

CONFORMITY DETERMINATION

**for the 2035 Regional Transportation Plan and
the 2008-2011 Transportation Improvement Program
for the Houston-Galveston Transportation Management Area**

2007

**HOUSTON-GALVESTON AREA COUNCIL
TRANSPORTATION DEPARTMENT**

Board Resolution



Resolution

NO. 2035-01-RTP

CERTIFYING THAT THE 2035 REGIONAL TRANSPORTATION PLAN AND THE 2008-2011 TRANSPORTATION IMPROVEMENT PROGRAM ARE IN CONFORMITY WITH THE CLEAN AIR ACT OF 1990, AS AMENDED, AND THE SAFE, ACCOUNTABLE, FLEXIBLE AND EFFICIENT TRANSPORTATION EQUITY ACT – A LEGACY FOR USERS OF 2005.

WHEREAS, it has become necessary to certify that the 2035 Regional Transportation Plan and the 2008-2011 Transportation Improvement Program were found to be in conformity for VOC and NO_x motor vehicle emissions budget contained in *Revisions to the State Implementation Plan for the Control of Ozone Air Pollution, Houston/Galveston/Brazoria Ozone Nonattainment Area*; and

WHEREAS, the 2035 Regional Transportation Plan (RTP) and the 2008-2011 Transportation Improvement Program (TIP) have met the requirements set forth in the Conformity State Implementation Plan issued jointly by the U.S. Department of Transportation and the Environmental Protection Agency (EPA); and

WHEREAS, vehicle emissions estimates resulting from the implementation of the transportation facility and service improvements recommended in the 2035 Regional Transportation Plan and the 2008-2011 Transportation Improvement Program provide for expeditious implementation of transportation control measures in its applicable implementation plan; and

WHEREAS, the 2035 Regional Transportation Plan and the 2008-2011 Transportation Improvement Program contribute to annual emissions reductions consistent with Sections 182 (b)(1) and 187 (a)(7) of the Clean Air Act, as amended; and

WHEREAS, implementation of the transportation facilities and services recommended in the 2035 Regional Transportation Plan Update and the 2008-2011 Transportation Improvement Program would result in lower total vehicle emissions than the 1990 base year emissions and the motor vehicles emissions budget (MVEB); and

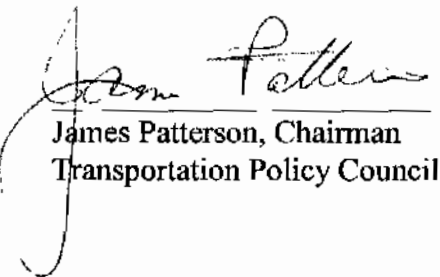
WHEREAS, approval of these proposed revisions is conditional upon completion of the Public Comment Period without significant public opposition.

NOW THEREFORE, be it resolved by the Transportation Policy Council for the Houston-Galveston Transportation Management Area that the 2035 Regional Transportation Plan and the 2008-2011 Transportation Improvement Program are in conformity with the 1990 U.S. Clean Air Act as amended, and the Safe Accountable Flexible and Efficient Transportation Equity Act – A Legacy for Users of 2005.

PASSED AND APPROVED this 24th day of August 2007 at a regularly scheduled meeting of the Transportation Policy Council for the Houston-Galveston Transportation Management Area.

APPROVED:

ATTEST:


James Patterson, Chairman
Transportation Policy Council



Tom Reid, Secretary
Transportation Policy Council

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List of Abbreviations

AERCO:	Area Emission Reduction Credit Organization
ALVW:	Adjusted Loaded Vehicle Weight
AQI:	Air Quality Index
AQM:	Air Quality Model
BA:	Baseline Activity
BACT:	Best Available Control Technology
BAP:	Bureau of Air Policy
BAQC:	Bureau of Air Quality Control
BART:	Best Available Retrofit Technology
BCCA:	Business Coalition for Clean Air
BER:	Baseline Emission Rate
BPA:	Beaumont/Port Arthur Ozone Nonattainment Area
CAA:	Clean Air Act of 1990
CAAA:	Clean Air Act Amendments of 1990
CARE:	Clean Air Responsibility Enterprise

