

## CHAPTER 1: BACKGROUND AND INTRODUCTION

### 1.1 GENERAL

“The History of the Texas State Implementation Plan (SIP),” a comprehensive overview of the SIP revisions submitted to the United States Environmental Protection Agency (EPA) by the State of Texas, is available at the following web site:

<http://www.tceq.state.tx.us/implementation/air/sip/sipintro.html#History>.

The one-hour ozone National Ambient Air Quality Standards (NAAQS), which preceded the eight-hour ozone standard, was revoked June 15, 2005 (69 FR 23951). On June 15, 2004, the EPA classified the Houston-Galveston-Brazoria (HGB) area, comprising Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties as a moderate nonattainment area for the eight-hour NAAQS under the 1990 Federal Clean Air Act (FCAA) Amendments (42 United States Code (USC) §§ 7401 *et seq.*).

The HGB area’s hot sunny climate, large urban population, and highly concentrated industrial area provide the necessary ingredients for ozone formation: sunlight, nitrogen oxides (NO<sub>x</sub>), and volatile organic compounds (VOC). The Houston area’s significant biogenic VOC emissions, and complex meteorology that includes land sea breeze air parcel recirculation, complicate air quality modeling.

The substance of the existing plan to control ozone formation in the HGB area centers on the following key measures.

- Approximately 80% reduction of NO<sub>x</sub> emission from point sources through the associated Mass Emission Cap and Trade (MECT) program.
- NO<sub>x</sub> emission reductions from on-road and non-road sources through the vehicle inspection and maintenance (I/M) program, the Texas Emission Reduction Plan (TERP), and the Texas Low Emission Diesel (TxLED) program.
- Highly reactive volatile organic compounds (HRVOC) controls through rules and the associated HRVOC Emission Cap and Trade (HECT) program.
- VOC controls through rules.

The EPA approved the HGB one-hour ozone attainment demonstration and these components and rules in the September 6, 2006, Federal Register notice (71 FR 52656). Rapid economic and population growth continue to create air quality challenges for the HGB area, even as the key ozone-targeting regulatory programs have reduced the number and magnitude of ozone exceedances, the area of exceedance, and the population exposed to exceedances.

This SIP revision is the first step in addressing the eight-hour ozone standard in the HGB area and represents the TCEQ’s best effort considering the time constraints for planning for attainment of the eight-hour ozone standard due to EPA’s late adoption of the implementation rules.

The HGB SIP development is challenged by the high concentration of industry and motor vehicles in the HGB area. Significant NO<sub>x</sub> controls are already in place on the industrial sector in the HGB area and further controls on these sources will be costly and technically challenging.

The TCEQ contracted with the Houston-Galveston Area Council (H-GAC) to identify possible on-road and non-road mobile source control strategies and with Lamar University to identify possible area and point source control strategies. Between March and June 2006, H-GAC, Lamar University, and their subcontractor held five stakeholder meetings to give HGB-area stakeholders the opportunity to hear about and comment on the progress of the control strategy development work. They included meetings on March 22, 2006, and May 27, 2006, that focused on mobile source (on-road and non-road) control strategy development; March 28, 2006, regarding ports,

locomotives, and marine sources; and April 19, 2006, and May 24, 2006, for point and area source control strategy development.

The subcontractor for H-GAC and Lamar University, ENVIRON International, compiled draft control strategy catalogs and evaluated each potential strategy against the EPA's criteria for SIP creditability. ENVIRON then evaluated each strategy meeting the EPA criteria against a second set of criteria, including feasibility, public acceptability, emissions benefit, and cost effectiveness. After presenting the short list of strategies for public comment, ENVIRON quantified the reductions (where possible) associated with the high-ranking strategies and placed them on a final list. The TCEQ evaluated and analyzed the final list of strategies for sensitivity modeling purposes.

