estimated a 4.1% NO_x reduction for the same engines.

Also note that pre-1990 engine benefits were estimated using CARB test data from 1988. While this data set is thin, it is the only data available for estimating aromatics effects in pre-electronic control engines (estimated at 7% for NO_x). Therefore, ERG relied on this estimate for the older portion of the on-road fleet as well as the entire off-road diesel fleet.

On-Road Modeling Methodology for Statewide and for the 95-county Region plus the BPA Ozone Nonattainment Area

ERG developed baseline emission estimates for heavy-duty diesel vehicles using MOBILE5b, and county-specific inputs as well as projected vehicle miles traveled estimates for these vehicles. Resulting emissions were adjusted by the LED benefit estimate developed for the Dallas nonattainment area rulemaking. The following summarizes ERG's methodology and assumptions used to estimate ton per day NO_x reductions for this measure.

ERG developed individual MOBILE5b input files for the 95 counties in order to develop baseline NO_x emission inventories for each area. ERG used existing data sources to develop the baseline emission inventories. Table 6.3-1 summarizes the data sources used for each of the key input parameters.

Table 6.3-1. Data Sources for Statewide and 95-county Region Inventory Development

Input Parameter	Source
Vehicle registration distributions	1997 TxDOT records, by county
Average vehicle speed (excluding Travis, Hays, Williamson, and Bexar counties)	By county, from TTI COAST Modeling Project
Travis and Williamson County speeds	1996 TTI Conformity Modeling
Bexar County speed	1995 TTI Conformity Modeling
Hays County speed	Assumed equal to Comal County (due to I-35 location and proximity to major urban areas)
VMT per day (2007)	By county from E.H. Pechan Tier 2 Study for EPA, projected from HPMS data
HDD VMT fraction	By county from E.H. Pechan Tier 2 Study for EPA, projected from HPMS data

With the exception of the county-specific registration and speed inputs, ERG used default MOBILE5b settings, with the introduction of the new HDD emission standards in 2004. Once HDD gram per mile emission factors were estimated for each county, these were combined with HDD VMT estimates to determine total NO_x tpd emissions for the region as a whole (116 tpd).

County-specific data for the remaining counties in the western part of the state are quite limited, due to the lack of conformity and related modeling efforts for this region. Therefore, ERG developed an alternative approach for estimating NO_x inventories for these counties. The three counties in the BPA ozone nonattainment area (Hardin, Jefferson, and Orange) have also been included in this analysis.

ERG used the MOBILE5b input files from E.H. Pechan's National Tier 2 analysis for this effort. These input files contained detailed registration distributions for each region. Pechan grouped together counties

with similar roadway, vehicle, and speed profiles for their analysis. Table 6.3-2 summarizes the county groupings used by Pechan to generate representative NO_x emission factors.

Table 6.3-2. Pechan's County Groupings for MOBILE5b Inputs

Representative County	Counties Represented
El Paso	El Paso only
Hardin	Hardin only
Jefferson	Jefferson only
Orange	Orange only
Anderson	All other "western" counties

ERG obtained the representative input files from Pechan in order to develop appropriate emission factors. However, these files were developed for use in post-processing with roadway specific speed data not currently available to ERG. Therefore, ERG ran each of the Pechan input files at 33.1 and 54.0 mph, the respective low and high speeds seen in the 95-county region data set, to "bracket" the likely emission factors for these counties. Table 6.3-3 summarizes the emission factors associated with the low- and high-end speeds, for each county grouping.

Table 6.3-3. Grams per Mile as a Function of Low/High Speed Assumption, by County Group

Representative County	Low Speed g/mi	High Speed g/mi
El Paso	7.13	9.53
Hardin	6.98	9.32
Jefferson	6.76	9.03
Orange	7.50	10.02
Anderson	6.70	8.95

As with the previous analysis, the Pechan input files accounted for the effect of the 2004 HDD engine standards.

Once obtained, the g/mi values were combined with Pechan's 2007 VMT estimates for each county to generate tpd values for NO_x from HDD vehicles. The resulting value for all 147 counties was 89.35 tpd.

Using a previous analysis, ERG estimated the NO_x reductions expected from adopting the California diesel fuel specifications in various Texas nonattainment areas. The specifications for Texas LED are essentially identical to the CARB specifications for the purposes of NO_x estimation. Therefore, ERG used the previous estimate of a 5.7% NO_x reduction to determine expected tpd benefits for the different regions. It was noted that pre-1990 mechanically-controlled engines were estimated to achieve a 7.0% reduction. However, given the small amount of total heavy diesel VMT attributable to these engines in 2007, ERG did not differentiate the benefit estimate by model year, but simply applied the 5.7% reduction uniformly across the entire inventory.

It is important to note that these benefit estimates are independent of the fuel sulfur level. Sulfur level only has an impact on NO_x emissions when catalysts are in place. At this time, EPA and automakers do not believe that advanced NO_x catalysts will be required to meet the upcoming 2004 emission standards. Therefore, fuel sulfur level was not considered in this modeling analysis.

Non-road Modeling Methodology for the BPA Ozone Nonattainment Area and Additional 95-County Region

ERG developed baseline emission estimates for HDD engines using EPA's draft Non-road model for each county. Resulting emissions were adjusted by the LED benefit estimate developed for the Dallas nonattainment area rulemaking. The following summarizes ERG's methodology and assumptions used to estimate ton per day NO_x reductions for this measure.

The current non-road emission inventories for the HGA and DFW nonattainment areas are based on EPA's NEVES study from 1991 (with the exception of construction, commercial marine, and airport GSE, which were recently revised using bottom-up survey data.). However, the NEVES study did not provide emissions estimates for attainment areas. Therefore, ERG relied upon EPA's draft Non-road model to generate NO_x inventories for non-road diesel engines operating in the 95-county area. Non-road has the ability to allocate statewide equipment population estimates to the county level.

The following Non-road equipment categories were evaluated for diesel engines in each county:

- Construction
- Agricultural
- Commercial
- Industrial
- Lawn and Garden
- Logging

The following categories were excluded from the non-road analysis because their aggregate NO_x emissions from diesel engines in the 95-county area were estimated by Non-road to be substantially less than 1 tpd: recreational marine, airport GSE, and recreational vehicles.

ERG's recent survey of construction equipment in the HGA area found a significant overestimation of equipment population estimates in the default Non-road files. Equipment populations were overestimated by a factor of 2 to 3, depending upon engine type. A similar overestimation was subsequently found for the DFW area. Similar overestimations of construction equipment population estimates for the 95 counties were also anticipated to occur using the Non-road model. Therefore, ERG scaled the default statewide construction equipment population file downward to match the HGA survey totals when allocated back to the 8-county HGA area. ERG then used this adjusted statewide file to estimate a baseline emission inventory for diesel construction equipment in each of the 95 counties.

There is no bottom-up engine population survey available for many of the other equipment categories, such as agricultural and commercial. The level of uncertainty associated with Non-road's default population estimates for these categories is unknown. Since the Non-road population estimates were developed using the same database as was used for the construction sector, it is anticipated that default populations for these sectors are also overestimated. Therefore, ERG chose to estimate emissions inventories for these other categories using both the Non-road default populations as well as population files scaled downward in accordance with the HGA construction survey findings. For this later estimate, ERG used the ratio of total diesel construction equipment from the HGA survey and the default Non-road population estimates for the same area - 58%. In this way, ERG obtained a range for NO_x emissions in the 95-county area for these other equipment categories.

Table 6.3-4 summarizes the results of the non-road emissions inventory calculation for the 95-county area.

Table 6.3-4. 2007 Non-road NO_x Emission Inventory for 95-County Region

Equipment Category	NO_x Estimate, tpd*
Construction	51.4
Agricultural	43.1 – 74.2
Commercial	4.2 – 7.2
Industrial	8.9 – 15.4
Lawn and Garden	4.2 – 7.2
Logging	1.7 – 2.9
Total	**113.5 – 158.4**

* Low estimate based on 42% reduction from non-road default

Using a previous analysis, ERG estimated the NO_x reductions expected from adopting the California diesel fuel specifications in various Texas nonattainment areas. The specifications for Texas LED are essentially identical to the CARB specifications for the purposes of NO_x estimation. Therefore, ERG used the previous estimate of a 7% NO_x reduction to determine expected tpd benefits for the 95-county region. It was noted that advanced electronically-controlled engines are estimated to achieve a 5.7% reduction with Texas LED. However, given the small amount of electronically-controlled engines likely to be in the fleet in 2007, ERG did not differentiate the benefit estimate by model year, but simply applied the 7% reduction uniformly across the entire inventory.

