

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

POST 1999 RATE-OF-PROGRESS DEMONSTRATION PLAN  
FOR THE HOUSTON-GALVESTON-BRAZORIA NONATTAINMENT AREA

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
P.O. BOX 13087  
AUSTIN, TEXAS 78711-3087

PROJECT NO. 2004-049b-SIP-AI

Adopted October 27, 2004

## LIST OF ACRONYMS

ASC - Area Source Categories  
BACT - Best Available Control Technology  
BEIS - Biogenic Emissions Inventory System  
BEIS-2 - Biogenic Emissions Inventory System, version2  
BELD - Biogenic Emissions Land Cover Database  
BIOME - Biogenic Model for Emissions  
BPA - Beaumont-Port Arthur Nonattainment Area  
CFR - Code of Federal Regulations  
CO - Carbon Monoxide  
DOW - Day of Week  
DV - Design Value  
EDMS - Emissions and Dispersion Modeling System  
EGAS - Economic Growth Analysis System  
EI - Emissions Inventory  
EIQ - Emissions Inventory Questionnaire  
EPA - U.S. Environmental Protection Agency  
ERC - Emission Reduction Credit  
ERG - Eastern Research Group  
ESAD - Emission Specification for the Attainment Demonstration  
FCAA - Federal Clean Air Act  
FMVCP - Federal Motor Vehicle Control Program  
FR - Federal Register  
GloBEIS - Global Biogenic Emissions Inventory System  
HC - Hydrocarbon  
HGB - Houston-Galveston-Brazoria Nonattainment Area  
HGAC - Houston-Galveston Area Council  
HPMS - Highway Performance Monitoring System  
HON - Hazardous Organic NESHAP  
ICI - Industrial, Commercial, and Institutional  
IIG - Interim Implementation Guidance  
IIP - Interim Implementation Plan  
I/M - Inspection and Maintenance  
MACT - Maximum Achievable Control Technology  
MPO - Metropolitan Planning Organization  
MECT - Mass Emissions Cap and Trade Program  
MVEB - Motor Vehicle Emissions Budget  
NAAQS - National Ambient Air Quality Standard  
NESHAP - National Emissions Standards for Hazardous Air Pollutants  
NO<sub>x</sub> - Nitrogen Oxides or Oxides of Nitrogen  
O<sub>3</sub> - Ozone  
OAQPS - Office of Air Quality Planning and Standards  
OTAQ - Office of Transportation and Air Quality  
PEI - Periodic Emissions Inventory  
ppb - Parts Per Billion  
ppm - Parts Per Million  
ppmv - Parts Per Million by Volume

PSDB - Point Source Database  
QA/QC - Quality Assurance/Quality Control  
RACT - Reasonably Available Control Technology  
ROP - Rate-of-Progress  
SETRPC - Southeast Texas Regional Planning Commission  
SIC - Standard Industrial Classification  
SIP - State Implementation Plan  
TAC - Texas Administrative Code  
TACB - Texas Air Control Board  
TCAA - Texas Clean Air Act  
TCM - Transportation Control Measure  
TIP - Transportation Implementation Program  
TCEQ - Texas Commission on Environmental Quality (commission)  
TPOD - Tons Per Ozone Day  
TPY - Tons Per Year  
TTI - Texas Transportation Institute  
TxDOT - Texas Department of Transportation  
UAM - Urban Airshed Model  
VMEP - Voluntary Mobile Source Emissions Reduction Program  
VMT - Vehicle Miles Traveled  
VOC - Volatile Organic Compound

**HOUSTON-GALVESTON-BRAZORIA RATE-OF-PROGRESS  
TABLE OF CONTENTS**

*List of Acronyms*

*Table of Contents*

*List of Tables*

*List of Appendices*

*Executive Summary*

*Chapter 1: General*

- 1.1 ROP Requirements
- 1.2 HGB ROP Background
- 1.3 Public Hearing Information
- 1.4 Social and Economic Considerations
- 1.5 Fiscal and Human Resources

*Chapter 2: Updated Emission Inventories*

- 2.1 Overview of Methodologies and Assumptions
- 2.2 Updated 1990 Rate-of-Progress Base Year Inventory
- 2.3 Updated 1990 Adjusted Base Year Inventories for Milestone and Attainment Years (1996, 1999, 2002, 2005, 2007)
- 2.4 Updated Uncontrolled Milestone and Attainment Year Emission Inventories (2002, 2005, 2007)
- 2.5 Updated Controlled Milestone Year Emission Inventories (2002, 2005, 2007)

*Chapter 3: Target Emission Levels*

- 3.1 Target Level Methodologies and Assumptions
- 3.2 Rate-of-Progress Demonstration for 2002 (33%)
- 3.3 Rate-of-Progress Demonstration for 2005 (9%)
- 3.4 Rate-of-Progress Demonstration for 2007 (6%)

*Chapter 4: Control Measures to Achieve Target Emission Levels*

- 4.1 Overview of Control Measures
- 4.2 Point-Source Controls
- 4.3 Area-Source Controls
- 4.4 Non-road-Mobile-Source Controls
- 4.5 Onroad-Mobile Source Controls
- 4.6 Contingency Measures

*Chapter 5: Motor Vehicle Emissions Budgets*

- 5.1 Overview of Methodologies and Assumptions
- 5.2 Motor Vehicle Emissions Budgets for Milestone and Attainment Years (2002, 2005, 2007)

*Glossary*

**HOUSTON-GALVESTON RATE OF PROGRESS  
LIST OF TABLES**

Number	Table Name
ES-1	<i>Summary of Rate of Progress Demonstration, Houston-Galveston Ozone Non-attainment Area</i>
ES-2	<i>ROP Motor Vehicle Emission Budgets for HGB</i>
2-1	<i>HGB All Counties 1-Hr Rate-of-Progress Ozone Season Weekday On-Road Mobile Source VMT,, and Emissions</i>
2-2	<i>1990 Base Year ROP On Road Mobile Emission Inventory, HGB, 1-Hr Rate-of-Progress, Ozone Season, Weekday, On road Mobile Source VMT, and Emissions</i>
2-3	<i>Summary of Non-creditable Reductions, HGB, 1-Hr Rate-of-Progress, Ozone Season Weekday, On road Mobile Source VMT and Emissions</i>
2-4	<i>Uncontrolled Milestone Year Emission Inventories, HGB All Counties 1-Hr Rate-of-Progress Ozone Season Weekday, On road Mobile Source VMT, and Emissions</i>
2-5	<i>Controlled Milestone Year Emissions Inventories, HGB All Counties 1-Hr Rate-of-Progress Ozone Season Weekday, On road Mobile Source VMT, and Emissions</i>
3-1	<i>Summary of VOC and NOx Percent Reduction for HGB ROP SIP Update</i>
3-2	<i>Summary of Rate of Progress Demonstration</i>
4-1	<i>Summary of Emission Reductions</i>
4-2	<i>Summary of Area Source Emissions</i>
4-3	<i>Summary of Non road Mobile Emissions</i>
4-4	<i>Control Programs Modeled in MOBILE6 Emissions Factors For 1990, 2002, 2005, and 2007 ROP Controlled Emissions Inventories</i>
4-5	<i>On road Mobile Control Strategy Reductions ROP Milestone Year, HGB 1-Hr Rate-of-Progress Ozone Season Weekday, With and Without Rural County I/M</i>
4-6	<i>ROP Contingency Demonstration for HGB</i>
5-1	<i>2002 ROP Motor Vehicle Emission Budgets for HGB</i>
5-2	<i>2005 ROP Motor Vehicle Emission Budgets for HGB</i>



**HOUSTON-GALVESTON RATE OF PROGRESS  
LIST OF APPENDICES**

Appendix #	Appendix Name
1	<i>Houston-Galveston 1 Hour Ozone Nonattainment ROP Calculation Spread Sheet</i>
2	<i>Houston/Galveston One-Hour Ozone Nonattainment Area Rate-of-Progress On road Mobile Source Emissions Inventories Revisions; Texas Transportation Institute, The Texas A&amp;M University System; College Station, Texas; April 2004.</i>
3	<i>Houston-Galveston Ozone Nonattainment ROP Non road Mobile Control File</i>
4	<i>Houston-Galveston Ozone Nonattainment ROP Non road Mobile Custom File</i>
5	<i>Houston-Galveston Ozone Nonattainment ROP Non road Mobile Uncontrolled File</i>
6	<i>Documentation of Area Source Emission Inventory Improvements</i>
7	<i>Documentation of Non road Mobile Emission Inventory Improvements</i>

## EXECUTIVE SUMMARY

Section 182 of the FCAA Amendments of 1990 requires ozone nonattainment areas with air quality classified as moderate or worse to submit plans showing reasonable further progress/rate-of-progress<sup>1</sup> (ROP) towards attainment of the NAAQS. The HGB area is classified as a severe-17 nonattainment area for ozone with an attainment date of 2007 for the 1-hour ozone standard. The rate-of-progress SIP is not required or intended to demonstrate attainment of the ozone NAAQS. It is intended as a demonstration of the effectiveness of the Texas emission control program in achieving 15 percent reduction in VOC by 1996 and a 3 percent per year reduction in ozone precursors, averaged over each consecutive three-year period beginning with 1996 and continuing through the attainment year. The end of each three year period is termed a milestone year and requires a ROP analysis. Severe-17 areas have rate-of-progress milestone dates of 1996, 1999, 2002, 2005 and 2007. For the HGB area TCEQ has submitted the following ROP milestone plan requirements:

- A 15 percent ROP SIP for reductions achieved between 1990 and 1996.
- A 9 percent ROP SIP for the period of 1996 to 1999.
- A 9 percent ROP SIP for the period of 1999 to 2002.
- A 9 percent ROP SIP for the period of 2002 to 2005.
- A 6 percent ROP SIP for the period of 2005 to 2007.

Since the last HGB ROP SIP revision the following updates have been made:

- the HGB attainment demonstration SIP has been updated;
- the EPA has released NONROAD2002 a new tool for estimating emissions from non road sources;
- the EPA has released MOBILE6 a new tool for estimating emissions from on road mobile sources; and
- the HGB Metropolitan Planning Organization (MPO) has updated the forecast on road activity levels to include the effects of the latest census information and the most recent transportation planning assumptions.