This revision contains the reasonably available control technology (RACT) analysis, Texas 2002 Periodic Emissions Inventory (EI) for the Houston-Galveston-Brazoria Ozone Nonattainment Area, and water heater rule amendment emission offsets. This SIP revision also includes rule revisions to 30 TAC Chapter 114 related to adding marine diesel fuels to the definition of diesel fuels that are subject to the Texas Low Emission Diesel Rule and to 30 TAC Chapter 115 related to control of under-estimated, unreported, or under-reported VOC emissions from tank landings, flash emissions, and degassing of storage tanks, transport vessels, and marine vessels with liquid heels. The TCEQ expects that compliance with the rules in 30 TAC Chapter 115, Storage of Volatile Organic Compounds for the Eight-Hour Ozone Standard will improve HGB air quality by removing many tons of VOC from the airshed. This revision also includes additional VMEP commitments.

The plan also describes ongoing efforts to develop the eight-hour ozone attainment demonstration including a new modeling episode, the continued implementation of increasingly lower federal on-road and non-road engine standards, and further research and consideration of additional control strategies, which will help determine the appropriate year for attainment of the eight-hour standard in the HGB area.

The following summaries of recent HGB-area SIP revisions are provided to give context and greater understanding of the complex issues involved in HGB's ozone challenge.

#### **1.1.1 December 2000**

The December 2000 SIP revision contains rules and photochemical modeling analyses in support of the HGB one-hour ozone attainment demonstration. The majority of the emission reductions identified in this revision were from an overall 90 percent reduction in point source NO<sub>x</sub>, including the MECT program. A modeling analysis, showing a 141 parts per billion peak ozone level, indicated a shortfall of 91 tons per day (tpd) in NO<sub>x</sub> emissions reductions that were necessary, but not readily available, for an approvable attainment demonstration. In addition, the revision contained post-1999 rate-of-progress (ROP) plans for the milestone years 2002 and 2005, the attainment year 2007, and transportation conformity motor vehicle emissions budgets (MVEB) for NO<sub>x</sub> and VOC. The SIP also contained enforceable commitments to implement further measures (in support of the HGB area's attainment demonstration and to remedy the estimated 91 tpd shortfall), as well as a commitment to perform and submit a mid-course review (MCR) to EPA.

#### **1.1.2 September 2001**

The September 2001 HGB one-hour ozone SIP revision included the following elements: 1) corrections to the ROP table/budget for the years 2002, 2005, and 2007 due to a mathematical error; 2) incorporation of a change to the idling restriction control strategy clarifying that the operator of a rented or leased vehicle is responsible for compliance with the requirements in situations where the operator of a leased or rented vehicle is not employed by the owner of the vehicle; 3) incorporation of revisions to the clean diesel fuel rules to provide greater flexibility in complying with the rule requirements while preserving the emission reductions previously

represented; 4) incorporation of a stationary diesel engine rule; 5) incorporation of revisions to the point source NO<sub>x</sub> rules; 6) incorporation of revisions to the NO<sub>x</sub> emissions cap and trade rules; 7) removal of the construction equipment operating restriction and the accelerated purchase requirement for Tier 2/Tier 3 heavy-duty equipment; 8) replacement of the Tier 2/Tier 3 rules with the Texas Emission Reduction Plan; 9) layout of the MCR process which detailed how the state would fulfill the commitment to obtain the additional emission reductions necessary to demonstrate attainment of the one-hour ozone standard in the HGB area; and 10) replacement of 2007 ROP MVEB to be consistent with the attainment MVEB.

Despite the gap control measures adopted in December 2000 and the stationary diesel engine rules included in the September revision, an estimated 56 tpd NO<sub>x</sub> reduction shortfall remained. The state committed to address the remaining shortfall through the MCR process. In the November 14, 2001, issue of the Federal Register, EPA approved the December 2000 and September 2001 submittals.