It is important to note that these benefit estimates are independent of the fuel sulfur level. Sulfur level only has an impact on NO_x emissions when catalysts are in place. At this time, EPA and engine manufacturers do not believe that advanced NO_x catalysts will be required to meet the upcoming Tier 2 and Tier 3 emission standards for non-road engines. Therefore, fuel sulfur level was not considered in this modeling analysis. However, diesel fuel sulfur level could have a significant impact on aftermarket NO_x reduction systems, which are often fouled by exposure to higher sulfur levels.

As described in this section, modeling has indicated that by 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment statewide by 30 tpd, of which 6.84 tpd of reductions will be achieved in the HGA ozone nonattainment area. These reductions are necessary for the HGA area to demonstrate attainment with the ozone NAAQS within the time frame prescribed by the EPA.

Distribution

A statewide LED fuel requirement facilitates distribution. The statewide coverage area for on-road use will create a large enough market to ease the costs of distribution. Supplies can be co-mingled in the pipeline, trading can take place, and tracking compliance will be simplified. Since the DFW and HGA ozone nonattainment areas already distribute a federal RFG, and the state's low-RVP Gasoline is already distributed to the 95 East and Central Texas county regional area, diesel producers and importers will be able to use the current distribution system to distribute state LED fuel to the affected areas beginning in 2004 when the sulfur in LED is limited to 30 ppm for the HGA, BPA, and DFW ozone nonattainment areas and 95 East and Central Texas counties.

Transport

Air pollution knows no boundaries. Federal and state studies have shown that pollution from one area can affect ozone levels in another area. Regional air pollution should be considered when studying air quality in Texas' ozone nonattainment areas. This work is supported by the findings of the OTAG study,

which is the most comprehensive attempt ever undertaken to understand and quantify the transport of ozone. Both the commission and the OTAG study results point to the need to take a regional approach to control air pollutants, such as that prescribed in the state LED fuel program.

The regional implementation of LED fuel will result in reductions of NO_x emissions in the surrounding counties and help reduce the amount of NO_x being transported into the HGA, BPA, and DFW ozone nonattainment areas. As modeling has shown that HGA ozone and ozone precursor transport has the potential to impact areas as far away as DFW, the benefits from reduced HGA peak ozone concentrations have the potential to positively impact other nonattainment and near-nonattainment areas.

In addition to the current 1-hour ozone nonattainment counties, Texas also has several areas that are facing potential nonattainment status under the new 8-hour ozone standard. These areas will benefit not only from reduced ozone and ozone precursor transport, but also from the immediate reduction of NO_x emissions in their local area from the use of LED fuel.

Length of Time Needed to Achieve Benefits

The most important aspect of using the state LED fuel program is that the benefits are seen immediately. Once the state LED fuel program begins, emission reductions begin for both old and new vehicles, as well as from non-road engines that use the fuel. The statewide coverage area required by the state LED fuel program ensures NO_x emission reductions significant enough to have an immediate impact on the air quality in the HGA ozone nonattainment area.

EMISSION REDUCTIONS NEEDED FOR ATTAINMENT OF THE NAAQS

The HGA ozone nonattainment area will need to ultimately reduce NO_x by more than 750 tpd to reach attainment with the 1-hour ozone NAAQS. In addition, a VOC reduction of about 25% will have to be achieved. The state LED fuel program will contribute to attainment and maintenance of the 1-hour ozone NAAQS in the HGA area. The state LED fuel program also may contribute to a successful demonstration of transportation conformity in the HGA area. Assessment of emissions inventory data has also shown that over 20% of the NO_x emissions in the HGA area come from mobile sources. As such, the control strategy package for the HGA ozone nonattainment area needs to include strategies that have an immediate impact on mobile sources. The state LED fuel program will have an immediate impact. In order for HGA to demonstrate attainment in 2007, monitored ozone concentrations in the HGA area must show compliance with the ozone NAAQS for the three-year period 2005–2007. By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment statewide by 30 tpd, of which 6.84 tpd of reductions will be achieved in the HGA ozone nonattainment area.

EVALUATION OF OTHER CONTROL MEASURES

The commission has analyzed other control measures for reasonableness and practicability of implementation to meet the attainment deadline. This included evaluating on-road mobile sources, non-road mobile sources, area, and point sources. A complete listing of these control strategy measures is provided in Section 6.1.

CONCLUSIONS

By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment statewide by 30 tpd, of which 6.84 tpd of reductions will be achieved in the HGA ozone nonattainment area, and is a vital component of the overall NO_x emissions reduction strategy for the HGA ozone nonattainment area. Modeling has shown that without the emission reductions achieved by the state LED fuel program, it will not be possible for the HGA ozone nonattainment area to demonstrate attainment with the NAAQS within the time frame prescribed by EPA. Therefore, the commission finds

that the state LED fuel program is essential to the timely attainment of the 1-hour ozone NAAQS in the HGA ozone nonattainment area. In addition, the commission believes the state LED fuel program will lead to emission reductions throughout Texas, which will facilitate compliance with the ozone NAAQS for all the state's nonattainment and near-nonattainment counties.

Port Estimated Emission Reductions

There are a number of sea ports located in the HGA area. These ports contribute to the economy of the HGA area. They also contribute, in some part, to the air quality challenges the HGA area faces and will play a significant role in the air quality improvement plan. There are several measures, all of which may be quantified, which apply to the port industries. These measures can be added together to arrive at an emissions reduction target for the HGA area port industries. The port industries contribute a little less than 3% (2.7%) of the overall non-road emissions in the HGA area. This fraction of the emissions inventory can be used to calculate the reduction amount from each proposed measure for which the port is responsible. The measures that apply to the port are: the construction equipment operating restriction, accelerated purchase of Tier 2/ Tier 3 diesel equipment, diesel emulsions, and low emission diesel fuel. Applying the emission reductions to the percentage of contribution of the port, the total number of reductions which are estimated to be the port's responsibility is 1.56 tpd of NO_x. See the following methodology:

HGA Ports Estimated Emissions Contributions	
Port Equipment Inventory	2.7 (based on TNRCC Non-road run and Port inventory data)
Total industrial Diesel Inventory	6.65
Total construction Diesel Inventory	31.60
Total industrial + construction inventory	38.25
Port Fraction	0.07

HGA Ports Estimated Emission Reduction Goal from Nonroad Cargo Handling Equipment		
	Updated NOx Reduction (tpd)	Proportional Maritime Share NO_x
Construction Equipment Operating Restriction	6.7	0.47
Accelerated Purchase of Tier 2/Tier 3 Equipment	11.48	0.81
Diesel Emulsions	2.08	0.15
LED Fuel	1.85	0.13
Total		**1.56**

6.3.6 Low Sulfur Gasoline

This strategy would implement a regional low sulfur gasoline (LSG) air pollution control strategy to reduce emissions of NO_x necessary for the HGA, BPA, and DFW ozone nonattainment areas to be able to demonstrate attainment with the ozone NAAQS.

The revisions will implement a state LSG program requiring gasoline which may ultimately be used to power gasoline-fueled spark-ignition engines in the affected areas to meet the LSG standards beginning May 1, 2004. The fuel required by the state LSG program will be required to adhere to more stringent standards in each gallon of gasoline than required by current federal regulations for gasoline in the affected area.

The state LSG program will lower NO_x emissions from gasoline-fueled spark-ignition engines in the affected areas. Because NO_x emissions are precursors to ground-level ozone formation, reduced emissions of NO_x will result in ground-level ozone reductions. The state LSG program will reduce NO_x emissions by 4.98 tpd in the affected areas.

The state LSG program will require LSG in the 8-county HGA ozone nonattainment area ,which comprises Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties; in the 3-county BPA ozone nonattainment area, which comprises Hardin, Jefferson, and Orange Counties; in the four-county DFW ozone nonattainment area, which comprises Collin, Dallas, Denton, and Tarrant Counties; and in 95 East and Central Texas counties comprising Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bell, Bexar, Bosque, Bowie, Brazos, Burleson, Caldwell, Calhoun, Camp, Cass, Cherokee, Colorado, Comal, Cooke, Coryell, De Witt, Delta, Ellis, Falls, Fannin, Fayette, Franklin, Freestone, Goliad, Gonzales, Grayson, Gregg, Grimes, Guadalupe, Harrison, Hays, Henderson, Hill, Hood, Hopkins, Houston, Hunt, Jackson, Jasper, Johnson, Karnes, Kaufman, Lamar, Lavaca, Lee, Leon, Limestone, Live Oak, Madison, Marion, Matagorda, McLennan, Milam, Morris, Nacogdoches, Navarro, Newton, Nueces, Panola, Parker, Polk, Rains, Red River, Refugio, Robertson, Rockwall, Rusk, Sabine, San Jacinto, San Patricio, San Augustine, Shelby, Smith, Somervell, Titus, Travis, Trinity, Tyler, Upshur, Van Zandt, Victoria, Walker, Washington, Wharton, Williamson, Wilson, Wise, and Wood counties.