EPA SIP development guidance recommends inventory consistency between ROP and attainment demonstration SIPs. Transportation conformity is most effectively accomplished when the SIP motor vehicle emissions budgets (MVEB) reflect the most recent on road mobile tools and activity level estimates. TCEQ has previously submitted a HGB SIP with an ROP plan for all milestone years. To maintain consistency with the attainment demonstration SIP and to have MVEBs that reflect the latest on road mobile tools and transportation planning assumptions, an ROP SIP update is required. Because the 1996 and 1999 ROP requirements have been met, and there are no conformity issues associated with 1996 or 1999, ROP update requirements can be met by updating the ROP analysis for the milestone years of 2002, 2005 and 2007.

This SIP demonstrates the updated Texas plan for meeting the post-1999 ROP requirements for the analysis periods of 1990 to 2002, 2002 to 2005, and 2005 to 2007. Using an EPA approved method the 2002 plan demonstrates a total reduction of 33 percent (effect of MOBILE 6 on the 15 percent required reductions in the 1996 SIP and the mandated 9 percent reductions in the 1999 SIP). The 2005 ROP plan will demonstrate a 9 percent ROP reduction. The 2007 ROP plan will demonstrate a 6 percent reduction. Target year inventories include all the latest information available to estimate emissions growth. Target levels for all

---

<sup>1</sup> <sup>1</sup> To help clarify the rate-of-progress terminology in this document a Glossary has been included at the end of Section 5.

three years also account for ROP corrections and non-creditable reductions. All the ROP inventories are based upon an ozone season weekday analysis. (Because the attainment demonstration inventories are based upon episode day analysis, and because activity levels, temperature and humidity may be different for a specific episode day relative to an average ozone season weekday some differences are to be expected between the attainment demonstration inventories and the ROP inventories.)

There are two major ROP requirements: the 15 percent VOC reduction by 1996, and 3 percent per year reduction for either VOC or NO<sub>x</sub> for each year between 1996 and the attainment year. The annual 3 percent can be taken as:

- a VOC reduction;
- a NO<sub>x</sub> reduction; or
- a combination of NO<sub>x</sub> and VOC reductions that total 3 percent.

This SIP uses both NO<sub>x</sub> and VOC reductions to meet the post-1996 3 percent per year reduction requirement. The ROP methodology involves development of the base year, determination of the 15 percent and 3 percent reduction requirements, development of the milestone year inventories, development of the emission reductions for each milestone year, and the development of an estimate of the effects of non-creditable reductions and pre-1990 CAAA rule corrections. Once these values have been analyzed the milestone target levels and emission inventories can be compared to determine if the forecast controlled emission inventory is less than the target level. The rate-of-progress plan requires the control strategy plan to demonstrate emission reductions that will reduce the future emission inventories to a value less than the emissions target value.

A summary of the uncontrolled milestone year inventories, the control strategies that are part of the Texas ROP plan, the control strategy reductions, the resulting controlled milestone year inventories, the target levels of emissions for each milestone year and a comparison of the controlled inventory to the target level of emissions is presented in Table ES-1. The comparison of the controlled target year inventories and the target level of emissions demonstrates that the ROP plan for HGB documented in this SIP meets the CAAA ROP requirements for all milestone years.

**Table ES-1 Summary of Rate of Progress Demonstration Houston-Galveston Ozone Non-attainment Area**

Description	2002		2005		2007	
	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC
Uncontrolled Emissions Forecast	1367.88	1026.58	1358.52	1039.48	1372.79	1057.49
Control Reductions to Meet ROP						
Point Source: Federal, State, Local Point Source Controls (See Appendix 1- Sheet13 for details of point source controls)	458.74	315.01	533.48	315.28	636.57	315.46
On road mobile: FMVCP Tier I/II, I/M, RFG, HDDV	57.00	55.80	109.61	82.00	164.27	103.10
Non-road mobile:(See Appendix 1- Sheet 14)	8.57	37.43	15.79	55.71	21.70	67.19
Area Source: (see Appendix 1-Sheet 12 for details)	0.00	60.79	0.00	62.83	0.00	64.62

Controlled ROP Emissions Forecast	843.57	557.55	699.64	523.66	550.25	507.12
ROP Target Level of Emissions <sup>1</sup>	1088.24	726.70	945.57	715.70	866.53	714.80
Is controlled emission forecast less than ROP target level of emissions?	Yes	Yes	Yes	Yes	Yes	Yes

Note 1: The ROP Target Level of Emissions is calculated by subtracting the 15% VOC reduction, the 3% per year reduction, the non-creditable reductions due to pre-1990 controls, and the RACT and I/M corrections from the base year inventory. All the elements to reproduce the value are not included in this table. Please refer to Appendix 1 for details concerning the calculation of the target level of emissions.

EPA requires all ROP and attainment demonstration SIPs to establish motor vehicle emissions budgets (MVEB) for transportation conformity purposes. Because this SIP demonstrates the updated Texas plan for meeting the post-1999 ROP requirements, it sets MVEBs for transportation conformity for the milestone years 2002, 2005 and 2007. An MVEB 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. To pass the budget test, areas must demonstrate that the estimated emissions from transportation plans, programs and projects do not cause the motor vehicle emissions budget(s) to be exceeded.

If the commission adopts additional control measures to reduce on road motor vehicle emissions as a SIP revision, or if the commission submits a SIP update that includes modification of the on road mobile inventory or control reduction values used to demonstrate ROP, the commission will concurrently revise the motor vehicle emissions budget(s) for the SIP and submit such revised budget(s) to EPA as a revision to the SIP. Although no new on road mobile source controls have been adopted for the updated ROP plan presented in this SIP update, the on road mobile emission inventories and control reduction values were updated using the latest EPA on road mobile source inventory development tool, MOBILE6. Since the inventories and the control reductions values have changed, the MVEBs are updated as part of this SIP revision. Chapter 5 documents the details of the development of revised ROP MVEBs for the 8-county HGB ozone nonattainment area. A summary of the revised MVEBs is presented in Table ES-2.

**Table ES-2 ROP Motor Vehicle Emission Budgets for HGB**

Description	NO <sub>x</sub> tons per day	VOC tons per day
2002 ROP MVEB	326.6	132.0
2005 ROP MVEB	257.3	104.2
2007 ROP MVEB	210.0	90.0

## CHAPTER 1: GENERAL

### 1.1 ROP Requirements

The FCAA Amendments of 1990 require a specified rate of emission reductions for all ozone areas classified as moderate and above. Section 182(b)(1) requires moderate and above areas to submit a SIP revision detailing how the area will achieve a reduction in VOC emissions of at least 15 percent between November 15, 1990 and November 15, 1996 (hereafter called the ROP demonstration). This ROP SIP was due November 15, 1993. The ROP requirement is based on the 1990 base-year emissions inventory, which all nonattainment areas were required to submit by November 15, 1992.

Section 182(c)(2) required all ozone nonattainment areas classified as serious and above to submit a SIP revision by November 15, 1994 to achieve additional emission reductions of 3 percent per year averaged over each consecutive three year period from November 15, 1996, until the area's attainment date (post 1996 ROP demonstration). This SIP revision was also required to describe how any growth in emissions over each applicable post-1996 period will be offset. In addition, 3 percent contingency measures must be adopted, to be implemented in the event that milestone reductions fail to occur.

The FCAA Amendments of 1990 also provide for crediting of VOC emission reductions achieved in the 1990-1996 period to the post-1996 ROP demonstration, if they are in excess of the 15 percent VOC reductions (net of growth) required between 1990 and 1996, and substitution of NO<sub>x</sub> emission reductions (net of growth) occurring in the post-1990 period for the post-1996 VOC emission reduction requirements.

Demonstrating achievement of the 15 percent VOC emission reductions by November 15, 1996, and then subsequently demonstrating achievement of the 3 percent per year VOC emission reductions averaged over each consecutive 3-year period from November 15, 1996, until the attainment date, are termed milestone demonstrations.

### 1.2 HGB ROP Background

The HGB ozone nonattainment area is classified as severe-17 under the FCAA Amendments of 1990 (42 United States Code (USC) §§7401 et sequence.). The area is required to attain the 1-hour ozone standard of 0.12 ppm by November 15, 2007. The HGB area is comprised of eight counties, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties.

The following paragraphs provide a brief history of HGB ROP demonstrations, including SIP submissions to EPA in November 1994, January 1995, May 1998, December 2000, and September 2001.

The FCAA Amendments of 1990 required a post-1996 ROP SIP revision and accompanying rules by November 15, 1994. On November 9, 1994, the state submitted a SIP revision to meet required 3 percent per year VOC reductions for 1997 through 1999. The revision detailed how the HGB was to achieve 9 percent net-of-growth VOC reductions, i.e., 3 percent per year for three years. Most of this amount was achieved by quantifying additional reductions from existing rules and reductions from federally mandated rules. Rules to achieve the further reductions needed to meet the ROP SIP goal were submitted to EPA on January 11, 1995.

Following EPA changes in SIP elements and timelines, EPA issued revised draft guidance for areas such as HGB that do not attain the 1-hour ozone standard. In response to the guidance, the state submitted to EPA on May 19, 1998, a revision to the HGB SIP containing, among other elements, a revision to the post-1996 9 percent ROP SIP, which remedied a deficiency that made the previous version unapprovable.

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. The state submitted the SIP in April, 2000, which contained a state commitment to submit a post-1999 ROP demonstration by December 31, 2000.

The December 2000 SIP revision contained rules and photochemical modeling analyses in support of the HGB ozone attainment demonstration. In addition, the revision contained post-1999 ROP demonstrations for the milestone years 2002 and 2005, and for the attainment year 2007, and transportation conformity MVEBs for NO<sub>x</sub> and VOC, including replacement of 2007 ROP MVEBs consistent with attainment MVEBs. A September 2001 SIP revision included corrections to the ROP table/budget for the years 2002, 2005, and 2007 due to a mathematical error.

### 1.3 Public Hearing Information

The commission held public hearings at the following times and locations:

CITY	DATE	TIME	LOCATION
Houston	August 2, 2004	1:30 p.m. 5:30 p.m.	City Hall Council Chambers 901 Bagby
Beaumont	August 3, 2004	10:30 a.m.	John Gray Institute 855 East Florida Avenue
Austin	August 5, 2004	9:30 a.m.	Texas Commission on Environmental Quality 12100 Park 35 Circle Building F, Room 2210

Written comments were also accepted via mail and fax through August 9, 2004.