### **1.1.3 December 2002**

In January 2001, the Business Coalition for Clean Air-Appeal Group (BCCA-AG) and several regulated companies challenged the December 2000 HGB SIP and some of the associated rules. Among other things, BCCA-AG contended that the last 10 percent of the NO<sub>x</sub> emissions reductions were not cost effective and that the ozone plan would fail because the TCEQ did not account for VOC emissions associated with upset conditions. In May 2001, the parties agreed to a stay in the case, and Judge Margaret Cooper, Travis County District Court, signed a Consent Order, effective June 8, 2001. The order required the commission to perform an independent and thorough analysis of the causes of rapid ozone formation events and to identify potential mitigating measures not yet identified in the HGB attainment demonstration.

In compliance with the Consent Order, the commission conducted a scientific evaluation based in large part on aircraft data collected by the Texas Air Quality Study 2000 (TexAQS 2000). The TexAQS 2000 was a comprehensive research project, conducted in August and September 2000, involving more than 40 research organizations and over 200 scientists that studied ground-level ozone air pollution in the HGB and east Texas regions. These and other studies suggested that the HGB area's high ozone events can be attributed to, in part, the presence of significant reactivity in the airshed. An analysis of automated gas chromatograph data (Estes, 2002) revealed that four HRVOC were frequently responsible for high reactivity days: ethylene, propylene, 1,3-butadiene, and butenes. As such, these compounds were selected as the best candidates for HRVOC emission controls. Analysis showed that the ozone control strategy involving limits on emissions of ethylene, propylene, 1,3-butadiene, and butenes from industrial sources, in conjunction with an 80 percent reduction in industrial or point source NO<sub>x</sub>, was equivalent or better in terms of air quality benefit than the previous ozone control strategy (a 90 percent point source NO<sub>x</sub> emissions reduction requirement alone). Therefore, in December 2002, the TCEQ adopted a SIP revision that replaced the most stringent 10 percent industrial source NO<sub>x</sub> emissions reductions with industrial source HRVOC controls. The result was an industrial source ozone control strategy that relies on an 80 percent reduction in NO<sub>x</sub> emissions and HRVOC rules that better quantify and reduce emissions of HRVOC from four key industrial sources: fugitives, flares, process vents, and cooling towers. The HRVOC rules are performance-based and emphasize monitoring, recordkeeping, reporting, and enforcement, rather than establishing individual unit emission rates. The 2002 SIP revision exchanging the two strategies for the one strategy met the FCAA Section 110(l) requirement which allows revision of the SIP where that revision would not interfere with reasonable further progress toward attainment of the NAAQS.

### **1.1.4 December 2004**

In December 2000, the TCEQ committed to perform a MCR to ensure attainment of the one-hour ozone standard. The MCR process provides the opportunity to update emissions inventory data, use current modeling tools, and enhance the photochemical grid modeling. The data gathered

from the TexAQS 2000 was used to improve the photochemical modeling of the HGB area. These technical improvements provided a more comprehensive understanding of the ozone challenge in Houston that is necessary to develop an attainment plan. In early 2003, as the TCEQ was preparing to move forward with the MCR, EPA announced its plans to begin implementation of the eight-hour ozone standard. On June 2, 2003, the Federal Register published EPA's proposed "Implementation Rule for the Eight-Hour Ozone Standard." In the same timeframe, EPA formalized its intentions to designate areas for the eight-hour ozone standard by April 15, 2004, requiring states to reassess their efforts and control strategies to address this new standard in a revised plan to be submitted to EPA by June 2007. Recognizing that existing one-hour nonattainment areas would soon be subject to the eight-hour ozone standard and in an effort to efficiently manage the state's limited resources, the TCEQ developed an approach that addressed the outstanding obligations under the one-hour ozone standard while beginning to analyze eight-hour ozone issues.

The TCEQ's one-hour ozone SIP commitments that were addressed in the December 2004 revision include:

- completion of a one-hour ozone MCR;
- performance of modeling;
- adoption of measures sufficient to fill the shortfall of NO<sub>x</sub> reductions;
- adoption of measures sufficient to demonstrate attainment; and
- revision of the MVEB using the MOBILE6 model.