CEM:	Continuous Emission Monitor
CMAQ:	Congestion Mitigation/Air Quality funds under ISTEA, TEA21, and SAFETEA-LU
CMSA:	Consolidated Metropolitan Statistical Area (the Houston-Galveston-Brazoria CMSA consists of the Houston PMSA [Chambers, Fort Bend, Harris, Liberty, Montgomery and Waller Counties], the Galveston-Texas City PMSA [Galveston County], and the Brazoria PMSA [Brazoria County]).
CNG:	Compressed Natural Gas
CO:	Carbon Monoxide
CO₂:	Carbon Dioxide
COAST:	Coastal Oxidant Assessment for Southeast Texas
COG:	Council of Governments
COPD:	Chronic Obstructive Pulmonary Disease
DERC:	Discrete Emission Reduction Credit
DFW:	Dallas/Fort Worth Ozone Nonattainment Area
EBTA:	Emissions Banking and Trading of Allowances (SB7)
EBTP:	Emissions Banking and Trading Program
EGF:	Electric Generating Facility
EPA:	Environmental Protection Agency
EPN:	Emission Point Number
ERC:	Emission Reduction Credit
ERP:	Emission Reduction Plan
ESAD:	Emission Specifications for Attainment Demonstration
ESL:	Effects Screening Level
ETR:	Employer Trip Reduction
FCAA:	Federal Clean Air Act
FCFF:	Federal Clean Fuel Fleet
FIN:	Facility Identification Number
FTA:	Federal Transit Administration
GHP:	Greater Houston Partnership
GHRCP:	Greater Houston Regional Clean Cities Program
GIS:	Geographic Information Systems
GVWR:	Gross Vehicle Weight Rating
HAP:	Hazardous Air Pollutant
HC:	Hydrocarbons
HCOEM:	Harris County Office of Emergency Management
HDDV2b:	Heavy-Duty Diesel Vehicles Class 2b (8,501-10,000 lbs. GVWR)
HDDV3:	Heavy-Duty Diesel Vehicles Class 3 (10,001-14,000 lbs. GVWR)
HDDV4:	Heavy-Duty Diesel Vehicles Class 4 (14,001-16,000 lbs. GVWR)
HDDV5:	Heavy-Duty Diesel Vehicles Class 5 (16,001-19,500 lbs. GVWR)
HDDV6:	Heavy-Duty Diesel Vehicles Class 6 (19,501-26,000 lbs. GVWR)
HDDV7:	Heavy-Duty Diesel Vehicles Class 7 (26,001-33,000 lbs. GVWR)
HDDV8a:	Heavy-Duty Diesel Vehicles Class 8a (33,001-60,000 lbs. GVWR)
HDDV8b:	Heavy-Duty Diesel Vehicles Class 8b (>60,000 lbs. GVWR)
HDDBS:	Heavy-Duty Diesel School Buses