### 1.4 Social and Economic Considerations

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

### 1.5 Fiscal and Human Resources

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

## CHAPTER 2: UPDATED EMISSION INVENTORIES

### 2.1 Overview of Methodologies and Assumptions

The FCAA Amendments of 1990 require that emission inventories be prepared for ozone nonattainment areas. Because ozone is photochemically produced in the atmosphere when VOCs are mixed with  $\text{NO}_x$  in the presence of sunlight, it is important that the agency compile information on the significant sources of these precursor pollutants. The role of the emissions inventory is to identify the source types present in an area, the amount of each pollutant emitted, and the types of processes and control devices employed at each plant or source category. The emissions inventory 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 and  $\text{NO}_x$  for an area is summarized from the estimates developed for the five general categories of emission sources: stationary point, area, onroad mobile, non road mobile, and biogenics.

Some emissions data for the base year, milestone years and the attainment year emissions inventories were updated from the previous ROP SIP submittals. This was necessary due to significant changes in methods of calculating emissions and in the improvement in collecting more and better activity data that can be used in calculating emissions.

The same changes that apply to the inventories also apply to the calculation of control strategy emission reductions. When the inventories and control reductions change, it is necessary to reevaluate the controls that are used to demonstrate achievement of the ROP milestone and contingency year requirements. Therefore in addition to the inventory and control reduction updates, the controls used to demonstrate both ROP and contingency requirements have been updated.

**Point sources.** Major point source emissions and industrial process operating data are collected annually from sites that meet the reporting requirements of 30 Texas Administrative Code 101.10.

To collect emissions and industrial process operating data for these plants, the commission mails Emissions Inventory Questionnaires (EIQs) to all sources identified as meeting reporting requirements. Companies are required 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 that result in emissions. 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 quality assurance procedures and entered into an electronic data base. Additional information is available upon request from the Technical Analysis Division of the TCEQ.

**Area sources.** Area sources are commercial, small-scale industrial and residential categories of sources that use materials or operate processes that can generate emissions. Area sources are too small to meet the reporting criteria for major point sources and emissions are calculated as county-wide totals rather than as individual facilities. Area sources can be divided into two groups characterized by the emission mechanism: hydrocarbon evaporative emissions or fuel combustion emissions. Examples of evaporative sources 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 refuse burning, structural fires, and wildfires. These emissions, with some exceptions, may be calculated by multiplication of an established emission factor (emissions per unit of activity) times the appropriate activity or activity surrogate responsible for generating emissions. Population is the most commonly used activity surrogate for

many area sources, while other activity data include amount of gasoline sold in an area, employment by industry type, and acres of cropland.

**On road mobile sources.**

On road mobile sources of emissions 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. To calculate emissions both the rate of emissions per unit of activity (emission factors) and the number of units of activity must be determined. The U.S. EPA provides guidance on the development of emission factors and activity levels.

Emission factors are developed using the EPA's mobile emission factor model, MOBILE (current version MOBILE6.2.03). The model allows substantial input in order to simulate the driving behavior, meteorological conditions and vehicle characteristics specific to the HGB area. Inputs used for Texas ROP on road mobile emission inventory development are: vehicle speeds for each roadway link, vehicle age distributions for each vehicle type, percentage of miles traveled for each vehicle type, type of inspection-maintenance program, fuel control programs, and gasoline vapor pressure. Because inputs influence the emission factors calculated by the MOBILE model, every effort is made to input parameters reflecting local conditions, rather than national default values.

To estimate on road mobile emissions, emission factors calculated by the MOBILE model described above must be multiplied by the level of vehicle activity. For on-road mobile, the emission factors are in units of grams per mile. Therefore the activity information that is required to complete the inventory calculation is vehicle miles traveled. The level of vehicle travel activity is developed using travel demand models (TDM) run by the Texas Department of Transportation or the local metropolitan planning organizations. Travel demand models are validated against a large amount of ground counts, i.e., traffic passing over counters placed in various locations throughout a county. Estimates of vehicle-miles-traveled are often calibrated to outputs from the federal Highway Performance Monitoring System, which is a model built from a smaller number of traffic counters. Roadway speeds, which are required as input for the MOBILE model, are calculated by using the activity volumes from the TDM and a post-processor speed model.

In order to complete the ROP calculations a set of mobile inventories is required.

- The 1990 base year is the starting point for 1-hour ROP. This starting point establishes the inventory as it existed upon implementation of the 1990 CAAA.
- The adjusted base year inventories (ABY) are the basis for calculating the percent reductions as required in the ROP guidance and as a basis for determining the non-creditable reductions due to control programs implemented prior to the 1990 CAAA. Because the ABY inventory adjusts the 1990 Base Year inventory for the fleet turn over effects of pre-1990 FMVCP and the 1992 RVP control, only the emission rates are different than the 1990 Base Year. The activity levels for both the base year and the adjusted base year inventories are speed and VMT consistent with the travel demand model output for the 1990 roadway network and demographic demands.
- An on road mobile ABY inventory is required for each milestone year and for any year for which a percent reduction requirement calculation must be completed.
- The ROP analysis also requires an uncontrolled inventory with growth for each milestone year. These uncontrolled inventories serve as the basis for determining how much emissions reduction is required in order to meet the ROP target. The control strategy inventories serve as the basis for calculating on road mobile source control strategy reductions for each milestone year.
- The ROP analysis requires the calculation of a controlled inventory to subtract from the uncontrolled inventory in order to determine the effectiveness of control strategies. ROP requires direct calculation

of the control reduction which may then be subtracted from the inventory in order to determine the controlled inventory value. For HGB on road mobile control scenarios with and without the Texas Low Emission Diesel Program (TxLED) were calculated. Both control emission levels are presented in the on road mobile inventory summary table, Table 2-1. The TCEQ determined that the ROP demonstration for HGB did not require the use of TxLED. Therefore the ROP calculations and MVEB determinations do not include the TxLED emission reduction.

Because the I/M program for the three rural counties in Houston has not been implemented, and repeal of the I/M requirement is under consideration in those counties, two control strategy scenarios were developed for the milestone years of 2005 and 2007, with and without rural county I/M. Complete documentation of the development of the on road mobile inventories for the HGB ROP is available in Appendix 2. The complete set of input and output files are available upon request from the TCEQ's Technical Analysis Division.

A summary of the on road mobile HGB ROP inventories is presented in Table 2-1.

**Table 2-1 HGB All Counties 1-Hr Rate-of-Progress Ozone Season Weekday Onroad Mobile Source VMT, and Emissions (tons per day)**

<b>Emissions Inventory</b>	<b>VMT</b>	<b>VOC</b>	<b>NO<sub>x</sub></b>
1990 Base Year	98,710,454	321.7	391.1
1996 Adjusted Base Year (ABY)	98,710,454	182.4	319.6
1999 ABY	98,710,454	156.1	303.1
2002 ABY	98,710,454	141.2	286.9
2005 ABY	98,710,454	130.2	253.9
2007 ABY	98,710,454	129.3	247.6
2002 Pre-1990 Control (Pre90C)	131,839,614	187.8	383.6
2005 Pre90C	142,067,256	186.2	366.9
2007 Pre90C	148,552,482	193.1	374.3
2002 Control Strategy (CS)	131,839,614	132.0	326.6
2005 CS	142,067,256	103.6	249.0
2005 CS, No Rural County I/M	142,067,256	104.2	249.3
2005 CS, No Rural County I/M and no TxLED	142,067,256	104.2	257.3
2007 CS	148,552,482	89.4	203.2
2007 CS, No Rural County I/M	148,552,482	90.0	203.6
2007 CS, No Rural County I/M and No TxLED	148,552,482	90.0	210.0

**Non road mobile sources.** Non road mobile sources include aircraft operations, marine vessels, recreational boats, railroad locomotives, and a very large assortment of other off-highway equipment from 600-horsepower engines mounted on construction equipment to 1-horsepower string trimmers. Methods for calculating emissions from non road engine sources are based on information about equipment population, engine horsepower and load factor, emission factors, 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 originally projected to later years based on EPA's Economic Growth Analysis System (EGAS) model. Subsequently, several projects using improved methodologies revised the inventory for some categories. Each major non road mobile source category has a unique method for emission calculations. EPA's NONROAD model was developed to calculate emissions from all non road mobile categories except aircraft, commercial marine, and locomotives. The 1990 base year emissions inventory was updated with emissions results calculated by this model.

**Biogenic sources.** Biogenic sources include hydrocarbon emissions from crops, lawn grass, and forests as well as a small amount of NO<sub>x</sub> 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 emission estimates based on emission factors by plant species using the GLOBEIS model. Emissions from biogenic sources are subtracted from the inventory prior to determining any required reductions for a ROP demonstration. However, the biogenic emissions are important in determining the overall emissions profile of an area and therefore are required for regional air quality photochemical modeling.

## **2.2 Updated 1990-ROP Base Year Inventory**

### **Point sources.**

Updates to the point source inventory were conducted on the basis of individual companies resubmitting their EIQs in order to provide more accurate emissions information, submit recalculated emissions based on improved methodologies, or to correct mistakes discovered in their original submittals. Additional information is available upon request from the Technical Analysis Division of the TCEQ.

**Area sources.** The 1990 base year emissions inventory was developed in 1992. Since that time several updates in methodologies have evolved for compiling area source emissions. The EPA's Emissions Inventory Improvement Program produced approved methodologies for several area source categories, which have been implemented into the periodic inventories following 1992. These methods offered improvements in activity data to be used as well as improved emission factors. Area source categories affected by major changes include oil and gas production, industrial coatings, consumer products, and stage I gasoline marketing. In addition, area source improvements resulted from conducting "bottom-up" surveys for some categories, including graphic arts, forest fires, and oil and gas production. These surveys produced data that more accurately depicted facility activity levels than did previous methodologies. Since these updates occurred after the 1990 base year emissions inventory was originally developed the 1990 inventory was updated with these improvements. See Appendix 6 for documentation of area source improvements.

### **On road mobile sources.**

The 1990 base year emission inventory for on road mobile sources was updated using emission factors calculated using the latest version of the MOBILE model, MOBILE6.2. Additional updates were made in order to incorporate the latest activity estimates from the HGB travel demand model 1990 network. Only control strategies implemented prior to 1990 were included in the input to the inventory development for the 1990 on road mobile source base year inventory.. These controls include: Pre-90 FMVCP, and the 1990 state Anti-Tampering Program (ATP) in Harris County. The activity levels used to calculate the inventory reflect the 1990 roadway network, with 1990 vehicle miles of travel and speeds. A summary of the inventory is presented in Table 2-2. Complete documentation of the development of the inventory and the details of MOBILE inputs is available for review in Appendix 2.