The December 2004 revision reflects a shift from primarily reducing industrial emissions of NO<sub>x</sub> to reducing both industrial emissions of NO<sub>x</sub> and point source HRVOC. This revision included measures to ensure compliance with the specific strategies to control HRVOC emissions and created the HRVOC emissions cap and trade (HECT) program. The HECT program is an annual cap and trade program to provide compliance flexibility to the Chapter 115 control requirements for flares, process vents, and cooling-tower heat exchangers. Sites subject to the program are required to possess an HRVOC allowance for each ton of HRVOC emissions. Sites have the option to trade excess HRVOC allowances on the open market. The December 2004 revision also reflected the repeal of the motor vehicle idling rules and modified certain recordkeeping requirements of the general VOC fugitive emission rules to make them apply only to sources of HRVOC fugitive emissions.

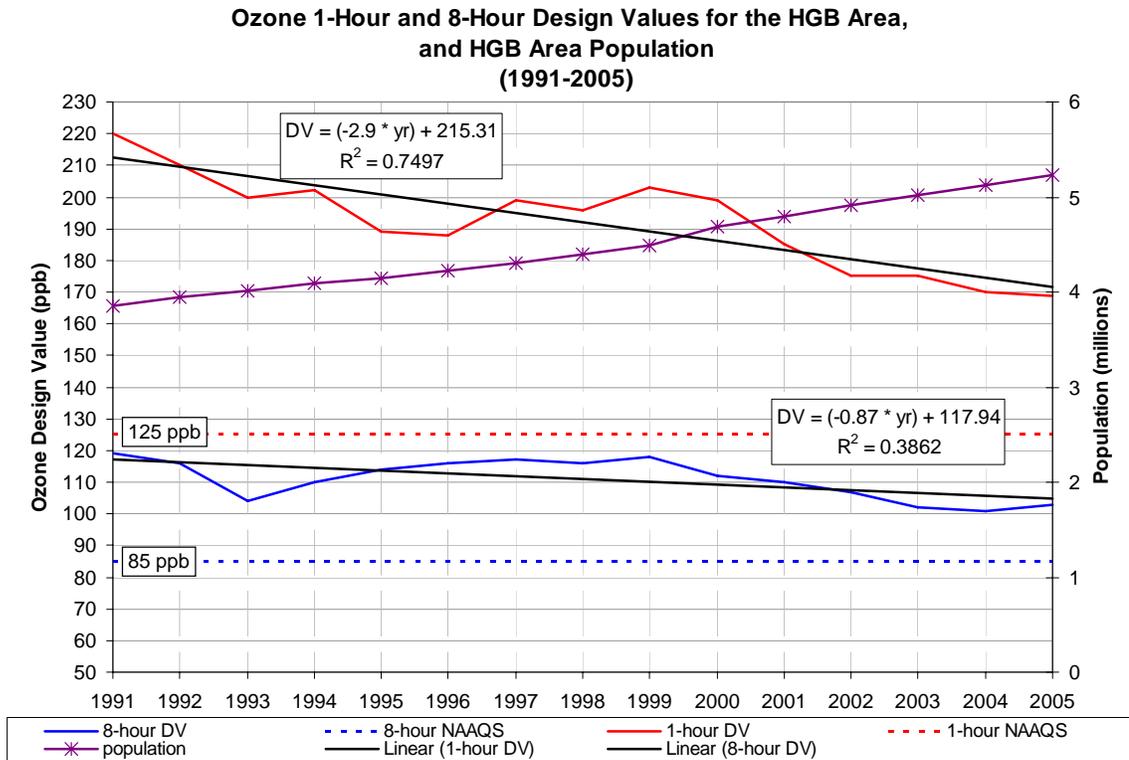
#### **1.1.5 EPA Approval of the One-Hour Ozone Attainment Demonstration and Associated Rules**

On September 6, 2006, EPA published the approval of the HGB nonattainment area one-hour ozone attainment demonstration and associated rules (71 FR 52656). The one-hour attainment SIP revision demonstrates that the HGB nonattainment area will comply with the one-hour ozone standard by 2007. The approval was published in six parts, covering the rules for the control of HRVOC, the HECT program, the MECT program for NO<sub>x</sub>, the one-hour ozone attainment plan, the emissions credit banking and trading program, and the discrete emission credit banking and trading program.