The state LSG program will require that the sulfur content of all gasoline produced for delivery and ultimate sale to the consumer in the affected areas shall not exceed 15 ppm sulfur per gallon, beginning May 1, 2004.

The state LSG program will require gasoline producers and importers to test fuel samples for compliance and keep records of the test results. All parties in the fuel distribution system (producers, importers, pipelines, rail carriers, terminals, truckers, and retailers) will be required to keep records of fuel transfer documents for two years. Retail fuel dispensing outlets will be exempt from all of the state LSG program's testing and recordkeeping requirements except for the keeping of fuel transfer documents.

The commission's authority to implement the state LSG program is found in the Texas Health and Safety Code (Vernon 1992), the TCAA, §382.017, which provides the commission with the authority to adopt rules consistent with the policy and purposes of the TCAA; TCAA §382.012, which requires the commission to develop plans for protection of the state's air; TCAA §382.019, which provides the commission with the authority to regulate emissions from motor vehicles; TCAA §382.037(g), which gives the commission authority to regulate fuel content if it is demonstrated to be necessary for attainment of the NAAQS; and TCAA §382.039, which provides the commission with authority to develop and implement transportation programs and other measures necessary to demonstrate attainment and protect the public from exposure to hazardous air contaminants from motor vehicles. This proposal was

developed specifically in order to meet the requirements of federal law (§110 of the FCAA) and not solely under the general powers of the agency.

SECTION 211(C)(4)(C) WAIVER REQUEST

Section 211(c)(4)(A) of the FCAA prohibits states from prescribing or attempting to enforce any "control or prohibition" of a "characteristic or component of a fuel or fuel additive" if the EPA has promulgated a control or prohibition applicable to such characteristic or component under section 211(c)(1). Section 211(c)(4)(C) provides an exception to this prohibition for a nonidentical state standard contained in a SIP where the standard is "necessary to achieve" the primary or secondary NAAQS that the SIP implements. EPA can approve a SIP provision as necessary if the Administrator finds that "no other measures exist and are technically possible to implement, but are unreasonable or impracticable." Therefore, Texas is submitting this revision to the SIP as adequate justification and is requesting a waiver from Section 211(c)(4)(A) of the FCAA from EPA to implement a state LSG program in the areas defined in this SIP revision.

Waiver Requirements for Alternative Fuel Specifications

Under Section 211 (c)(4)(C) of the FCAA, EPA may approve a non-identical state fuel control as a SIP provision, if the state demonstrates that the measure is necessary to achieve the national primary or secondary ambient air quality standard that the plan implements. EPA can approve a state fuel requirement as necessary only if no other measure exists that would bring about timely attainment, or if other measures exist but are unreasonable or impracticable.

If a state decides to pursue a state fuel requirement, the state must submit a SIP revision adopting the state fuel control and apply for a waiver from federal preemption. The state must include in its petition specific information showing the measure is necessary to meet the ozone NAAQS, based on the statutory requirements for showing necessity. The waiver request must:

Identify the quantity of reductions needed to reach attainment of the NAAQS;

- Identify possible other control measures and the quantity of reductions each would achieve;
- Explain in detail, with adequate factual support, which of those identified control measures are considered unreasonable or impracticable; and
- Show that even with the implementation of all reasonable and practicable measures, the state would need additional emissions reductions for timely attainment, and the state fuel measure would supply some or all of such additional reductions.

Determining Whether Other Measures are Unreasonable or Impracticable

In determining whether ozone control measures are unreasonable or impracticable, reasonableness and practicability are determined in comparison to the state-specific fuel control program.

While the basis for finding unreasonableness or impracticability is in part comparative, the state still must provide solid reasons why the other measures are unreasonable or impracticable, and must demonstrate these reasons with adequate factual support. Reasons why a measure might be unreasonable or impracticable for a particular area include, but are not limited to, the following:

1. Length of time to implement the measure;
2. Length of time to achieve ozone reduction benefits;
3. Degree of disruption entailed by implementation;
4. Other implementation concerns, such as supply issues;

5. Costs to industry, consumers, or the state;
6. Cost-effectiveness; and
7. Reliance on commercially unavailable technology.

A strong justification for finding a measure unreasonable or impracticable might rely upon the combination of several of these reasons.

THE NEED FOR THE STATE LOW SULFUR GASOLINE PROGRAM

The commission has developed an air quality control strategy consisting of a state LSG program that it believes is an essential element in the control strategy package needed for the HGA, BPA, and DFW ozone nonattainment areas to be able to demonstrate attainment of the NAAQS. The fuel required by the state LSG program will be required to adhere to more stringent standards in each gallon of gasoline than required by current federal regulations for gasoline in the affected area.

The main attractiveness of the fuel based strategy is that it has a more immediate impact than other controls. Once the fuel is in the marketplace, it begins having an immediate air quality impact as both old and new vehicles and non-road equipment begin using the new fuel.

The fuel required by the state LSG program was chosen based upon the following reasons:

- Emissions performance;
- Effect on advanced technology vehicles and engines;
- Modeling;
- Distribution;
- Transport; and
- Length of time needed to achieve benefits.

Emissions Performance

State and federal modeling has shown that reductions in NO_x contribute to reductions in ozone. The use of LSG as a regional control strategy will reduce emissions of NO_x from gasoline-fueled spark-ignition engines in the 8-county HGA, 3-county BPA, and 4-county DFW ozone nonattainment areas, and in the 95 East and Central Texas counties also affected by this program. The LSG is also beneficial in that emission reductions will be seen in all gasoline-fueled spark-ignition engines, both old and new.

Effect on Advanced Technology Vehicles and Engines

Through the NLEV program, vehicle and engine manufacturers have made a commitment to introduce cleaner vehicles and engines to the nation earlier than required by the FCAA. The reductions from this action will not be enough to get Texas where it needs to be in relation to overall air quality. Improvements in gasoline fuel quality alone will not be enough. However, an improvement in gasoline fuel quality as the result of a state LSG program, combined with the advanced vehicle and engine technology, will bring Texas closer to achieving its overall air quality goals.

Modeling

The commission contracted with ERG to estimate the on-road NO_x emissions benefits associated with adopting 15 ppm sulfur gasoline requirements as specified in the state LSG program for the 8-county HGA, 3-county BPA, and 4-county DFW ozone nonattainment areas, as well as an additional 95 East and Central Texas counties, for a typical ozone summer day in 2007. ERG first developed emission estimates for gasoline vehicles using MOBILE5b, using county-specific inputs as well as projected vehicle miles traveled estimates for these vehicles. Resulting emissions were adjusted by NO_x benefits estimated using

EPA's Complex Model. The following summarizes ERG's methodology and assumptions used to estimate the ton per day NO_x reductions for this measure.

Methodology and Assumptions
Ideally, NO_x benefit estimates for 15 ppm sulfur gasoline would be based on actual emissions test data using a variety of vehicles operating on such a fuel. However ERG was not able to identify any emissions test data using gasoline with sulfur levels lower than 30 ppm. Therefore, projection of emissions benefits for this measure, using models based on existing data, is inherently uncertain.

ERG first investigated using the sulfur correction functions in EPA's Tier 2 spreadsheet model to estimate the benefits of ultra-low sulfur gasoline. However, the curve fitting procedure used by EPA assumed a complicated exponential relationship between sulfur levels and NO_x emissions. As a result, NO_x emissions are predicted to fall off drastically at sulfur levels just below 30 ppm. In fact, emissions approach zero for certain vehicle classes as sulfur levels go to zero. ERG believes that this is actually an artifact of the modeling process, rather than a real response. If used, these functions are likely to significantly overestimate the NO_x benefits for gasolines below 30 ppm.

For these reasons, ERG chose to use EPA's Complex Model to estimate NO_x benefits for this measure. Although the Complex Model does not utilize data from gasolines below 30 ppm sulfur either, the model predicts a more linear response than does the Tier 2 model. Therefore, ERG believes the Complex Model provides a more realistic basis for estimating NO_x benefits for gasolines below 30 ppm than does the Tier 2 model.

The Complex Model is a generalized tool for evaluating fuel effects at the national level, and it cannot account for fleet-specific differences such as vehicle age distributions. Therefore, ERG assumed that the NO_x benefits derived from the model could be applied equally to both the DFW, BPA, and HGA area fleets. The baseline fuel parameters used in the model are summarized in Table 6.3-5 below.