**Table 2-2 1990 Base Year ROP Onroad Mobile Emission Inventory HGB, 1-Hr Rate-of-Progress, Ozone Season, Weekday On road Mobile Source VMT, and Emissions (tons per day)**

<b>Emissions Inventory</b>	<b>VMT</b>	<b>VOC</b>	<b>NO<sub>x</sub></b>
1990 Base Year	98,710,454	321.7	391.1

**Non road mobile sources.** Since the 1990 base year emissions inventory was developed in 1992, several updates in methodologies for compiling area source emissions have evolved. Categories in the model include specific equipment types associated with construction, agriculture, lawn and garden, and industry. The model also accommodates recreational boats. The model has been modified and improved to its current version. See Appendix 7 for documentation of non road mobile improvements.

Three major non road mobile categories not included in the model are aircraft, commercial vessels, and locomotives. Since the development of the original 1990 base year inventory methods for calculating emissions for these three categories have improved. A special model was developed for generating emissions from aircraft. In addition, emissions from commercial vessels and locomotives have been updated by means of detailed surveys and studies. Since these updates occurred after the 1990 base year emissions inventory was originally developed, the 1990 inventory was updated with these improvements. Custom files with activity data and equipment populations are located in Appendix 4.

**Biogenic sources.**

Emissions from biogenic sources are subtracted from the inventory prior to determining any required reductions for a ROP demonstration. An updated 1990 ROP base year emissions inventory is not required.

**2.3 Updated 1990 Adjusted Base Year Inventories for Milestone and Attainment Years 1996, 1999, 2002, 2005, 2007**

The ROP planning process includes calculating the emissions baseline, the adjusted base year emission inventory, from which the ROP required percent emissions reductions are calculated. As specified by the 1990 Clean Air Act Amendments (CAAA), certain on road mobile source emissions reductions are not creditable toward these required percentage reductions. The non-creditable reductions include the emissions reductions that would occur by the target years due to the pre-1990 CAAA state controls, pre-1990 CAAA Federal Motor Vehicle Control Program (FMVCP) and pre-1990 promulgated federal fuel volatility regulations (summertime gasoline Reid Vapor Pressure [RVP] limits beginning in 1992). Because the defeat device for HDDVs was affecting an FMVCP control that was implemented prior to the 1990 CAAA, the HDDV NO<sub>x</sub> off-cycle emissions effects and associated mitigation program effects are also considered not creditable. For this updated HGB ROP analysis pre-1990 non-creditable emission factor reductions include:

- pre-1990 CAAA FMVCP,
- 1992 summertime RVP limit are termed pre-1990 controls,
- HDDV NO<sub>x</sub> off-cycle emissions and mitigation programs, and,
- 1984 Texas Anti-Tampering Program (ATP) in Harris County.

An adjusted base year emission inventory for on road mobile sources is developed for each milestone year using emission factors from the MOBILE model that reflect only control strategies implemented prior to 1990 but projected to each milestone year. By projecting the pre-1990 FMVCP into future years the effects of additional fleet turn over due to the new standards is reflected in the emission factors. The controls included in the ABY inventory development include: Pre-90 FMVCP, the 1992 low RVP control and the 1990 State program Anti-Tampering Program (ATP) in Harris County. The activity levels used to calculate the inventory reflect the 1990 roadway network, with 1990 vehicle miles of travel and speeds. The estimated non-creditable emissions reductions due to pre-1990 controls are calculated by subtracting the 1990 ABYEI

relative to the target year, from the actual 1990 BYEI. A summary of the inventories and associated non-creditable emissions reductions is presented in Table 2-3. Complete documentation of the development of the inventory and the details of MOBILE inputs is available for review in Appendix 2.

**Table 2-3 Summary of Non-creditable Reductions HGB, 1-Hr Rate-of-Progress, Ozone Season Weekday On road Mobile Source VMT and Emissions (tons per day)**

Calendar Year	VMT	1990 Base/Adjusted Base Year Inventory		Non-creditable Emissions Reductions	
		VOC	NOx	VOC	NOx
1990 Base Year	98,710,454	321.7	391.1	N/A	N/A
1996 Adjusted Base Year (ABY)	98,710,454	182.4	319.6	139.3	71.5
1999 ABY	98,710,454	156.1	303.1	165.6	88.0
2002 ABY	98,710,454	141.2	286.9	180.5	104.2
2005 ABY	98,710,454	130.2	253.9	191.5	137.2
2007 ABY	98,710,454	129.3	247.6	192.4	143.5

#### 2.4 Updated Uncontrolled Milestone and Attainment Year Emission Inventories 2002, 2005, 2007

**Overview of Methodologies and Assumptions.** The uncontrolled Milestone Year Emission Inventory represents the inventory for the milestone year if no further action to control emissions was taken beyond the actions that were already in place at the enactment of the 1990 CAAA. The inventory is calculated for each major source category using methodologies approved by EPA and then combined to obtain the total uncontrolled milestone year inventory for both VOC and NOx. The uncontrolled milestone inventory includes:

- pre-1990 CAAA controls, and
- growth in activity from 1990 to the milestone year.

The uncontrolled milestone inventory does not include:

- post 1990 CAAA controls.

**Point sources.** The methodology used to obtain uncontrolled inventories is based on historical survey data. The survey conducted analyzed reasons for point source decreases and increases in the Emissions Inventory. The results of the survey were then used to develop a calculation methodology to derive future year uncontrolled inventories. The methodology is described in detail in Appendix S of the December 2000 HGB SIP submittal. Using the methodologies outlined in these documents, a growth rate can be calculated for any year, area or pollutant and applied to the base year inventory. The formula is as follows:

$$EI_{FutureYear} = EI_{1990adjusted} \left( 1 + \frac{GrowthRate}{100} \right)^{(FutureYear-1990)}$$

**Area sources.** Future year area source emission inventories had previously been compiled for SIP strategies. However, these inventories were developed prior to the inventory improvements discussed in section 2.2 and were basically grown from the original 1990 base year inventory using EPA approved growth factors. Since

the future year inventories were based upon the non-updated 1990 base year inventory it was important to update these future year inventories. In addition, growth mechanisms have improved since the original future year inventories were developed. The updated controlled milestone and attainment year emission inventories reflect updates in the 1990 base year inventory as well as improvements in growth technologies. For the 1990 base year, the emissions inventory was forecast using EPA approved EGAS growth factors to develop the corresponding controlled emissions inventories for milestone and attainment years. Rule effectiveness factors for appropriate categories with TCEQ rules were applied to develop the controlled emissions.

**On road mobile sources.**

The milestone year uncontrolled emission inventory for on road mobile sources is developed using emission factors from the MOBILE model that reflect only control strategies implemented prior to 1990. The latest version of MOBILE, MOBILE6 was used to develop the inventories for this SIP update. The activity levels were updated to include the latest output from the HGB travel demand model. These controls include: Pre-90 FMVCP, the 1992 RVP control, and the 1990 State program Anti-Tampering Program (ATP) in Harris County. The activity levels used to calculate the inventory reflect the milestone roadway network, with milestone year vehicle miles of travel and speeds. A summary of the inventories is presented in Table 2-4. The summary shows that the inventory goes down from the base year even though VMT is increasing due to the effects of the pre-1990 controls. However, in 2007 the VMT growth has continued and the fleet turn over effects of pre-1990 controls is diminishing and an increase in the inventory is indicated. Complete documentation of the development of the inventory and the details of MOBILE inputs is available for review in Appendix 2.

**Table 2-4 Uncontrolled Milestone Year Emission Inventories HGB All Counties 1-Hr Rate-of-Progress Ozone Season Weekday On road Mobile Source VMT, and Emissions (tons per day)**

<b>Emissions Inventory</b>	<b>VMT</b>	<b>VOC</b>	<b>NO<sub>x</sub></b>
1990 Base Year	98,710,454	321.7	391.1
2002 Pre-1990 Controls	131,839,614	187.8	383.6
2005 Pre-1990 Controls	142,067,256	186.2	366.9
2007 Pre-1990 Controls	148,552,482	193.1	374.3

**Non road mobile sources.** Uncontrolled emission inventories are required for those non road mobile categories affected by specific rules impacted by ROP. Future year emission inventories had been compiled for SIP strategies prior to the inventory improvements discussed in Section 2.2. Since the future year inventories were based upon the non-updated 1990 base year inventory it was important to update these future year inventories. In addition, growth mechanisms have improved since the original future year inventories were developed. The updated uncontrolled milestone and attainment year emission inventories reflect updates in the 1990 base year inventory as well as improvements in growth technologies. In order to determine the value of the impacted rules these inventories were developed with the specific controls for these rules removed. NONROAD model uncontrolled files may be found in Appendix 5.

**Biogenic sources.**

Emissions from biogenic sources are subtracted from the inventory prior to determining any required reductions for a ROP demonstration. No uncontrolled milestone and attainment year emission inventories for 2002, 2005, and 2007 are required.

**2.5 Updated Controlled Milestone Year Emission Inventories 2002, 2005, 2007**

**Overview of Methodologies and Assumptions.** The Controlled Milestone Year Emission Inventory represents the inventory for the milestone year with growth from the 1990 base year and with all ROP controls taken into account. The inventory is calculated for each major source category using methodologies approved by EPA and then combined to obtain the total controlled milestone year inventory for both VOC and NOx. The controlled milestone inventory includes:

- pre-1990 CAAA controls,
- growth in activity from 1990 to the milestone year, and,
- post 1990 CAAA controls that are used to meet the ROP target level of emissions.

The uncontrolled milestone inventory does not include:

- post 1990 CAAA controls that are not used to meet the ROP target level of emissions.

**Point sources.** Point source control strategies developed as part of the HGB ROP are taken into account in the updated controlled year emissions inventories. See Section 4.2 for a discussion of the specific controls and reductions in effect for each of the milestone years.