HDDBT:	Heavy-Duty Diesel Transit and Urban Buses
HDGB:	Heavy-Duty Gasoline Buses (school, transit and urban)
HDGV2b:	Heavy-Duty Gasoline Vehicles Class 2b (8,501-10,000 lbs. GVWR)
HDGV3:	Heavy-Duty Gasoline Vehicles Class 3 (10,001-14,000 lbs. GVWR)
HDGV4:	Heavy-Duty Gasoline Vehicles Class 4 (14,001-16,000 lbs. GVWR)
HDGV5:	Heavy-Duty Gasoline Vehicles Class 5 (16,001-19,500 lbs. GVWR)
HDGV6:	Heavy-Duty Gasoline Vehicles Class 6 (19,501-26,000 lbs. GVWR)
HDGV7:	Heavy-Duty Gasoline Vehicles Class 7 (26,001-33,000 lbs. GVWR)
HDGV8a:	Heavy-Duty Gasoline Vehicles Class 8a (33,001-60,000 lbs. GVWR)
HDGV8b:	Heavy-Duty Gasoline Vehicles Class 8b (>60,000 lbs. GVWR)
HGB:	Houston/Galveston/Brazoria Ozone Nonattainment Area
H-GAC:	Houston-Galveston Area Council
HIRI:	Heat Island Reduction Initiative
HOV:	High-Occupancy Vehicle
HRM:	Houston Regional Monitoring Corporation
ILEV:	Inherently Low Emission Vehicle
I/M:	Inspection/Maintenance program (vehicle emissions control)
ISTEA:	Intermodal Surface Transportation Efficiency Act of 1991
LAER:	Lowest Achievable Emission Rate
LDDV:	Light-Duty Diesel Vehicles (passenger cars)
LDDT12:	Light-Duty Diesel Trucks 1 and 2 (0-6,000 lbs. GVWR)
LDDT34:	Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs. GVWR)
LDGV:	Light-Duty Gasoline Vehicles (passenger cars)
LDGT1:	Light-Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)
LDGT2:	Light-Duty Gasoline Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)
LDGT3:	Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)
LDGT4:	Light-Duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)
LEV:	Low Emission Vehicle
LNG:	Liquefied Natural Gas
LOA:	Level of Activity
LPG:	Liquefied Propane Gas
LVW:	Loaded Vehicle Weight
MACT:	Maximum Achievable Control Technology
MAERT:	Maximum Allowable Emission Rate Table
MC:	Motorcycles (gasoline)
MDERC:	Mobile Discrete Emission Reduction Credit
MECT:	Mass Emission Cap and Trade
MERC:	Mobile Emission Reduction Credit
METRO:	Metropolitan Transit Authority of Harris County
MOA:	Memorandum of Agreement
MPO:	Metropolitan Planning Organization
MTBE:	Methyl Tertiary Butyl Ether
MTP:	Metropolitan Transportation Plan

MVEB:	Motor Vehicle Emissions Budget
µg:	Micrograms or 10 ⁻⁶ grams
NAAQS:	National Ambient Air Quality Standards
NAMS:	National Air Monitoring Stations
NESHAPs:	National Emission Standards for Hazardous Air Pollutants
NLEV:	National Low Emission Vehicle
NO₂:	Nitrogen Dioxide
NO_x:	Nitrogen Oxides
NSPS:	New Source Performance Standards
NSR:	New Source Review
NWS:	National Weather Service
O₂:	Oxygen
O₃:	Ozone
OTAG:	Ozone Transport Assessment Group
Pb:	Lead
PCC:	Program Compliance Credit
PM_{2.5}:	Particulate Matter less than 2.5 microns in size
PM₁₀:	Particulate Matter less than 10 microns in size
PMT:	Personal Miles Traveled
PPB:	Parts per Billion
PPM:	Parts per Million
PSD:	Prevention of Significant Deterioration
RACT:	Reasonably Available Control Technology
RAQPC:	Regional Air Quality Planning Committee
RCAP:	Regional Commute Alternatives Program
RFP:	Reasonable Further Progress
ROP:	Rate of Progress
RFG:	Reformulated Gasoline
RTP:	Regional Transportation Plan
SA:	Strategic Activity
SAFETEA-LU:	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SER:	Strategic Emission Rate
SIP:	State Implementation Plan
SLAMS:	State or Local Air Monitoring Station
SO₂:	Sulfur Dioxide
SOCMI:	Synthetic Organic Chemistry Manufacturing Industry
SOV:	Single-Occupant Vehicle
SO_x:	Oxides of Sulfur
SULEV:	Super Ultra Low Emission Vehicle
SUV:	Sport Utility Vehicle
TAC:	Technical Advisory Committee
TAFF:	Texas Alternative Fuel Fleet Program
TCAA:	Texas Clean Air Act
TCEQ:	Texas Commission on Environmental Quality (formerly TNRCC)
TCMs:	Transportation Control Measures