Table 6.3-5 Baseline Fuel Parameters Used in the Complex Model

Parameter	Conventional Gasoline	Reformulated Gasoline
Area Class	B	B
Phase	2	2
Season	Summer	Summer
% Oxygen	0	2.1
RVP	7.8	6.6
Sulfur	30	30
Aromatics	32%	24%
Olefins	9.2%	11%
Benzene	1.53%	0.80%
E200	41	52
E300	83	84

The Conventional Gasoline profile assumes federal conventional gasoline meeting the Tier 2 sulfur requirements of 30 ppm, along with a low RVP restriction. ERG assumes this fuel will be used in the BPA ozone nonattainment area and in the affected 95-county region.

The Reformulated Gasoline profile was obtained from EPA OTAQ staff. These parameters represent EPA's "best guess" as to the components of Federal Phase II RFG, derived for use in their regulatory impact analysis. Sulfur levels are set at the Tier 2 standards. ERG assumes this fuel will be used in both the DFW and HGA nonattainment areas.

Next, ERG varied the Complex Model inputs for each of these fuels, lowering sulfur levels from 30 to 15 ppm. The resulting correction factors are:

- Conventional Gasoline 0.99180
- Reformulated Gasoline 0.99183

Obviously, the model assumes that sulfur reduction benefits are independent of other fuel properties. Therefore, ERG assumed a 0.992 correction factor for both of these fuels.

ERG also evaluated the potential effect of different implementation dates for this measure. Because gasoline vehicle catalysts can experience some reversibility of sulfur poisoning effects, earlier implementation of this measure could generate greater ton per day reductions by 2007. Using the Tier 2 spreadsheets, ERG modified the Average and Cap levels on the Fuel Scenarios page to reflect 2004 and 2006 start dates. ERG found that a 2-year difference in start dates produced less than a 0.1% difference in predicted emissions levels. Therefore, ERG concluded that the correction factor calculated above is independent of implementation date.

ERG next determined the fraction of total emissions from gasoline vehicles in each of the areas. ERG assumed that both the Tier 2 and the enhanced I/M programs would be in place for this calculation (with the exception of the BPA ozone nonattainment area and the affected 95-county region.– ERG assumed no I/M for these areas.)

Finally, ERG obtained NO_x ton per day estimates for the on-road fleet in each area, assuming Tier 2 and enhanced I/M is in place (no I/M for the BPA ozone nonattainment area and the affected 95-county region). Table 6.3-6 summarizes the resulting tons per day emission reductions for the measure.

Table 6.3-6 Projected NO_x Emission Reductions, by Region

Region	Estimated Reductions (tons per day)
HGA	1.15
BPA	0.14
DFW	1.32
95 counties	2.37
Total	**4.98**

As described in this section, modeling has indicated that by 2007, a state LSG program will reduce NO_x emissions in the HGA, BPA, and DFW ozone nonattainment areas by 2.61 tpd, and in the affected 95-county region by 2.37 tpd, for a combined 4.98 tpd reduction. These reductions are necessary for the area to demonstrate attainment with the ozone NAAQS within the time frame prescribed.

Distribution

Distribution of the state LSG will use the same distribution systems currently used for conventional and reformulated gasoline. Conventional LSG distribution will be similar to the distribution of low RVP

gasoline which is currently distributed to the 95-county region. Reformulated LSG will be distributed in exactly the same manner as for the current RFG.

Transport

Air pollution knows no boundaries. Federal and state studies have shown that pollution from one area can affect ozone levels in another area. Regional air pollution should be considered when studying air quality in Texas' ozone nonattainment areas. This work is supported by the findings of the OTAG study which is the most comprehensive attempt ever undertaken to understand and quantify the transport of ozone. Both the commission and OTAG study results point to the need to take a regional approach to control air pollutants, such as that described in the state LSG program which will affect the HGA, BPA, and DFW ozone nonattainment areas and 95 East and Central Texas counties in the regional area.

Length of Time Needed to Achieve Benefits

The most important aspect of using the state LSG program is that the benefits are seen immediately. Once the state LSG program begins, emission reductions begin for both old and new vehicles. The large regional coverage area that the state LSG program affects ensures emission reductions significant enough to have an immediate impact on the air quality in the HGA, BPA, and DFW ozone nonattainment areas.

EMISSION REDUCTIONS NEEDED FOR ATTAINMENT OF THE NAAQS

Modeling for the DFW ozone nonattainment area has shown that NO_x emissions need to be reduced as much as 60% in order for the area to achieve attainment with the NAAQS. Assessment of emission inventory data has also shown that over 50% of the NO_x emissions in the DFW area come from mobile sources. Mobile sources contribute over 20% of the NO_x emissions in the HGA area. As such, the control strategy package for the HGA and DFW ozone nonattainment areas need to include strategies that have an immediate impact on mobile sources. The state LSG program will have an immediate impact. In order for HGA to demonstrate attainment in 2007, monitored ozone concentrations in the HGA area must show compliance with the ozone NAAQS for the three-year period 2005–2007. Modeling has indicated that without a state LSG program in the affected areas, which will reduce NO_x emissions from on-road and non-road applications by 4.98 tpd, it will not be possible to demonstrate attainment with the NAAQS within the time frame prescribed.

EVALUATION OF OTHER CONTROL MEASURES

The commission has analyzed other control measures for reasonableness and practicability of implementation to meet the attainment deadline. This included evaluating on-road mobile sources, non-road mobile sources, area, and point sources. A complete listing of these control strategy measures is provided in Section 6.1.

CONCLUSIONS

The state LSG fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment in the affected regional area by 4.98 tpd (of which 1.15 tpd is achieved in the HGA area), and is a vital component of the overall NO_x emissions reduction strategy for the HGA ozone nonattainment area. Modeling has shown that without the emission reductions achieved by the state LSG program it will not be possible for the HGA ozone nonattainment area to demonstrate attainment with the 1-hour ozone NAAQS within the time frame prescribed by EPA. Therefore, the commission finds that the state LSG program is essential to the timely attainment of the ozone NAAQS in the HGA ozone nonattainment area. In addition, the commission believes the state LSG program will lead to emission reductions throughout the affected regional area, which will facilitate compliance with the NAAQS for the state's nonattainment and near-nonattainment counties in this region.

6.3.7 Lawn Service Equipment Operating Restrictions

The proposed revisions implement an operating-use restriction program requiring that handheld and non-handheld spark-ignition lawn service equipment, rated at 25 hp and below, be restricted from use by both private and commercial operators between the hours of 6:00 a.m. through 12:00 p.m., April 1 through October 31. The affected handheld equipment includes, but is not limited to, trimmers, edgers, chainsaws, leaf blowers/vacuums, and shredders. Non-handheld lawn service equipment includes such devices as walk-behind lawnmowers, lawn tractors, tillers, and small generators. The affected area would include the 8-county HGA ozone nonattainment area. The effective date is be April 1, 2005. The commission staff estimates that implementation of this rule results in a shift in NO_x emissions of 0.58 tpd. Because of accompanying VOC reductions resulting from this rule, the modeled ozone concentration is projected to improve by 1.1 ppb, which has impact of reducing the gap by 7.7 tpd NO_x.

6.3.8 Voluntary Mobile Emissions Reduction Program

The FCAA Amendments of 1990 increased the responsibility of States to demonstrate progress toward attainment of the NAAQS. Voluntary mobile source measures have the potential to contribute, in a cost-effective manner, emission reductions needed for progress toward attainment and maintenance of the NAAQS.

Historically, mobile source control strategies have focused on reducing emissions per mile through vehicle and fuel technology improvements. Tremendous strides have been made resulting in new light-duty vehicle emission rates that are 70-90% less than for the 1970 model year. However, transportation emissions continue to be a significant cause of air pollution due to increases in VMT.

With the increasing cost of technological improvements to produce incrementally smaller reductions in grams per mile emissions in the entire fleet of vehicles, and the time it takes for technological improvements to penetrate the existing fleets, it becomes clear that supplemental or alternative approaches for reducing mobile source air pollution are necessary. Mobile source strategies that attempt to complement existing regulatory programs through voluntary, nonregulatory changes in local transportation sector activity levels or changes in in-use vehicle and engine fleet composition are being explored and developed.

A number of such voluntary mobile source and transportation programs have already been initiated at the state and local level in response to increasing interest by the public and business sectors in creating alternatives to traditional emission reduction strategies. Some examples include emission reduction programs implemented on a demonstration basis to test new technologies, and policies requiring the purchase of clean vehicles and equipment. These programs attempt to gain additional emissions reductions beyond mandatory FCAA programs by engaging the public to make changes in activities that will result in reducing mobile source emissions.