**Area sources.** Although there are area source controls in HGB, such as low evaporative emission gas cans, the ROP plan meets the target level of emissions without using these controls. Therefore, no area source controls have been included in this HGB ROP SIP update, and no controlled milestone and attainment year area source emission inventories are required

**On road mobile sources.**

The milestone year controlled emission inventory for on road mobile sources is developed using emission factors from the MOBILE model that reflect both control strategies implemented prior to 1990 and the control strategies used to demonstrate compliance with the rate-of-progress requirements. These controls include: Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, I/M, ATP and Texas LED. Control scenarios with and without both the rural county I/M program and the Texas LED benefit were developed for use in HGB ROP preliminary analysis. Neither the rural county I/M nor the Texas LED program are required to meet the ROP demonstration requirements. Therefore the control scenario with no rural county I/M and no TxLED is used for all final ROP and ROP MVEB calculations. The activity levels used to calculate the inventory reflect the milestone roadway network, with milestone year vehicle miles of travel and speeds. A summary of the inventories is presented in Table 2-5. Two control strategy scenarios were run for HGB on road mobile sources, with and without the I/M program in the rural counties. Results for both scenarios are reported in the summary table. Complete documentation of the development of the inventory and the details of MOBILE inputs is available for review in Appendix 2.

Updates to the inventory values used in this ROP SIP included use of the latest version of EPA's emission factor model, MOBILE6.2, and use of updated activity levels that reflect the most recent updates to transportation planning assumptions in HGB.

**Table 2-5 Controlled Milestone Year Emissions Inventories HGB All Counties 1-Hr Rate-of-Progress Ozone Season Weekday On road Mobile Source VMT, and Emissions (tons per day)**

<b>Emissions Inventory</b>	<b>VMT</b>	<b>VOC</b>	<b>NO<sub>x</sub></b>
1990 Base Year	98,710,454	321.7	391.1
2002 Control Strategy	131,839,614	132.0	326.6
2005 Control Strategy	142,067,256	103.6	249.0
2005 Control Strategy Without Rural County I/M, and Without TxLED	142,067,256	104.2	257.29
2007 Control Strategy	148,552,482	89.4	203.2
2007 Control Strategy Without Rural County I/M, and Without TxLED	148,552,482	90.0	210.03

**Non road mobile sources.** Controlled emission inventories are required for those non road mobile categories affected by specific rules impacted by ROP in order to show the impact of the emission reductions resulting from specific rules. For the same reasons denoted in Section 2.2 concerning updates in methodologies and growth technologies, updated controlled milestone and attainment year emission inventories were compiled for the ROP strategies. NONROAD model controlled files may be found in Appendix 3.

**Biogenic sources.**

Emissions from biogenic sources are subtracted from the inventory prior to determining any required reductions for a ROP demonstration. An updated controlled milestone year emission inventories for 2002, 2005, and 2007 is not required.

## CHAPTER 3: TARGET EMISSION LEVELS

### 3.1 Target Level Methodologies

Target level emissions are the maximum amount of emissions a nonattainment area can emit for a given target year while complying with the 3 percent per year reduction requirements and the 15 percent VOC requirement. Post-1999 target level years for the HGB area are 2002, 2005 and 2007.

The FCAA Amendments of 1990 mandate each serious and above ozone nonattainment area demonstrate actual VOC emission reductions of at least 3 percent per year averaged over each consecutive 3-year period beginning in 1996, until the area's nonattainment date. The FCAA Amendments of 1990 also require a 15 percent VOC emission reduction, net of growth between 1990 and 1996. These milestone emission reductions (the post-1999 ROP demonstration) are demonstrated by calculating the target levels of emissions, projected emissions growth, and emission reduction levels for each milestone and attainment date. This chapter describes how the post-1999 ROP demonstration for the HGB is calculated.

**3.1.a Calculation of the VOC emission target levels for the post-1996 target levels.** Six steps were used in calculating each post-1996 target level of emissions (see Appendix 1, Tables 1 through 6):

- Steps 1 and 2 (see Appendix 1, Tables 4-1 and 4-2), developing the 1990 base year inventory and the 1990 ROP inventory, were also required in the 15 percent ROP demonstration but were updated here to incorporate new emission methodologies, such as the MOBILE6 emission factor model.
- Step 3 Appendix 1, Table 4-3 recalculates each adjusted base year inventory due to fleet turn over (mobile source emissions are recalculated with the MOBILE6 model due to non-creditable pre-1990 RVP/FMVCP controls).
- Step 4, (Appendix 1, Table 4-4) calculates the amount of non-creditable FMVCP/RVP reductions by taking the difference between each milestone/attainment year's mobile source emissions and the mobile source emissions of the 1990 base year inventory. The fleet turnover correction factors are calculated by taking the difference between the FMVCP/RVP reductions.
- Steps 5 and 6, Appendix 1, Table 4-5, the 3 percent per year and the 15 percent reductions are calculated. The 15 percent reduction, which is required by 1996, is calculated first. Then the 3 percent per year reduction for the following milestone years are calculated as required by §182(c)(2)(c) of the FCAA Amendments of 1990, which allow for the substitution of actual NO<sub>x</sub> emission reductions to meet the 3 percent per year VOC emission target level requirements, Appendix 1, Tables 6-1, 6-2 and 6-3, demonstrates the combination of VOC and NO<sub>x</sub> emission reductions that totals 3 percent per year to satisfy this criteria.

The following equation generally describes the method to calculate the percentage of NO<sub>x</sub> emissions substituted for VOC emissions:

$$N = [0.03 * (X-Y)] - V$$

where:

- V = percentage VOC Reduction
- X = previous milestone date
- Y = milestone/attainment date
- N = percentage NO<sub>x</sub> reductions

For this HGB SIP update, NO<sub>x</sub> reductions were substituted for the entire 3 percent per year requirement. A summary of the percent reductions for VOC and NO<sub>x</sub> is shown in Table 3-1.

**Table 3-1 Summary of VOC and NO<sub>x</sub> Percent Reduction for HGB ROP SIP Update**

HGB ROP Milestone Year	Percent VOC Reduction	Percent NO <sub>x</sub> Reduction
1996	15	N/A
1999	5	4
2002	0	9
2005	0	9
2007	0	6

Next, these percentages are multiplied by the adjusted base year inventories calculated relative to the each milestone/attainment date to yield the required VOC and NO<sub>x</sub> emission reductions as generally described in the following equation:

$$RQ_{voc} = BEx * V$$

and

$$RQ_{no_x} = BEx * N$$

where:

- RQ<sub>voc</sub> = required VOC emission reductions
- RQ<sub>no<sub>x</sub></sub> = required NO<sub>x</sub> emission reductions
- BEx = adjusted base year inventory

In order to use NO<sub>x</sub> substitution, separate target levels of emissions need to be calculated for both NO<sub>x</sub> and VOC emission reductions. The target levels are calculated in Appendix 1, Table 4-6 for VOC and 4-7 for NO<sub>x</sub>. In Appendix 1, Tables 4-6 and 4-7, the 2002 target level of VOC emissions is calculated by combining the required 15 percent VOC reduction for 1996 with the VOC portion of the 9 percent total VOC and/or NO<sub>x</sub> reductions required for 1999 and the VOC portion of the 9 percent total VOC and/or NO<sub>x</sub> reductions required for 2002, resulting in a total VOC and NO<sub>x</sub> emission reductions of 33 percent by 1999, including 15 percent VOC required for the 1999 target level.

The calculation of the target levels of emissions for each post-1996 milestone year can be generalized into the following equation:

$$TL_x = TL_y - BG_x - FT_x$$

where:

- TL<sub>x</sub> = Target level of emissions for current milestone
- TL<sub>y</sub> = Target level of emissions for previous milestone
- BG<sub>x</sub> = Emission reduction requirement for current milestone
- FT<sub>x</sub> = Fleet turnover correction term for current milestone

The areas plan must demonstrate that the projected emissions for each milestone/attainment year, reflecting the adopted control strategy, will be less than or equal to the calculated target values calculated in Appendix

1, Table 7-1, 7-2 and 7-3. The following paragraphs describe these methods and the calculations required for this portion of the ROP demonstration.

**3.1.b Growth.** As previously stated, the FCAA Amendments of 1990 require all ozone nonattainment areas classified as moderate and above to achieve a 15 percent reduction in actual VOC emissions by 1996. Additionally, emissions must be reduced by 3 percent every year until the attainment date. The reductions are calculated from the anthropogenic VOC and NO<sub>x</sub> emission levels reported in the state's 1990 base year inventory after those levels have been adjusted for pre-1990 controls as described in Section 2.3. This section presents the projection or forecast year emission inventories, i.e., the state's estimation of the level of VOC and NO<sub>x</sub> emissions to be expected if no further action is taken to control VOC or NO<sub>x</sub> emissions. The VOC and NO<sub>x</sub> projected year emission inventories are derived by applying the appropriate growth factors to the 1990 base year emission inventories as described in Section 2.4.

Emission projections are calculated in Appendix 1, Tables 7-1, 7-2 and 7-3. Totals for NO<sub>x</sub> and VOC are calculated for each milestone/attainment year for which ROP attainment demonstration is required in this SIP. Target levels calculated in Appendix 1, Table 4-6 and 4-7, are subtracted from these emission forecasts to calculate the required emission reductions necessary for each milestone/attainment year.

**3.1.c ROP demonstration.** The target levels calculated in section Appendix 1, Table 4-6 and 4-7, are subtracted from the emissions forecast, Appendix 1 Tables 5-1, 5-2 and 5-3, to calculate the required emission reductions necessary for each milestone/attainment year. The actual reductions achieved are then subtracted from the required reductions calculated in Appendix 1, Tables 7-1. The FCAA Amendments of 1990 require the state to adopt specific contingency measures that will take effect without further action by the state or the EPA if the state fails to reduce VOC and/or NO<sub>x</sub> emissions by an additional 3 percent per year from 1997 through 2005. Contingency measures are further discussed in Section 4.6..

### **3.2 ROP Demonstration for 2002 (33 percent), ROP Demonstration for 2005 (9 percent) and ROP Demonstration for 2007 (6 percent)**

The rate-of-progress plan requires the control strategy plan to demonstrate emission reductions that will reduce the future emission inventories to a value less than the emissions target value. Table 3-2 summarizes the demonstration of the rate-of-progress plan for HGB for the post-1999 ROP milestone years of 2002, 2005 and 2007.