TCP:	Transportation Control Plan
TDM:	Transportation Demand Management
TEA21:	Transportation Equity Act for the 21 st Century (replaces ISTEA)
TERP:	Texas Emission Reduction Program
TIP:	Transportation Improvement Program
TMA:	Transportation Management Area
TMO:	Transportation Management Organization
TNRCC:	Texas Natural Resource Conservation Commission (now TCEQ)
TOG:	Total Organic Gases
TPC:	Transportation Policy Council
TPD:	Tons per Day
TPY:	Tons per Year
TxAQS 2000:	Texas 2000 Air Quality Study
TxDOT:	Texas Department of Transportation (formerly Texas Highway Department)
UAM:	Urban Airshed Model
ULEV:	Ultra Low Emission Vehicle
USDOT:	United States Department of Transportation
VMEP:	Voluntary Mobile Emission Reduction Program
VMT:	Vehicle Miles Traveled
VOC:	Volatile Organic Compound
ZEV:	Zero Emission Vehicle

Executive Summary

Milestones

On June 3, 2005, the Federal Highway Administration certified that the Houston-Galveston area's *2025 Metropolitan Transportation Plan (MTP) Update* and the *2006-2008 Transportation Improvement Program (TIP)* conformed with the requirements of the State Implementation Plan for the Houston-Galveston ozone nonattainment area. The June 3, 2005 conformity finding was established with the *Revisions to the State Implementation Plan for the Control of Ozone Air Pollution, Houston/Galveston/Brazoria Ozone Nonattainment Area* (hereafter referred to as the "Mid-Course Review SIP"). This SIP had an Attainment Demonstration and a Rate of Progress portion to which it was conformed using their respective Motor Vehicle Emission Budgets (MVEBs). The EPA found these MVEBs adequate on May 9, 2005.

This conformity is necessary to fulfill the need to update the *Regional Transportation Plan (RTP)* and the *Transportation Improvement Program (TIP)*; the RTP will be extended through 2035, and the new TIP will cover the years 2008-2011. Since there is not yet an approved SIP for the new 8-hour ozone standard, the new plans will have to conform to the MVEBs contained in the 1-hour Mid-Course Review SIP as an interim emissions budget for the 8-hour standard.

The new TIP and RTP are scheduled for consideration and approval by the Transportation Policy Council (TPC) in August and by the Federal Highway Administration (FHWA) in September.

Conformity Requirements

The Clean Air Act Amendments of 1990 (CAAA) require transportation plans, programs, and projects in nonattainment areas, which are funded or approved by the FHWA or the Federal Transit Administration (FTA), to conform to the MVEBs established in the SIP. This ensures that transportation plans, programs, and projects do not produce new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards (NAAQS). Conformity analysis requirements include:

- Use of the latest planning assumptions
- Analysis based on the latest emission estimation model available
- Interagency consultation, as well as a public involvement process, must be conducted during the analysis (found in Sections 7 and 8, respectively)
- Timely implementation of Transportation Control Measures (TCMs)
- An RTP and TIP that are consistent with the MVEBs established in the applicable SIP
- Include all regionally significant projects expected in the nonattainment area in the RTP and TIP

Regional Inventory

H-GAC conducts regional emission analyses of transportation plans to ensure that these activities are consistent with the air quality goals identified in the Mid-Course Review SIP. This conformity analysis of the Houston-Galveston-Brazoria (HGB) nonattainment area accounts for emissions resulting from the nonattainment area's transportation plans, including all regionally significant projects and the effects of emission control programs.

Motor Vehicle Emission Budgets

The budgets established in the Mid-Course Review SIP are as follows:

Table 1: Mid-Course Review Motor Vehicle Emission Budgets

Attainment Demonstration Budget (tpd)		
Year	NOx	VOC
2007	186.13	89.99

Source: Mid-Course Review SIP, TCEQ

These MVEBs represent the maximum allowable amount of emissions that may be produced by on-road sources as a result of the implementation of the RTP and TIP. These budgets are developed based on the emission inventories and photochemical modeling conducted for the development of the Mid-Course Review SIP and include emission reduction benefits from federal and state control programs.