Current EPA regulations have set a limit on the amount of emission reductions allowed for VMEPs in a SIP. The limit is set at 3% of the total future year emissions reductions required to attain the appropriate NAAQS. Specifically in the HGA nonattainment area, the commission estimates that 3% of the region's projected emissions are 24 tpd.

The H-GAC's air quality programming demonstrates a commitment to integrating environmental concerns into its organizational culture. H-GAC's programs advance air quality issues, innovative technologies, and policy-making towards creative solutions for the region's air quality problems. H-GAC

seeks to implement voluntary measures which present a common sense approach. Many of the proposed voluntary emission reduction measures will be administered through existing H-GAC programs such as those described below.

1. Clean Air Action
The program promotes awareness in the 8-county non-attainment region of ground level ozone pollution, ozone watches, ozone warnings, and EPA's Air Quality Index. Existing programs within the Clean Air Action program will be supplemented with the following additional program:

- Smoking Vehicle Program

2. Clean Cities
Supports the efforts of local, state, and federal agencies in complying with the various federal and state alternative fuel mandates. The program has been in existence since 1995, and over this period of time has contributed over $4 million in CMAQ funding for the purchase of, and conversion to, over 600 alternative fuel vehicles. Recently, this program was expanded so that alternative fuel infrastructure (e.g., refueling stations), as well as public/private partnerships, are now eligible to receive CMAQ funding. Existing programs within the Clean Cities program will be supplemented with the following additional programs:

- Electric or fleet controls for airport shuttle buses
- Hybrid electric buses
- Shuttle for hire fleet controls
- Local/County Emissions Reduction Plan

3. Commute Solutions
Also known as Regional Commute Alternative Program (RCAP), this program is being implemented to reduce vehicle trips throughout the 8-county HGA area. Commute Solutions is a partnership of the H-GAC Regional Commute Alternatives Program, the Metropolitan Transit Authority (METRO), and the region's TMOs. The purpose of the Commute Solutions partnership is to provide a one-stop alternative transportation resource in the HGA area for both commuters and employers. Existing programs within the Commute Solutions program will be supplemented with the following additional programs:

- Pricing measures
- Expanded marketing and outreach of current programs

4. AERCO
H-GAC's AERCO provides a mechanism for meeting required demonstrations of reasonable further progress in reducing emissions. The role of AERCO includes: 1) promoting generation of credits and selecting emissions reduction projects; 2) providing local policy options; and 3) selling or transferring credits to new or expanding industry needing them and creating a buffer for meeting emission reduction requirements.

Existing programs within the AERCO program will be supplemented with the following additional programs:

- Expanded emissions trading, including mobile source trading
- Utilization of on- and off-road mobile scrappage programs

A voluntary program will be available in all eight counties where MERCs, ERCs, MDERCs, and DERCs can be donated towards the HGA area's VMEP initiative. An account within the state's emissions banking and trading program will be established for entities to make MERC, ERC, MDERC or DERC donations. MERC, ERC, MDERC and DERC donations are considered tax deductible through AERCO, and the HGA area anticipates that this will create a financial incentive to donate reductions. As part of this initiative, when withdrawals are made from the state's emissions banking and trading program for any MERCs, ERCs, MDERCs or DERCs, the 10% environmental contribution will be applied to the HGA area VMEP initiative. Any donations from this initiative that cause the VMEP program to exceed its 24 tpd limit would be considered surplus, and would be banked within the state's emissions banking and trading program for other uses by H-GAC.

Other voluntary measures that do not necessarily fall within the scope of existing H-GAC programs but which may be undertaken include:

- Non-road spark ignition three-way catalyst retrofits
- School year schedule change
- TRANSTAR expansion
- Expanded transit services
- Land use measures

Economic Incentive Program Option

The emission trading program listed above in the VMEP measures may, as an alternative, be classified as an economic incentive program rather than a VMEP. By including the trading program in an economic incentive program, there is the potential for greater emissions reductions because the 3% cap associated with VMEP measures does not apply. If opted for, this trading program would be targeted at both on- and off- road (heavy and light duty) vehicles. Credits would be generated by increasing the currently proposed mobile emission reduction credit ratio of 1.1:1 to 1.3:1. The initial surplus benefit of 0.1 tons would go to the state through existing mechanisms, while the secondary surplus benefit of 0.2 tons would be "donated" (and thus is tax deductible through AERCO) for credit against the SIP. The program would be voluntary and available to all 8 HGA counties.

The VMEP measures introduced above are described in detail in Appendix K. For each measure, considerable discussion of the uncertainties in the summary of each emissions reduction measure has been included. In some cases, this is also reflected in a range of emissions reductions that may occur and/or in a range in costs for the implementation of the measure. Some of the uncertainty arises from uncertainties in the emissions inventories used in the calculations of the emissions reduction potential. This is discussed further in Appendix K. Other uncertainties arise due to the lack of experience in actual application of the measure, lack of comprehensive test data or other data, questionable commercial availability of the mechanism or fuel that is being evaluated, or very uncertain societal reactions to the measure (as is the case with certain transportation-related measures such as speed limits and increased mass transit, for example). Other measures that affect especially certain private sectors, such as commercial trucking, have an uncertain degree of market penetration potential.

In evaluating control measures for this project where MOBILE emission factors were needed, the 24-hour MOBILE5a input files from H-GAC (H24cs.inp, U24cs.inp, and R24cs.inp) were used as the starting point. The VMT mix and registration distribution included in those files were replaced with the updated VMT mix and registration distributions in MOBILE input files received later from commission staff (HASH0702.inp, HASU0703.inp, and HASR0704.inp). This was done to mirror the manual application

of a registration data update in the adjusted baseline inventory. The starting files were also converted from MOBILE5a input format to MOBILE5b format. The use of MOBILE5b enabled the Phase 2 reformulated gasoline benefits to be included in this analysis, as well as the updates that were made to the inventory to capture other differences between MOBILE5a and MOBILE5b.

Programs and control strategies, many of which fall within the purview of existing air quality programs, that will contribute to this 24 tpd target are summarized in Table 6.3-7:

Table 6.3-7 Summary of VMEP Measures Identified for the HGA SIP

VMEP Measure Name	Affected Engines	NOx Emissions Reductions (8-County tpd)	Cost-effectiveness ($/ton NO_x)
On-road			
Electric Airport Shuttle Buses (or fleet controls)	HDD	0.38-5.0	$12,000
Scrappage	On-road Light-Duty	1.0	$24,000
Smoking Vehicle Program	On-road Light-Duty	0.04	$37,000
Hybrid Electric Buses	Buses	0.03	$0 - $220,000
Shuttle for Hire Fleet Controls	Airport Shuttles	0.012	NA
Alternative Fuel Fleet Controls	On-road	NA	NA
Subtotal		1.462-6.082	
Non-road			
Scrappage	Off-road	NA	NA
Non-road SITWC Retrofits	Large Gasoline	1.5	$640
Reduce Tug/Tow Activity	Commercial Marine	0.15	NA
Subtotal		1.65	
Transportation			
Pricing Measures	Light-Duty Vehicles	7.84	NA
Commute Solutions	Light-Duty Vehicles	4.6	$596
School Year Schedule Change	Light-Duty Vehicles	0.83	<$100
TRANSTAR Expansion	Light-Duty Vehicles	0.41	NA
Expanded Transit Services	Light-Duty Vehicles	0.39	NA
Clean Air Action	Light-Duty Vehicles	NA	NA
Land Use Measures	Light-Duty Vehicles	0.47	NA
Subtotal		14.54	
Other			
Emission Trading	All	2.0 - 20	Comparable
Local/County Emissions Reduction Plan	Public vehicles/ equipment	4.0-5.0	NA
Subtotal		6.0-25.0	
TOTAL		**23.65-47.27**	

6.3.9 Accelerated Purchase of Tier 2/Tier 3 Diesel Equipment

This strategy affects state and local governments, businesses, and private entities in the HGA area that own or operate non-road equipment powered by compression-ignition engines rated 50 hp and above.

The proposed rule requires the owners or operators to meet the following requirements: for the portion of the fleet with equipment powered by non-road engines in the range from 50 hp to 100 hp, the owner or operator must ensure that 100% of such equipment will meet Tier 2 standards by the end of the calendar

year 2007. For the portion of the fleet in the 100 hp to 750 hp range, the owner or operator must ensure that at least 50% of such equipment meets Tier 3 standards, and that the remaining equipment meets Tier 2 standards. Finally, for the portion of the fleet greater than 750 hp, the owner or operator must ensure that 100% of such equipment meets Tier 2 standards by the end of calendar year 2007. The proposed rule exempts non-road engines used in locomotives, underground mining equipment, marine applications, aircraft, airport ground support equipment, equipment used solely for agricultural purposes, emergency equipment, and freezing weather equipment. This rule results in a 12.20 tpd reduction in NO_x.