**Table 3-2 Summary of Rate of Progress Demonstration**

Description	2002		2005		2007	
	NOx	VOC	NOx	VOC	NOx	VOC
Uncontrolled Emissions Forecast	1367.88	1026.58	1358.52	1039.48	1372.79	1057.49
Target level of emissions	1088.24	726.70	945.57	715.70	866.53	714.80
Required Reductions	279.64	299.88	412.95	323.78	506.26	342.69
Control Reductions						
Point Source: Federal, State, Local Point Source Controls (See Appendix 1- Sheet13)	458.74	315.01	533.48	315.28	636.57	315.46
On road mobile: Tier I/II, I/M, RFG, NLEV, HDDV	57.00	55.80	109.61	82.00	164.67	103.10
Non-road mobile:(See Appendix 1- Sheet 14)	8.57	37.43	15.79	55.71	21.70	67.19
Area Source: (see Appendix 1-Sheet 12 for details)	0.00	60.79	0.00	62.83	0.00	64.62
Sum of Control Reductions	524.31	469.03	658.88	515.82	822.54	550.37
Controlled Emissions forecast	843.57	557.55	699.64	523.66	550.25	507.12
Is controlled emission forecast less than target level of emissions?	Yes	Yes	Yes	Yes	Yes	Yes

## CHAPTER 4: CONTROL MEASURES TO ACHIEVE TARGET EMISSION LEVELS

### 4.1 Overview of Control Measures

This section briefly describes how control measures were used to account for the emission reductions required to meet the ROP requirements for the 2002, 2005, and 2007 HGB attainment milestones. Chosen creditable control measures and methodologies employed to estimate achieved emission levels are further described in Sections 4.2 through 4.6. The projected emissions reflect federal and state emission controls. All state control measures are codified in Texas state regulations. Because the control requirement to demonstrate attainment of the NAAQS is more stringent than the requirement to reduce emissions by 3 percent per year, the amount of control reduction for ROP is less than the amount of control reduction required for attainment demonstration. The list of controls used in the ROP plan therefore does not include all emission reduction programs for HGB. The summary of emission reductions expected from considering the control measures used to meet the milestone dates is presented in Table 4-1. Total NO<sub>x</sub> and VOC emission reductions for each milestone/attainment date are listed for each control measure and totals are summed.

**Table 4-1 Summary of Emission Reductions**

Description	2002		2005		2007	
	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC
Point Source: Federal, State, Local Point Source Controls (See Appendix 1-Sheet 13 for details of point source controls)	458.74	315.01	533.48	315.28	636.57	315.46
Onroad Mobile: Tier I/II, I/M, RFG, NLEV, HDDV	57.00	55.80	109.61	82.00	164.27	103.10
Nonroad Mobile: (See Appendix 1-Sheet 14)	8.57	37.43	15.79	55.71	21.70	67.19
Area Source: (See Appendix 1-Sheet 12)	0.00	60.79	0.00	62.83	0.00	64.62
Sum of Control Reductions	524.31	469.03	658.88	515.82	822.54	550.37

### 4.2 Point-Source Controls

The point source controls are calculated using several sources of data. These sources include, but are not limited to, emissions inventory data, mass emissions cap and trade (MECT) data, acid rain data and banked emissions data. All emission reductions required by state, federal and local rules are incorporated into the future projections for controlled inventories. The emission controls and the associated reductions are listed in Table 4-1. Point source controls are detailed in Appendix 1 - Sheet 13. The most significant of these reduction strategies being the Chapter 117 ESADs and the MECT Program for NO<sub>x</sub>. Some of the source categories and associated reductions are utility boilers (86 percent), turbines and duct burners (78 percent), heaters and furnaces (70 percent), IC engines (87 percent) and industrial boilers (89 percent) with an overall point source NO<sub>x</sub> reduction of (80 percent) These future controlled emissions estimates represented in Table 4-1 are consistent with the SIP model. See Appendix 1 Sheet 13 for the rule effectiveness adjusted, actual inventory data upon which the sum total of emissions reductions for point source controls are based, for calendar years up through 2002.

### 4.3 Area-Source Controls

Although there are area source controls in HGB, such as low evaporative emission gas cans, the ROP plan meets the target level of emissions without using these controls. Therefore, no area source controls have been included in this HGB ROP SIP update. For the 1990 Base Year, the emissions inventory was forecast using EPA approved EGAS growth factors to develop the corresponding controlled emissions inventories for milestone and attainment years. Rule effectiveness factors for appropriate categories with TCEQ rules were applied to develop the controlled emissions.

**Table 4-2 Summary of Area Source Emissions**

Houston/Galveston (Tons/Day)	1990		2002		2005		2007	
	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC
Uncontrolled Emissions Estimates	57.57	212.23	35.99	229.64	34.35	237.36	33.15	244.12
Controlled Emissions Estimates	57.57	208.17	35.99	168.85	34.35	174.53	33.15	179.50
Total Reductions	0.00	4.06	0.00	60.79	0.00	62.83	0.00	64.62

### 4.4 Non road-Mobile Source Controls

Most non road mobile equipment emissions were calculated using the EPA NONROAD2002 Model. The NONROAD2002 Model comes with a set of default files that are required for calculating non road mobile emissions. The TCEQ has customized several of the data files that are read by the NONROAD Model to more accurately reflect the emissions generated by non road mobile equipment in Texas. The remaining non road mobile equipment, comprised of locomotives, aircraft and its support equipment, and commercial marine vessels, was calculated outside of the NONROAD2002 Model using EPA approved methodologies.

For the Rate of Progress Plan (ROP), the model was executed using custom population and activity files. In some cases, custom allocation and technology type data files were also used. The technology type file is of most interest for the ROP because it identifies what percent of an equipment population is expected to utilize federal non road equipment controls for the year of interest.

For the baseline model runs, the technology type file was altered so that no controls phased-in past the year 1990 were applied, allowing the estimation of uncontrolled emissions for each year of interest. Thus, the file represents what the emissions would be if no new controls were implemented since the year 1990.

The default technology type file was then used to calculate controlled emissions for each year of interest. As stated, the default file defines federal controls distributed by year for non road equipment.

Once the uncontrolled and controlled emissions estimates have been generated by the NONROAD2002 Model, the effectiveness of control strategies for each year of interest can be evaluated. Emissions reductions from federal controls on non road equipment can be calculated by subtracting the controlled emissions estimates from the uncontrolled emissions estimates.

For each run that the NONROAD2002 Model executes, the model generates a message file that documents all of the input data files and input parameters used for each run. Message files for each of the runs used to evaluate the ROP may be found in Appendix 3 and Appendix 4. Documentation for the custom data files used in the ROP model runs may be found in Appendix 5. More information on technology types may be found in the technical documentation for the Non road Model.

Locomotive emissions were calculated on spreadsheets using track mileage and engine fuel data provided by individual railroad lines. Aircraft emissions were calculated using the EPA approved Emissions and Dispersion Model System (EDMS) model. Commercial marine vessel emissions were developed from an intensive study of actual vessel activity.

The summary of uncontrolled and controlled emissions estimates for the HGB area for all non road mobile equipment may be found below in Table 4-3. Details of the nonroad control strategy emission reductions are documented in Appendix 1 - Sheet 14.

**Table 4-3 Summary of Nonroad Mobile Emissions**

Houston/Galveston (Tons/Day)	1990		2002		2005		2007	
	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC
Uncontrolled Emissions Estimates	112.28	97.96	151.16	124.69	159.57	131.20	167.26	135.37
Controlled Emissions Estimates	112.28	97.96	142.59	87.26	143.78	75.49	145.56	68.18
Total Reductions	0.00	0.00	8.57	37.43	15.79	55.71	21.70	67.19

#### 4.5 Onroad-Mobile Source Control

The projected mobile source emissions inventories documented in Appendix 2 reflect all federal and state mobile source control rules required to demonstrate ROP for 2002, 2005 and 2007 for the 8-county HGB. The on road mobile controls used to demonstrate ROP include: an annual vehicle inspection and maintenance (I/M) program with onboard diagnostics system checks on 1996 and newer model year cars and light trucks (passenger vehicles and light duty trucks); a two speed idle test for heavy duty gas vehicles, a 2-mode ASM test, an anti-tampering program, and a gas cap pressure test; reformulated gasoline; the Federal Motor Vehicle Control Program; and low emission diesel fuel. Because the control requirement to demonstrate attainment of the NAAQS is more stringent than the requirement to reduce emissions by 3 percent per year, the amount of control reduction for ROP is less than the amount of control reduction required for attainment demonstration. The list of on road mobile controls used in the ROP plan therefore does not include TERP, VMEP, or TCMs. These programs continue to have an important role in HGB attainment demonstration. See Appendix 2 for a complete discussion of mobile source modeling and the control programs included in the inventory development. Table 4-4 summarizes the on road mobile controls modeled for each milestone year.

**Table 4-4 Control Programs Modeled in MOBILE6 Emissions Factors For 1990, 2002, 2005, and 2007 ROP Controlled Emissions Inventories**

Milestone Year	Controls Modeled
1990 Base Year	Pre-90 FMVCP 1990 State program: ATP in Harris County, (estimated actual RVP applied).
2002 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2002 State Programs: I/M in Harris County ATP in Harris County
2005 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2005 State Programs: I/M in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties ATP in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties
2007 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2007 State Programs: I/M in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties ATP in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties

The HGB area was modeled with two control strategy scenarios, with and without rural county (Chambers, Liberty and Waller) I/M. The results of both analysis indicate that the benefit for the rural county I/M program is less than 1 ton of either NOx or VOC for both 2005 and 2007. The program is not required in order to meet the target levels of emissions. Therefore, the HGB control scenario used to develop the inventories for the ROP controlled milestone emission inventories do not have rural county I/M. Table 4-5 summarizes the amount of control reduction for on road mobile sources for each milestone year.

**Table 4-5 Onroad Mobile Control Strategy Reductions ROP Milestone Year HGB 1-Hr Rate-of-Progress Ozone Season Weekday With and Without Rural County I/M**

Emissions Inventory Year	Uncontrolled		Controlled		Control Strategy Reductions	
	VOC	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC	NO <sub>x</sub>
2002	187.8	383.6	132.0	326.6	55.8	57.0
2005 Control Strategy (CS)	186.2	366.9	103.6	249.0	82.6	117.9
2005 CS, Without Rural County I/M Without Texas LED	186.2	366.9	104.2	257.3	82.0	109.6
2007 Control Strategy (CS)	193.1	374.3	89.4	203.2	103.7	171.1
2007 CS, Without Rural County I/M Without Texas LED	193.1	374.3	90.0	210.0	103.1	164.3

#### **4.6 Contingency Measures**

In case of a milestone failure, the state is required to have contingency control measures that achieve an additional 3 percent reduction between the milestone year and the next calendar year. For the HGB area the contingency plan includes the use of both non road and onroad mobile source control programs. A summary of the estimated control reduction and the required contingency level of reductions is presented in Table 4-6. This contingency plan meets the reduction requirements for all years.