Conformity Tests

As specified by the Code of Federal Regulations (40 CFR §93.109[c]¹, as amended by 62 FR 43807², Aug. 15, 1997) all ozone nonattainment areas designated moderate and above must pass a motor vehicle emissions budget test if an approved SIP budget exists. The HGB area has been designated as "Moderate" for the eight-hour standard with an attainment year of 2009. As noted earlier, the budget test must be satisfied using the MVEBs established in the Mid-Course Review SIP. Specifically, this test is satisfied when emissions of the ozone pollutant's precursors (VOC and NOx) for each analysis year are less than or equal to the MVEBs established in the SIP. For the test, the regional emission analysis may be performed for any years within the timeframe of the transportation plan, provided they are not more than ten years apart, and include the budget year (2007), the attainment year (2009) and the plan horizon year (2035). To meet this analysis requirement then, the years 2007, 2009, 2019, 2025 and 2035 were selected.

¹ Regulation may be found at:

http://a257.g.akamaitech.net/7/257/2422/22jul20061500/edocket.access.gpo.gov/cfr_2006/julqtr/pdf/40cfr93.109.pdf

² Rule may be found at: <http://frwebgate6.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=232990505077+0+0+0&WAISaction=retrieve>

Modeling

Two modeling suites were used in this process in order to obtain total emissions. The Travel Demand Modeling at H-GAC used the EMME/2 model with a special post-mode choice speed model in order to establish the region's total vehicle miles traveled (VMT). The TTI suite of emissions software was used in conjunction with the latest version of EPA's MOBILE6 model to replicate the on-road modeling performed in the SIP and obtain the appropriate emissions factors. The data used in this conformity analysis is consistent with what was used in the SIP, except where more recent planning assumptions have been developed. Total emissions were then calculated by multiplying the VMT by the emission factors for each of the analysis years.

Conformity Analysis Results

The results of this conformity determination show that the *2035 Regional Transportation Plan* and the *2008-2011 Transportation Improvement Program* for the HGB Transportation Management Area meet the requirements of the SIP for the Houston-Galveston ozone nonattainment area, as submitted December 17, 2004, and in accordance with the Clean Air Act (42 U.S.C. 7504, 7506 (c) and (d)³), as amended on November 15, 1990, and the final conformity rule (40 CFR Parts 51 and 93⁴).

Table 2: Conformity Analysis Summary

Analysis Year	VOC Emissions (tons/day)	VOC Budget (tons/day)	NOxEmissions(tons/day)	NOx Budget (tons/day)
2007	88.09	89.99	171.35	186.13
2009	80.70	89.99	150.86	186.13
2019	46.00	89.99	49.60	186.13
2025	42.20	89.99	39.34	186.13
2035	51.43	89.99	43.05	186.13

Figure 1: VOC Emissions Summary

³ Statutes may be found at: http://www4.law.cornell.edu/uscode/html/uscode42/usc_sec_42_00007504----000-.html and http://www4.law.cornell.edu/uscode/html/uscode42/usc_sec_42_00007506---000-.html

⁴ Regulations may be found at: http://www.access.gpo.gov/nara/cfr/waisidx_06/40cfr51_06.html and http://www.access.gpo.gov/nara/cfr/waisidx_06/40cfr93_06.html