#### **1.1.6 One-Hour Ozone Control Strategies**

Existing one-hour ozone control strategies and one-hour ozone voluntary mobile emission reduction program (VMEP) control strategies, discussed in Chapter 4, Section 4.1, show key control strategies for complying with the one-hour ozone standard in the HGB nonattainment area. Existing control strategies targeted to the one-hour standard, are expected to continue to reduce the emission of precursors to ozone in the HGB area and positively impact progress toward attainment of the eight-hour ozone standard. The one-hour and eight-hour ozone design values for the HGB area from 1991 to 2005 are illustrated in Figure 1-1: *One-Hour and Eight-Hour Ozone Design Value Trends (1991 to 2005) and HGB Area Population*. Both values decreased over the past 15 years. The 2005 one-hour design value was 169 parts per billion

(ppb), representing a 23 percent decrease from the value for 1991 (220 ppb). The 2005 eight-hour design value was 103 ppb, a 13 percent decrease from the 1991 value of 119 ppb. These decreases occurred despite a 36 percent increase in area population, as shown in the figure.



**Figure 1-1: One-Hour and Eight-Hour Ozone Design Value Trends (1991 to 2005) and HGB Area Population**

## 1.2 HEALTH EFFECTS

In 1997, EPA revised the NAAQS for ozone from a one-hour to an eight-hour standard based on scientific data that indicated that the eight-hour standard provides better protection of public health from longer-term exposures to moderate levels of ozone. To support the eight-hour ozone standard, EPA provided information that indicated that even low levels of ozone can decrease lung capacity temporarily in some healthy adults and cause inflammation of lung tissue, aggravate asthma, and make people more susceptible to respiratory illnesses such as bronchitis and pneumonia.

Children are at a higher risk from exposure to ozone, since they breathe more air per pound of body weight than adults and because children’s respiratory systems are still developing. Children also spend a considerable amount of time outdoors during summer and during the start of the school year (August-October) when the highest ozone levels are recorded. Adults most at risk to ozone exposure are outdoor workers, people outside exercising, and individuals with preexisting respiratory diseases.

### 1.3 PUBLIC HEARING AND COMMENT INFORMATION

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

CITY	DATE	TIME	LOCATION
Houston	January 29, 2007	2:00 PM	Houston-Galveston Area Council 3555 Timmons Lane Houston, TX 77027 Conference Room A, on the second floor
Houston	January 29, 2007	6:00 PM	Houston-Galveston Area Council 3555 Timmons Lane Houston, TX 77027 Conference Room A, on the second floor
Dallas	January 31, 2007	7:00 P.M.	Dallas Public Library Auditorium 1515 Young St., Dallas, TX 75201
Arlington	February 1, 2007	2:00 P.M.	Arlington City Hall 101 W. Abram Street Arlington, TX 76010
Midlothian	February 1, 2007	6:00 P.M.	Midlothian Conference Center 1 Community Center Circle Midlothian, TX 76065
Longview	February 6, 2007	2:00 P.M.	Longview Public Library 222 W. Cotton Street Longview, TX 75601
Austin	February 8, 2007	2:00 P.M.	Texas Commission on Environmental Quality 12100 Park 35 Circle, Austin, TX 78753 Building E, Room 201S

The comment period ended February 12, 2007, at 5:00 p.m. 55 comments related to the proposed HGB SIP revision were received. The response to comments has been attached to this document.

Copies of the adopted SIP revision and all appendices can be obtained from the TCEQ's web site at <http://www.tceq.state.tx.us/implementation/air/sip/hgb.html#> or upon request to:

Kathy Singleton  
MC 206  
State Implementation Plan Team  
Chief Engineer's Office  
Texas Commission on Environmental Quality  
P.O. Box 13087  
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### 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 rule package accompanying this SIP.

## **1.5 FISCAL AND MANPOWER 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.