The onroad mobile source contingency reductions were calculated by developing an emission factor ratio between the ROP milestone year and the ROP contingency year and multiplying the ratio by the milestone year emission inventory. The MOBILE model was used to develop the emission factors. The only difference in the MOBILE input between the milestone inventory development and the contingency year ratio development is the model evaluation year, allowing for a projection of the fleet turn over effect for a one year period. The detailed MOBILE inputs are documented in Appendix 2. The specific MOBILE input and output files for the contingency calculations are available from TCEQ upon request.

The non road mobile contingency estimates were calculated by assuming a linear reduction line between ROP milestone years. Using the linear reduction assumption, the non road inventories from the two inventory years closest to the contingency year were used to determine a one year emission reduction due to non road controls accounted for in the NONROAD Model. Details of the NONROAD Model inputs and inventory development are available in Appendices 3, 4 and 5.

**Table 4-6 ROP Contingency Demonstration for HGB**

Description	2003		2006		2008	
	NOx	VOC	NOx	VOC	NOx	VOC
Adjusted Base Year for Previous Milestone	1251.60	930.71	1218.60	919.71	1212.30	918.81
Percent for Contingency	2.4	0.6	2.0	1.0	1.9	1.1
Required Contingency Reduction	30.04	5.58	24.37	9.20	23.03	10.11
Control Reductions to Meet Contingency						
On road mobile: FMVCP, I/M, RFG	28.13	0.58	30.21	10.47	21.59	7.12
Non road mobile: Gasoline utility engine rule, marine recreation & HDDV standards	2.42	5.93	1.98	3.72	1.98	3.72
Total Contingency Reduction	30.55	6.51	32.19	14.19	23.57	10.84
Is contingency reduction greater than required contingency reduction?	Yes	Yes	Yes	Yes	Yes	Yes

## CHAPTER 5: MOTOR VEHICLE EMISSIONS BUDGETS

### 5.1 Overview of Methodologies and Assumptions

Because ROP demonstrations are control strategy SIP revisions, they establish motor vehicle emission budgets, which set caps on emissions. Projected emissions from transportation plans and programs must be equal to or less than these caps, under the federal transportation conformity rule.

### 5.2 Motor Vehicle Emissions Budgets for Milestone and Attainment Years 2002, 2005, 2007

EPA requires all ROP and attainment demonstration SIPs to establish motor vehicle emissions budgets for transportation conformity purposes. If the commission adopts additional control measures to reduce on road motor vehicle emissions as a SIP revision, the commission will concurrently revise the motor vehicle emissions budget(s) for the SIP and submit such revised budget(s) to EPA as a revision to the SIP. With regard to on road mobile source control measures, the state understands from EPA that only technology-related measures, such as I/M, cleaner fuels, and use restrictions/incentives may be included. Measures that could limit future highway construction, such as growth restrictions, may not be included.

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) can be used for conformity. 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 ROP motor vehicle emissions budgets for the 8-county HGB ozone nonattainment area are listed below in the Tables 5-1, 5-2, and 5-3. The ROP budgets in these three tables represent the 2002, 2005 and 2007 projected on road mobile source VOC and NO<sub>x</sub> emissions that demonstrate post-1999 rate-of-progress. Because the control requirement to demonstrate attainment of the NAAQS is more stringent than the requirement to reduce emissions by 3 percent per year, the amount of control reduction for ROP is less than the amount of control reduction required for attainment demonstration. The list of on road mobile controls used in the ROP plan therefore does not include, TxLED, TERP, VMEP or TCMs. These programs continue to have an important role in HGB attainment demonstration. The MVEBs for HGB therefore do not include the effects of these three programs.

**Table 5-1 2002 ROP Motor Vehicle Emission Budgets for HGB**

Description	NO <sub>x</sub> tons per day	VOC tons per day
2002 On road Emissions Projection Without Post-1990 CAAA Controls	383.6	187.8
2002 On road Mobile Rate-of-Progress Controls: FMVCP, Reformulated Gasoline (all counties), and I/M, Gas Cap Check and ATP in Harris County	57.0	55.8
2002 ROP MVEB (uncontrolled inventory minus controls)	326.6	132.0

**Table 5-2 2005 ROP Motor Vehicle Emission Budgets for HGB**

<b>Description</b>	<b>NO<sub>x</sub> tons per day</b>	<b>VOC tons per day</b>
2005 On road Emissions Projection Without Post-1990 CAAA Controls	366.9	186.2
2005 On road Mobile Rate-of-Progress Controls: FMVCP, Reformulated Gasoline (all counties), and I/M, Gas Cap Check and ATP in Five Counties TxLED	117.59	82.00
TxLED Only	7.99	0.00
2005 ROP MVEB (uncontrolled inventory minus controls, plus TxLED benefit)	257.3	104.2

**Table 5-3 2007 ROP Motor Vehicle Emission Budgets for HGB**

<b>Description</b>	<b>NO<sub>x</sub> tons per day</b>	<b>VOC tons per day</b>
2007 On road Emissions Projection Without Post-1990 CAAA Controls	374.3	193.1
2007 On road Mobile Rate-of-Progress Controls: FMVCP, Reformulated Gasoline (all counties), and I/M, Gas Cap Check and ATP in Five Counties TxLED	170.73	103.1
TxLED Only	6.43	0.00
2007 ROP MVEB (uncontrolled inventory minus controls, plus TxLED benefit)	210.0	90.0

## GLOSSARY

This section provides the specific definitions of terms that are used in this ROP SIP document. The following definitions are presented for the purposes of reading and understanding the information provided in this document only.

**Activity Level /Factor** is a measurable factor that is directly or indirectly related to the emissions of a process. An emission estimate is calculated by multiplying an activity level by an emission factor. The activity level is either directly related to the amount of emissions (as in the case of the amount of fuel used in combustion process), or is a more easily measured surrogate, such as population for consumer product usage.

**Anthropogenic Emissions** Pollutants emitted from sources for which the activity of the source derives from human activities.

**Area Sources** are smaller sources that do not qualify as point sources under the relevant emissions cutoffs. Area sources encompass more widespread sources that may be abundant, but that, individually, release small amounts of a given pollutant. Examples typically include dry cleaners, residential wood heating, auto body painting, and consumer solvent use.

**Attainment Year** The year that a nonattainment area is required to demonstrate attainment of the ozone NAAQS.

**Basic Inspection and Maintenance (I/M)** Programs requiring the inspection of vehicles including, but not limited to, measurement of tailpipe emissions, and mandating that vehicles with tailpipe emissions higher than the program cutpoints be repaired to pass a tailpipe emissions retest. Basic I/M programs must be at least as stringent as the requirements set out in FCAA of 1990, Section 182(a)(2)(B).

**Biogenic Emissions** Biogenic emissions are defined as all pollutants emitted from non-anthropogenic sources. Example sources include trees and vegetation, oil and gas seeps, and microbial activity. While fermentation produces biogenic emissions, gases from this process are included under either point or area sources.

**Controlled** Indicates that the effects of a specified set of control strategies is included in an emission inventory value.

**Control Technology; Control Measures** Equipment, processes or actions used to reduce air pollution. The extent of pollution reduction varies among technologies and measures. In general, control technologies and measures that do the best job of reducing pollution will be required in the areas with the worst pollution. A similar high level of pollution reduction will be achieved with maximum achievable control technology (MACT) which will be required for sources releasing hazardous air pollutants.

**Economic Growth Analysis System (E-GAS)** An EPA model for projecting emissions growth based on value-added and physical output data.

**Emission** Release of pollutants into the air from a source.

**Emission Factors** are ratios that relate emissions of a pollutant to an activity level at a plant that can be easily measured, such as an amount of material processes, or an amount of fuel used. Given an emission

factor and a known activity level, a simple multiplication yields an estimate of the emissions. Emission factors are developed from separate facilities within an industry category, so they represent typical values for an industry, but do not necessarily represent a specific source.

**Emission Inventory:** Emission inventories are quantities of pollutants measured over time. Emission inventories can be developed with different control strategies scenarios to determine the effectiveness of the control strategies in meeting regulatory requirements. The ROP inventories are developed for an ozone season weekday. The temperatures, fuels, controls and controls represent ozone season values. The activity levels represent weekday, average for Monday through Friday.

**Emission Standards** Rules and regulations that set limits on how much pollution can be emitted from a given source. The most straightforward emissions standard is a simple limitation on mass of pollutant per unit time (e.g., pounds of pollutant per hour). Vehicle and equipment manufacturers have responded to many mobile source emission standards by redesigning vehicles and engines to reduce pollution.

**Federal Motor Vehicle Control Program (FMVCP)** All federal actions aimed at controlling pollution from motor vehicles by such efforts as establishing and enforcing tailpipe and evaporative emission standards for new vehicles, testing methods development, and guidance to states operating inspection and maintenance programs.

**Fleet Turnover Correction** An adjustment made to the adjusted base year inventory in calculating the target level of emissions. This adjustment is computed for each milestone and attainment year to reflect the emission reductions associated with the pre-1990 FMVCP and RVP program as defined in 55 FR 23666, June 11, 1990.

**Milestone Compliance Demonstration** For serious and above classified nonattainment areas, demonstrating achievement of the 15 percent VOC emissions reduction over the 1990-1996 period, or demonstrating subsequent 3 percent VOC emissions reductions per year averaged over each consecutive 3-year period from November 15, 1996, until the attainment date. Section 182(g)(2) requires that within 90 days of the date on which an applicable milestone occurs (not including an attainment date on which a milestone occurs in cases where the standard has been attained), States with nonattainment areas must submit a demonstration that the milestone has been met.

**Milestone Year.** The third year of each consecutive 3-year period from November 15, 1996, until the attainment date in an ozone nonattainment area is termed a milestone year. The area is required to demonstrate a 3 percent per year VOC/NOx emission reduction averaged over the three year period for each milestone year.