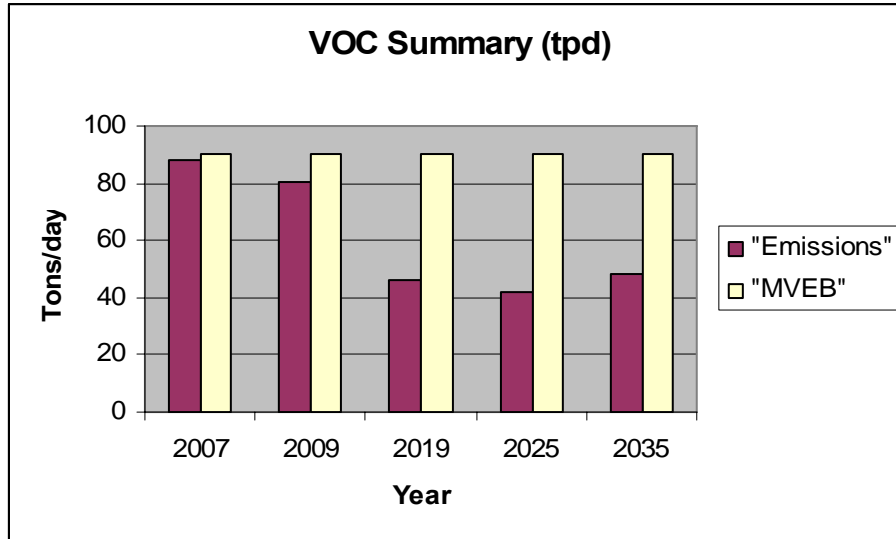
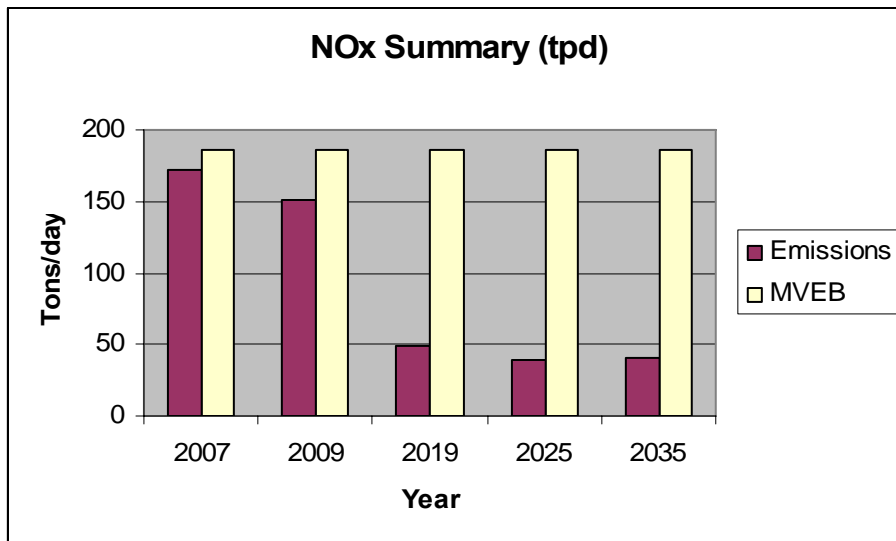


Figure 2: NOx Emission Summary



Background Information on Conformity

More information on what conformity is and the regulations that apply to it can be found at: <http://www.fhwa.dot.gov/environment/conform.htm>. This conformity determination involved a pre-analysis review discussion with the review agencies (Section 7) and a public comment period (Section 8).

1.0 Introduction

With the signing of the Clean Air Act Amendments of 1990 (CAAA) into law, the Houston-Galveston region was designated nonattainment for exceeding the National Ambient Air Quality Standard (NAAQS) for the pollutant ozone. Following the revocation of the 1-hour ozone standard, the Houston-Galveston region was designated as "moderate" for the 8 hour ozone standard and given until the year 2009 to attain.

The CAAA requires each state to submit a state implementation plan (SIP) to the U.S. Environmental Protection Agency (EPA). The SIP is a legally binding document that defines the structure through which emissions will be reduced and the ozone standard will be attained. As the central focus of the air quality planning process, the SIP ties in transportation planning through the conformity provisions in the CAAA. These provisions verify that federal actions on transportation projects are consistent with the air quality objectives contained in the SIP. In many cases, transportation-related control measures identified in the SIP are contained and funded in the Regional Transportation Plan (RTP) and the Transportation Improvement Program (TIP).

Section 176(c)(4) of the CAAA requires the EPA to make rules regarding conformity determinations for transportation plans and programs. In response to this requirement, the EPA published its *Criteria and Procedures for Determining Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Funded Under Title 23 U.S.C. or the Federal Transit Act* in the *Federal Register* on November 24, 1993. This conformity rule requires metropolitan planning organizations (MPOs) and the U.S. Department of Transportation (U.S. DOT) to make conformity determinations on metropolitan transportation plans and transportation improvement programs before they are adopted, approved or accepted in air quality nonattainment areas. The EPA has promulgated four separate amendments to the conformity rule, most recently in July 2004. The EPA has also proposed new rules affecting the conformity for the eight-hour ozone standard. This conformity uses the 1-hr MVEBs from the Mid-Course Review SIP per 40 CFR 93.118.