Owners or operators can be exempted from this rule if they submit an emission reduction plan by May 31, 2002, that the commission approves by May 31, 2003. The plan must describe in detail how the owner or operator will reduce NO_x emissions by June 1, 2005 by an amount equivalent to the total reductions achieved by implementation of this rule. Owners or operators may submit plans to apply for exemption from either the Accelerated Purchase of Non-road Heavy-duty Diesel Equipment rule or the Construction Equipment Operating Restrictions rule, or from both rules. The plans must contain emission reductions equivalent to the total NO_x reductions achieved by the rule or rules from which they are applying for exemption. Preliminary estimates indicate that implementation of both this rule and the Accelerated Purchase rule will result in a NO_x reduction of approximately 12.20 tpd.

Construction Industry Reduction Goal

The construction industries in the HGA contribute to the overall air quality challenges faced by the HGA area. They also will contribute, in substantial part, to the solution. It is possible to determine how much emissions come from non-road diesel construction equipment and then apply the emission reduction goals of the various programs to this inventory to arrive at an estimated overall goal for non-road diesel powered construction equipment in the 8-county HGA area. The commission has estimated this number to be 20.75 tons of NO_x per day. A photochemical model run was used to estimate the equivalent NO_x reductions achieved by a shift in the construction work day. This was determined to be equivalent to removing 6.7 tpd of NO_x from the inventory. The accelerated purchase of Tier 2/Tier 3 equipment as applied to the construction inventory was determined to be 10.62 tpd of NO_x. LED fuel again applied to just non-road construction equipment was estimated at 1.45 tpd NO_x, and finally, diesel emulsion fuel applied to non-road diesel construction equipment was 1.98 tpd of NO_x. Adding these measures together arrives at the 20.75 tpd estimated above.

Port Estimated Emission Reductions

There are a number of sea ports located in the HGA area. These ports contribute to the economy of the HGA area. They also contribute, in some part, to the air quality challenges the HGA area faces and will play a significant role in the air quality improvement plan. There are several measures, all of which may be quantified, which apply to the port industries. These measures can be added together to arrive at an emissions reduction target for the HGA area port industries. The port industries contribute a little less than 3% (2.7%) of the overall non-road emissions in the HGA area. This fraction of the emissions inventory can be used to calculate the reduction amount from each proposed measure for which the port is responsible. The measures that apply to the port are: the construction equipment operating restriction, accelerated purchase of Tier 2/ Tier 3 diesel equipment, diesel emulsions, and low emission diesel fuel. Applying the emission reductions to the percentage of contribution of the port, the total number of reductions which are estimated to be the port's responsibility is 1.56 tpd of NO_x. See the following methodology:

HGA Ports Estimated Emissions Contributions	
Port Equipment Inventory	2.7 (based on TNRCC Non-road run and Port inventory data)
Total industrial Diesel Inventory	6.65
Total construction Diesel Inventory	31.60
Total industrial + construction inventory	38.25
Port Fraction	0.07

HGA Ports Estimated Emission Reduction Goal from Nonroad Cargo Handling Equipment		
	Updated NOx Reduction (tpd)	Proportional Maritime Share NO_x
Construction Equipment Operating Restriction	6.7	0.47
Accelerated Purchase of Tier 2/Tier 3 Equipment	11.48	0.81
Diesel Emulsions	2.08	0.15
LED Fuel	1.85	0.13
Total		**1.56**

6.3.10 Residential and Commercial Air Conditioners

The purpose of this proposed rule is to incorporate a technology in new residential and commercial air conditioner units that will reduce ozone from ambient air that is drawn across the external heat exchanger units of air-cooled air conditioning units, including heat pumps. This rule requires new units to reduce ozone by at least 70% and retain a minimum efficiency of 50% for 15 years. Implementation of the rule would begin January 1, 2002 in the HGA, BPA, and DFW areas as well as the East and Central Texas area. The commission estimates that this measure will achieve a minimum of 13.0 tpd of NO_x equivalent reductions in HGA.

6.3.11 NO_x Reduction Systems

This rule affects any owner or operator of large diesel engines, both on-road and non-road, which are registered in the 8-county HGA area. Selective catalysis, oxidation catalysts, exhaust recirculation, and NO_x absorbers are examples of emergent NO_x reduction systems. Since the goal is to clean up older, more polluting engines, the rule covers engines which were manufactured prior to the 1997 model year. On-road engines over 10,000 pounds gross vehicle weight rating are covered; non-road engines over 175 hp are likewise included. Implementation of the proposed measure begins on May 1, 2004. The strategy will result in a NO_x reduction of 16.25 tpd.

6.3.12 Speed Limit Reduction

Substantial emissions reductions can be achieved by implementing 55 mph maximum speed limits on all roadways with current posted speeds above 55 mph in the 8-county HGA area. These reduced speed

limits will be implemented by May 1, 2002. This measure will reduce emissions in the 8-county area by 18.27 tpd NO_x and 1.40 tpd VOC in 2007.

The emissions reductions were calculated using a ratio methodology based on a comparison of HGA and DFW 2007 VMT and DFW's calculated emissions reductions for reduced speed limits. Since the HGA and DFW metropolitan areas are very similar in terms of population, VMT, and congestion levels, this approach provides a reasonable estimate of the speed limit reduction measure. Additional methodology information is provided below.

HGA 8-county 2007 VMT - 129,487,934

DFW 4-county 2007 VMT - 141,083,493

DFW 55 mph 2007 NOx redx = 19.91 tpd, 2007 VOC redx = 1.52 tpd

HGA scaled (scale factor .9178) 55 mph speed limit NOx = 18.27 tpd, VOC 1.40 tpd

* Information sources
HGA 2022 Transportation Plan Conformity Determination
NCTCOG VMT and speed limit reduction calculations for Attainment Demonstration

The commission is soliciting comments on alternative speed limits on roadways in Chambers, Liberty and Waller Counties. The commission is also soliciting comments on not reducing speed limits on toll roads and HOV lanes in order to encourage maximum use of these types of roadways.

Speed limit signs will have to be changed in order to implement this measure. TxDOT estimates costs of $300.00 for small sign replacement and $600.00 for large sign replacement. Benefits in addition to emissions reductions will be achieved through implementation of this measure. The severity of traffic accidents will be reduced. Significant fuel savings will also be realized from the speed limit reductions.

TxDOT adopted revisions to the Texas Transportation Code on May 25, 2000 which established procedures allowing speed limits to be changed for emissions reduction purposes. TNRCC will define the roadway specific speed limits, which will be implemented according to the procedures established in the Texas Transportation Code. The commission will work with other state and local agencies to ensure adequate enforcement of this measure.

6.3.13 Diesel Emulsion

This strategy relies on an additive that blends water with low emission diesel fuel, thereby reducing combustion temperature and NO_x emissions. Affected by the rule would be diesel fuel distributors, who must make the diesel emulsion fuel available for HDD engines. Facilities such as truck stops selling on-road diesel would have to have a throughput of more than 25,000 gallons per month to be affected by the rule; for non-road, dyed fuel, the rule would apply for a throughput over 500 gallons per month. Implementation of the proposed measure would begin on May 1, 2004. The strategy would result in a NO_x reduction of 10.7 tpd.

Port Estimated Emission Reductions

There are a number of sea ports located in the HGA area. These ports contribute to the economy of the HGA area. They also contribute, in some part, to the air quality challenges the HGA area faces and will

play a significant role in the air quality improvement plan. There are several measures, all of which may be quantified, which apply to the port industries. These measures can be added together to arrive at an emissions reduction target for the HGA area port industries. The port industries contribute a little less than 3% (2.7%) of the overall non-road emissions in the HGA area. This fraction of the emissions inventory can be used to calculate the reduction amount from each proposed measure for which the port is responsible. The measures that apply to the port are: the construction equipment operating restriction, accelerated purchase of Tier 2/ Tier 3 diesel equipment, diesel emulsions, and low emission diesel fuel. Applying the emission reductions to the percentage of contribution of the port, the total number of reductions which are estimated to be the port's responsibility is 1.56 tpd of NO_x. See the following methodology:

HGA Ports Estimated Emissions Contributions	
Port Equipment Inventory	2.7 (based on TNRCC Non-road run and Port inventory data)
Total industrial Diesel Inventory	6.65
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Total industrial + construction inventory	38.25
Port Fraction	0.07

HGA Ports Estimated Emission Reduction Goal from Nonroad Cargo Handling Equipment		
	Updated NOx Reduction (tpd)	Proportional Maritime Share NO_x
Construction Equipment Operating Restriction	6.7	0.47
Accelerated Purchase of Tier 2/Tier 3 Equipment	11.48	0.81
Diesel Emulsions	2.08	0.15
LED Fuel	1.85	0.13
Total		**1.56**

6.3.14 Airport Ground Support Equipment

This strategy affects any owner and operator of GSE at airports in the HGA 8-county area if the airport experiences 100 or more air carrier operations per year (excluding general aviation operations, non-fixed wing aircraft operations, and military operations), averaged over a three-year period.