**MOBILE6.2** MOBILE is an EPA model for estimating pollution from highway vehicles. MOBILE calculates emissions of hydrocarbons (HC), oxides of nitrogen (NOx), and carbon monoxide (CO) from passenger cars, motorcycles, light- and heavy-duty trucks. The model accounts for the emission impacts of factors such as changes in vehicle emission standards, changes in vehicle populations and activity, and variation in local conditions such as temperature, humidity and fuel quality. MOBILE is used to calculate current and future emission inventories of these emissions at the national and local level. These inventories are used to make decisions about air pollution policy at the local, state and national level. Inventories based on MOBILE are also used to meet the federal Clean Air Act's State Implementation Plan (SIP) and transportation conformity requirements.

**Mobile Sources** Motor vehicles, engines, and equipment that move, or can be moved, from place to place. Mobile sources include vehicles that operate on roads and highways ("onroad" or "highway" vehicles), as

well as non road vehicles, engines, and equipment. Examples of mobile sources are cars, trucks, buses, motorcycles, earth-moving equipment, lawn and garden power tools, ships, railroad locomotives, and airplanes.

**Motor Vehicle Emissions Budget** 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.

**1990 Adjusted Base Year Inventory** FCAA of 1990, Section 182(b)(1)(B) and (D) describe the inventory (hereafter referred to as the adjusted base year inventory) from which moderate and above ozone nonattainment areas must achieve a 15 percent reduction in VOC emissions by 1996. This inventory is equal to "the total amount of actual VOC or NO<sub>x</sub> emissions from all anthropogenic (man-made) sources in the area during the calendar year of enactment," excluding the emissions that would be eliminated by FMVCP regulations promulgated by January 1, 1990, and RVP regulations (55 FR 23666, June 11, 1990), which require specific maximum RVP levels for gasoline in particular nonattainment areas during the peak ozone season. The 1990 rate-of-progress base year inventory (defined below) removes biogenic emissions and emissions from sources listed in the base year inventory that are located outside of the nonattainment area. The adjusted base year inventory removes the emissions reductions from the FMVCP and RVP program from the 1990 rate-of-progress base year inventory. The adjusted base year inventory, which is due by November 15, 1992, is used to calculate the required 15 percent reductions.

Adjusted Base Year Emissions Inventory = Base Year Emissions Inventory, minus the following:

- Biogenic source emissions.
- Emissions from sources outside of the nonattainment area boundary.
- Emissions reductions from the FMVCP.
- Emissions reductions from the RVP rules

**1990 Base Year Inventory** An accounting of all anthropogenic VOC, CO, and NO<sub>x</sub> emissions in the nonattainment area. This emissions inventory is calculated by removing biogenic emissions and the emissions from sources that are located outside of the nonattainment area from the base year inventory. This inventory is used in developing the adjusted base year inventory. It is also used as the basis from which to calculate the 1996 target level of emissions.

**1996 Target Level of Emissions** The 1996 target level of emissions is the maximum amount of ozone season VOC emissions that can be emitted by an ozone nonattainment area in 1996 for that nonattainment area to be in compliance with the 15 percent rate-of-progress requirements. It is calculated by first taking 15 percent of the adjusted base year inventory emissions. This emissions value is then added to the expected emissions reductions due to the FMVCP and RVP program, and from corrections to any deficient RACT rules and I/M programs. The summation of the 15 percent, the expected reductions from deficient I/M and RACT programs, and reductions from the FMVCP and RVP program are then subtracted from the 1990 rate-of-progress base year inventory to arrive at the 1996 target level of emissions. This target is used by States to design their 15 percent VOC emissions reduction control strategies. The projected control strategy inventory used in the rate-of-progress plan must be at or below the 1996 target level of emissions to demonstrate that the 15 percent VOC emissions reduction will be accomplished.

Target Level of Emissions = Rate-of-Progress Base Year Inventory, minus the following:

- 15 percent of the 1996 adjusted base year inventory emissions.
- 3 percent a year of the post-1996 adjusted base year inventory emissions.
- Emissions reductions from corrections to any deficient RACT rules.

- Emissions reductions from corrections to deficient I/M programs.
- Emissions reductions from the pre-1990 FMVCP.
- Emissions reductions from RVP rules.

**Nitrogen Oxides (NO<sub>x</sub>)**: A group of highly reactive gases that contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colorless and odorless. The common pollutant nitrogen dioxide (NO<sub>2</sub>) can often be seen combined with particles in the air as a reddish-brown layer over many urban areas. Nitrogen oxides are formed when the oxygen and nitrogen in the air react with each other during combustion. The formation of nitrogen oxides is favored by high temperatures and excess oxygen (more than is needed to burn the fuel). The primary sources of nitrogen oxides are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.

**Nonattainment Area** A geographic area in which the level of a *criteria air pollutant* is higher than the level allowed by the federal standards. A single geographic area may have acceptable levels of one criteria air pollutant but unacceptable levels of one or more other criteria air pollutants; thus, an area can be both attainment and nonattainment at the same time. It has been estimated that 60 percent of Americans live in nonattainment areas.

**NONROAD Model**: The NONROAD model is an EPA tool used to determine emissions of exhaust, diurnal, and refueling hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), exhaust particulate matter (PM), carbon dioxide (CO<sub>2</sub>), as well as volume of fuel consumed by all types of non road mobile equipment except locomotives, aircraft, and commercial marine vessels. The level of detail from the model includes fuel type (diesel, gasoline, LPG, and CNG), individual Source Category Classification (SCC), power range, geographic area (nationwide, state, or county), and temporal (annual, seasonal, monthly, weekday/weekend) for calendar years 1970 to 2050. During the model development process a number of model versions have been released for public comment and used in EPA rulemaking inventory estimates. The current version of NONROAD is NONROAD2002, released in December 2002. NONROAD2002 was used to develop the ROP inventories used in this SIP.

**Offset Ratios** For the purpose of satisfying the emissions offset reduction requirements of section 173(a)(1)(A), the emissions offset ratio is defined as the ratio of total actual emissions reductions of VOC (and NO<sub>x</sub> unless exempted under FCAA of 1990, Section 182 (f) obtained as offsets from existing sources to total allowable emissions increases of such pollutant from the new source.

**Ozone** A gaseous molecule that contains three oxygen atoms (O<sub>3</sub>). Ozone can exist either high in the atmosphere, where it shields the Earth against harmful ultraviolet rays from the sun, or close to the ground, where it is the main component of smog. Ground-level ozone is a product of reactions involving hydrocarbons and nitrogen oxides in the presence of sunlight. Ozone is a potent irritant that causes lung damage and a variety of respiratory problems.

**Peak Ozone Season** The contiguous 3-month period of the year during which the highest ozone exceedance days have occurred over the 3 to 4 years prior to the 1990 base year. Most ozone nonattainment areas have a peak ozone season lasting from June through August. The peak ozone season is used to determine the temperatures that are appropriate for developing emission inventories for ROP analyses.

**Point Source** Any stationary source that has the potential to emit more than a specified threshold level of a pollutant or is identified as an individual source in a State's emissions inventory. For base year SIP inventory purposes, point sources are defined as sources emitting 10 tpy or more of VOC emissions or 100 tpy or more of NO<sub>x</sub> or CO emissions.

**Post-1996 Rate-of-Progress Plan** The portion of the SIP revision due by November 15, 1994, which describes how serious and above areas plan to achieve the post-1996, 3 percent per year VOC emissions reductions averaged over each consecutive 3-year period from November 15, 1996 until the attainment date. This SIP revision also includes the attainment demonstration for moderate interstate nonattainment areas and serious and above nonattainment areas.

**Projected Milestone Inventory** An inventory of projected emissions that includes the effect of future control measures. A nonattainment area computes this inventory in its post-1996 rate-of-progress plan for each target year.

**Reasonably Available Control Technology (RACT)** Control technology that is reasonably available, and both technologically and economically feasible. Usually applied to existing sources in nonattainment areas; in most cases is less stringent than new source performance standards.

**Reformulated Gasoline** -- specially refined gasoline that when combusted produces specified reductions in the amounts of VOCs and NO<sub>x</sub> relative to a standard gasoline. The 1990 FCAA requires sale of reformulated gasoline in nine areas, including HGB. The Act also specified that RFG contain oxygen - 2 percent by weight. MTBE (methyl tertiary butyl ether) and ethanol are the two most commonly used substances that add oxygen to gasoline. Oil companies decide which substance to use to meet the law's requirements.

**Rule Effectiveness (RE)** For stationary sources, a measure of the extent to which a regulatory program achieves emissions reductions. An RE of 100 percent reflects a regulatory program achieving all the emissions reductions that could be achieved by full compliance with the applicable regulations at all sources at all times. However, regulations typically are not 100 percent effective due to limitations of control techniques or shortcomings in the implementation and enforcement process. The EPA allows the use of three different methods for determining RE: an 80 percent default value; results from EPA Questionnaires; or results from a Stationary Source Compliance Division (SSCD) study.

**State Implementation Plan (SIP)** A detailed description of the programs a state will use to carry out its responsibilities under the Federal Clean Air Act. State implementation plans are collections of the regulations used by a state to reduce air pollution. The Clean Air Act requires that EPA approve each state implementation plan. Members of the public are given opportunities to participate in review and approval of state implementation plans.

**Target Year** A year in which a nonattainment area must recalculate its adjusted base year inventory for the post-1996 rate-of-progress plan (e.g., target years for extreme areas are 1999, 2002, 2005, 2008, and 2010).

**Target Level of Emissions** The maximum amount of emissions that a nonattainment area can emit for a given target year while complying with the post-1996 rate-of-progress plan requirements.

**Uncontrolled** Indicates that only effects of baseline control strategies is included in an emission inventory value.

**Vehicle Miles Traveled (VMT)**: The total number of miles traveled in a given period of time (e.g., day, year) by a given vehicle or fleet of vehicles. VMT, combined with pollutant emission factors per mile traveled, provide an estimate of the total amount of vehicle pollution in a given period of time.

**Volatile Organic Compound (VOC)** Any compound of carbon, excluding CO, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric

photochemical reactions. This includes any organic compound other than those EPA has determined to have negligible photochemical reactivity. VOCs are a subset of hydrocarbon (HC) emissions.

**Weekday Average** Monday through Friday