The rule requires owners or operators of the affected ground support equipment to ensure that their ground support equipment fleet is electric-powered, or else implement alternative emission reduction measures to reduce NO_x via a phase-in period that concludes at the end of 2005. This measure is estimated to lower NO_x emissions by 5.09 tpd.

As part of this attainment demonstration SIP, the commission is proposing a rule requiring NO_x reductions equivalent to 90% from airport GSE. Continental Airlines, the largest carrier at George Bush Intercontinental Airport, has indicated willingness to commit to reducing NO_x emissions from GSE by 75% at Bush Intercontinental, or by 2.71 tpd. The City of Houston has committed to obtaining the remaining 15% of Continental's reduction obligation, plus the emission reductions required of other GSE at Bush Intercontinental, for a total of 1.35 tons NO_x per day.

In addition to Bush Intercontinental, William P. Hobby Airport and Ellington Field are airports in the HGA area that would also be affected by the proposed GSE rules. It is possible that the City of Houston's airport GSE reduction plan could extend to these airports as well.

In order to make these commitments enforceable, the commission plans to approve agreed orders outlining the above-reference emission reduction plans. The commission commits to approve these orders and submit them to EPA, as part of the HGA attainment demonstration SIP, by December 31, 2000.

Airport Emission Inventory and Estimated Reductions for HGA Airports
There are three major airports located within the 8-county HGA nonattainment area. These airports contribute to the air quality challenges and will contribute to the air quality solution for the area. It is possible to determine how much of the NO_x emission inventory is coming from GSE at these three airports and it is also possible to determine what the effect of the commission's rules for GSE will contribute to reducing this inventory. The EI for GSE at the three aiports is 5.65 tpd. To allocate between Bush Intercontinental, Hobby, and Ellington Field, the following breakout was used — 80% for Bush, 18% for Hobby, and 2 % for Ellington. These percent numbers come from GSE owned by ATA members by airport as provided by ATA in their May 25, 2000 memo.

Bush = 5.65 * 80% = 4.52 tpd
Hobby = 5.65 * 18% = 1.02 tpd
Ellington = 5.65 * 2% = 0.11 tpd

The GSE rule requires a 90% reduction from GSE equipment which would be 5.09 tpd (5.65 *90%). So the reductions for each airport would be:

Bush = 5.09 * 80% = 4.07 tpd
Hobby = 5.09 * 18% = 0.92 tpd
Ellington = 5.09 * 2% = 0.10 tpd

6.3.15 California Spark-Ignition Engines

This proposed rule implements the control requirements for non-road, large spark-ignition engines statewide. The proposed rule is necessary to attain the ozone NAAQS, and to establish a single standard for the state. A single statewide standard would help to prevent the incompatibility and expense that may arise from the distribution of equipment with different emission standards. These amendments are proposed in order to control ground-level ozone in the state by restricting the sale and use of non-road, large spark-ignition (LSI) engines 25 hp and larger produced in model year 2004, and all equipment and vehicles produced on or after January 1, 2004 that use such engines; to LSI engines that are certified under Title 13, California Code of Regulations, Chapter 9, concerning Off-Road Vehicles and Engines Pollution Control Devices. The proposal incorporates the non-road, LSI engine rules by reference,

including all future revisions. For the HGA area, emission reductions will be approximately 2.80 tpd. The program is estimated to cost about $500 per ton of NO_x reduced.

6.3.16 Vehicle Idling Restrictions

This strategy implements motor vehicle engine idling restrictions in the HGA ozone nonattainment area that, beginning April 1, 2001, limit the engine idling time of motor vehicles with a gross vehicle weight rating of greater than 14,000 pounds to five consecutive minutes while the vehicle is operating in the affected area.

The proposed idling restrictions lower NO_x emissions from both gasoline-powered and diesel-powered motor vehicles in the affected areas. Because NO_x emissions are precursors to ground-level ozone formation, reduced emissions of NO_x will result in ground-level ozone reductions. By 2007, the idling restrictions will reduce NO_x emissions in the affected areas by 0.92 tpd. In addition, the idling restrictions will also reduce VOC (by 0.36 tpd) and PM emissions from motor vehicles with a gross vehicle weight rating of greater than 14,000 pounds.

Documentation for the vehicle idling restrictions proposal is contained in Appendix J.

6.3.17 Gas-fired Water Heaters, Small Boilers, And Process Heaters

This statewide rule, which was adopted April 19, 2000, reduces NO_x emissions from new natural gas-fired water heaters, small boilers, and process heaters sold and installed in Texas beginning in 2002. The rule applies to each new water heater, boiler, or process heater with a maximum rated capacity of up to 2.0 MMBtu/hr. The rule is based upon those of California's Bay Area Air Quality Management District Regulation 9, Rule 6 and SCAQMD Rules 1121 and 1146.1. The estimated reductions in HGA resulting from this rule are 0.5 tpd NO_x.

6.3.18 Energy Efficiencies for Buildings

This measure implements energy conservation efforts for buildings, including the 2000 International Energy Conservation Code criteria, to reduce electricity usage through use of better insulation, reflective roofing, etc. Municipalities in the HGA area will be required to enact ordinances to implement this strategy, so it is considered a local measure. This control strategy is estimated to provide a reduction of 2.00 tpd NO_x in the HGA area.

6.3.19 Transportation Control Measures

TCMs are transportation projects and related activities that are designed to achieve on-road mobile source emission reductions and are included as control measures in the SIP. Allowable types of TCMs are listed in §7408 (Air Quality Criteria and Control Techniques) of the FCAA, 42 USC, 1970, as amended, and defined in the federal transportation conformity rule found in Title 40 CFR (40 CFR), Part 93 (Determining Conformity of Federal Actions to State or Federal Implementation Plans). In general, a TCM is a transportation-related project that attempts to reduce vehicle use, change traffic flow, or reduce congestion conditions. A project that adds single-occupancy vehicle roadway capacity or is based on improvements in vehicle technology or fuels is not eligible as a TCM.

The H-GAC has identified numerous TCMs that have been, or will be, implemented in the 8-county HGA area. By 2007, these TCMs will reduce NO_x emissions in the nonattainment area by at least 2.13 tpd and VOC emissions by at least 4.29 tpd. One additional potential TCM, the Downtown to Astrodome light rail project, would reduce 2007 emissions by 0.60 tpd NO_x and 0.22 tpd VOC, resulting in total 2007 TCM emissions reductions of 2.73 tpd NO_x and 4.51 tpd VOC. All TCM emission reductions were

calculated using EPA's MOBILE5a model 2007 emission factors. Specific calculation methodologies for the different types of TCMs are documented in Appendix I. Table 6.3-9 summarizes total 2007 emissions reductions by type of TCM. Appendix I contains a project specific list of the TCMs, including TCM location, project limits, implementation date, and emission reductions.

Table 6.3-9 Total 2007 Emission Reductions by Type of TCM

TCM Type	July 2007 NO_x Benefits (lbs/day)	July 2007 VOC Benefits (lbs/day)
Traffic Signalization	0.003	118.30
Computerized Traffic Mgmt. System (CTMS)	230.00	885.80
Arterial Traffic Mgmt. System (ATMS)	0.50	2.41
Bicycle/Pedestrian Projects	62.18	37.85
Intersection Improvements	14.50	50.64
Vanpools	824.00	316.00
Park and Ride Lots	142.20	82.00
Regional Computerized Traffic Signalization Systems (RCTSS)	1,494.00	6,320.00
Grade Separations	5.80	19.20
Port Projects	160.00	40.00
Telecommuting Projects	1,320.00	700.00
Subtotal: (lbs/day)	**4253.18**	**8572.20**
(tons/day)	**2.17**	**4.29**
Additional Potential TCM Downtown to Astrodome Light Rail Project:		
(lbs/day)	1,215.00	448.80
(tons/day)	0.61	0.22
Total: (lbs/day)	**5468.18**	**9021.00**
(tons/day)	**2.73**	**4.51**

Many TCMs that have already been implemented in accordance with HGA 1996 and 1999 SIP commitments will still reduce VOC and NO_x emissions in 2007. Emission benefits of these projects have been included in this SIP. Benefits from one new TCM, RCTSS, have also been included. RCTSS is a funded project now in progress with a 2004 implementation date.

The HGA region is also considering one new TCM commitment, the Downtown to Astrodome light rail project, for possible inclusion in this SIP. The rail project is currently in preliminary engineering and the current schedule calls for revenue service to begin in 2004. METRO's estimated capital cost for the rail project is $300 million. Emissions evaluations of this project are included in Appendix I. The HGA region is soliciting comments on this potential TCM.

In addition to emission reduction benefits, the TCMs will also reduce congestion, which will produce time savings for drivers in the nonattainment area. Many TCMs, such as rail projects and bicycle/pedestrian facilities, will also encourage mixed use and sustainable development, which may reduce urban sprawl in the area.

The TCMs, including the Downtown to Astrodome light rail project, have been included in the H-GAC long-range transportation plan and/or TIP, which constitutes evidence that the TCMs were properly adopted and have funding and appropriate approval. Inclusion of the TCMs in the H-GAC transportation plan and TIP also constitutes evidence of a specific schedule to plan, implement and enforce the measures. The H-GAC is required by 30 TAC §114.260 to submit an annual TCM status report to the commission. The report must include the TCM's implementation date and emissions reduction status. The status report and supporting activities serve as the TCM monitoring program.

Enforcement and implementation of TCMs is also addressed in the Texas transportation conformity rule (30 TAC §114.260) and the Federal transportation conformity rule (40 CFR §93.113), which indicate that the H-GAC is responsible for ensuring that TCMs are implemented on schedule. According to 30 TAC §114.260 and 40 CFR §93.113, failure to implement TCMs according to schedule can be grounds for the denial of an area's transportation conformity determination.

6.4 Enforceable Commitments

Because of the magnitude of reductions required for attainment, and the extremely challenging process of identifying, quantifying, and implementing the control strategies, the commission believes that additional, short-term enforceable commitments may be necessary to achieve the full extent of reductions to demonstrate attainment. EPA has approved the use of enforceable commitments as a mechanism for identifying potential control strategies and associated anticipated reductions under limited circumstances with certain restrictions.

In its review of the 1994 SCAQMD attainment demonstration SIP (62 FR 1155-57, 117-82), EPA stated:

> "The CAA requires that SIPs include enforceable control measures sufficient to meet rate-of-progress milestones and provide the reductions needed for attainment by the applicable CAA deadline. Where it is infeasible for a state to accomplish the necessary regulatory adoption in the short term, we have recognized that this requirement can be satisfied, to some extent, by enforceable commitments to adopt regulations in the future, since these commitments can be enforced in court by EPA or citizens.
>
> In view of the magnitude of reductions required in the South Coast and the fact that SCAQMD and CARB have already adopted in regulatory form more stringent measures than are included in most other SIPs, we approved the 1994 Ozone SIP despite its heavy reliance on commitments to adopt regulations."

Additionally, EPA stated its support for enforceable commitments in the proposed conditional approval and disapproval of the attainment demonstration SIP for the HGA ozone nonattainment area. "EPA has recognized that in some limited circumstances, it may be appropriate to issue a full approval for a submission that consists, in part, of an enforceable commitment. Unlike the commitment for conditional approval, such an enforceable commitment can be enforced in court by EPA or citizens. In addition, this type of commitment may extend beyond one year following EPA's approval action. Thus, EPA may accept such an enforceable commitment where it is infeasible for the state to accomplish the necessary action in the short term." 64 FR 70548, 70550 (1999).

Therefore, the use of enforceable commitments as a possible alternative to one or more of the measures proposed in the current SIP, or in addition to the measures already proposed in the current SIP, based on

comments received during the comment period may be considered in the adoption of this SIP. As always, the commission remains receptive to additional potential control strategies for the reduction of ozone.

6.5 Incentive Programs

Several local stakeholders in the HGA area have expressed an interest in the creation of programs designed to provide incentives for the achievement of earlier and/or greater reductions than anticipated from currently proposed control measures. Such incentive programs could be effective technology-forcing tools to obtain substantial innovation and ozone reductions, in the most cost-efficient manner possible.

Such programs may require legislative authority. Interested stakeholders have been working with legislative staff, exploring possible legislation to create various incentive programs. Possible components of one such program could be the competitive provision of funds to entities operating both on- and off-road NO_x sources to assist in the incremental costs of cleaner equipment (which could encourage earlier implementation of new technologies, cleaner engines, and fuels). Other incentive programs could focus on tax incentives, subsidies, research and development technological assistance, etc.

The commission anticipates that such programs could be components of the HGA ozone nonattainment SIP, either as enforceable commitments, as potential future substitute for rules or measures based on the per ton reduction cost and total funding associated with the final scope of the programs, or as alternative methods of compliance with proposed control strategies.

The commission solicits comment on the concept of such economic incentive programs, and the possible benefits or disadvantages that could result for the HGA ozone nonattainment area. Additionally, the commission solicits comment on the necessary components of such programs, and the way in which the programs should be included in the SIP should the commission determine that such programs would be beneficial for the HGA ozone nonattainment SIP.

6.6 Innovative Technology

Although the FCAA reserves for extreme areas the ability to include control measures into an approvable SIP based on anticipated development of new control techniques or improvement of existing control technologies, the commission believes that the current SIP approval process and current EPA guidance do provide some flexibility in this area. While the commission has not yet identified specific techniques or technologies that would be appropriate for such flexibility, the commission is hopeful that continued research, development, and stakeholder and public input will provide ideas or possible solutions that would benefit from further review and refinement. The commission solicits comment on the inclusion of such control measures in the adoption of the current SIP.

6.7 Federal Measures

Although the commission remains fully committed to the adoption of an approvable attainment demonstration SIP for the HGA ozone nonattainment area, the commission also recognizes that this effort may require assistance from EPA to obtain reductions from sources that states are federally preempted from regulating, such as locomotives, marine engines, aircraft engines, etc.

Additionally, some of the measures currently proposed for inclusion in the SIP are similar to measures adopted for the DFW ozone nonattainment SIP which are currently in litigation, and may need to be replaced with additional reductions in the event regulations are overturned by courts.

The commission believes that EPA could provide some amount of reductions from federally preempted sources to assist in the commission's effort to reach attainment. The commission solicits comment on the measures appropriate for such federal action, and the nature of such measures.

CHAPTER 7: FUTURE ATTAINMENT PLANS

7.1 ONGOING ACTIVITIES

During the proposal, hearing, public comment, and evaluation of testimony phases of this SIP revision, the commission will continue to refine the attainment demonstration through additional photochemical modeling, improvement of the emissions inventory, and intensive, frequent consultation with stakeholders. Major milestones associated with these tasks are summarized in Table 7.1-1.

Table 7.1-1 Schedule for Submitting HGA SIP and Adopted Rules

Action	Date
Proposal package filed with Chief Clerk	July 21, 2000
Proposal presented at commission agenda	August 9, 2000
30-day comment period begins	August 9, 2000
Public hearings held (12)	September 18-25, 2000
Comment period closes	September 25, 2000
Adoption package filed with Chief Clerk	November 17, 2000
SIP/rules adopted by commission	December 6, 2000
SIP/rules submitted to EPA	December 29, 2000

7.2. MID-COURSE REVIEW

The commission will perform a mid-course review and submit the results to EPA by May 1, 2004. This effort will involve a thorough evaluation of all modeling, inventory data, and other tools and assumptions used to develop the attainment demonstration. However, the mid-course review will not relate monitored ambient ozone measurements to the effectiveness of the overall control strategy, since the key strategies crucial to attainment probably will not have been implemented by that time. Although NO_x emissions will begin to decrease in the 2001/2002 time frame, these reductions may not result in lowered monitored ozone levels until the 2005/2006 time frame, considering the time needed to implement point, on-road mobile, and non-road mobile source controls.

One aspect of the mid-course review involves an intensive field study planned for the summer of 2000, which will improve understanding of the physical processes leading to high ozone concentrations in East Texas and particularly along the Gulf Coast. Together with improvements to the emissions inventory, the results of this study will provide part of the scientific basis for reassessing the ozone problem in the HGA ozone nonattainment area. The commission plans to perform new modeling after the appropriate quality assurance and analysis of the field study and inventory data are completed. New modeling results may be expected in 2003, at which time the commission would be able to re-evaluate the control strategies for the area. Completing the mid-course review in late 2003 and taking it through the proposal, hearing, and adoption process in early 2004 would allow the mid-course review SIP revision to be submitted to EPA by May 1, 2004.

The commission commits to continue working with EPA and the HGA regional stakeholders in an open, public consultative process to ensure that the mid-course review is a comprehensive and thorough evaluation.