1.1 MPO Organization and Role

The Houston-Galveston Area Council (H-GAC) has been designated by the State of Texas as the Metropolitan Planning Organization (MPO) charged with coordinating transportation planning for the region. H-GAC's Transportation Policy Council (TPC) is responsible for the development of the long-range, 20-year transportation plan for the eight-county Transportation Management Area (TMA). The ozone nonattainment boundaries are the same as the MPO boundaries. The TPC provides regional coordination with various stakeholders including cities and counties in the eight-county area, the Texas Department of Transportation (TxDOT), transportation agencies (such as transit, toll and port authorities) and citizens of the region.

This conformity is necessary to fulfill the need to update the *Regional Transportation Plan* (RTP) and the *Transportation Improvement Program* (TIP); the RTP will be extended through 2035, and the new TIP will cover the years 2008-2011. Since there is

not yet an approved SIP for the new 8-hour ozone standard, the new plans will have to conform to the MVEBs contained in the 1-hour Mid-Course Review SIP as an interim emissions budget for the 8-hour standard.

1.2 Purpose

To demonstrate conformity, as defined by the EPA's final rule, analyses of transportation plans and TIPs must address the following criteria:

- Are the RTP and TIP consistent with the most recent estimates of on-road mobile source emissions?
- Do the RTP and TIP provide for expeditious implementation of transportation control measures (TCMs) in the applicable SIP?

This criteria is met and conformity is demonstrated if both VOC and NO_x emissions in each of the analysis years modeled conforms to the criteria in Section 1.3.

1.3 Conformity Criteria

The final conformity rule requires MPOs in air quality nonattainment areas to conduct conformity determinations on their transportation plans and TIPs. The rule requires that conformity analyses adhere to a number of criteria:

- The analysis process must use the most recent planning assumptions in force at the time of the conformity determination and employ the latest available and approved emissions model.
- The transportation plan and TIP must provide for the timely implementation of TCMs from the applicable SIP.
- A regional emissions analysis must be conducted for significant air quality milestone years and the RTP horizon year.
- VOCs and NO_x emissions from each analysis year must be less than the MVEB established in the applicable SIP.

1.4 Document Format

The format and content of the conformity documentation was determined by the Technical Working Group (TWG). The TWG is a group of technical on-road modelers, planners, and engineers from MPOs and councils of government across the state, as well as representatives from state and federal agencies. This document includes:

- Summary of economic/demographic inputs to the travel modeling process by analysis year;
- Listing of emission model inputs by analysis year;

- Estimates of emission reductions from TCMs and a demonstration of their timely implementation;
- Adjustments to estimated vehicle miles traveled based on a historic comparison to the Highway Performance Monitoring System (HPMS);
- Summaries of travel demand forecasts (person, vehicle and transit trips by mode and purpose) and summaries of vehicle miles of travel (by major functional classifications and vehicle speed) for each analysis year;
- Listings of regionally significant federal, state and local added capacity highway and transit projects by analysis year, including funding source; and
- Network link listings by analysis year.

1.5 Electronic Data Submittal

This document is available in hard copy and in electronic format. Submittal of the conformity to review agencies will be in electronic format, except to agencies that have specifically requested a printed copy. Additionally, this material is available on the H-GAC Conformity Web site:

<http://www.hgac.com/HGAC/Departments/Transportation/Air+Quality/Conformity/2007+Documents.htm>

1.6 Checklist

The Documentation Subcommittee of the TWG created the checklist located in Appendix 9.18. This checklist serves the dual function of reminding the submitting agency to submit everything listed on the sheet, and to serve as a quick reference for review agencies.

2.0 2035 RTP & 2008-2011 TIP Conformity to the SIP

The purpose of this document is to demonstrate that the 2035 RTP and the 2008-2011 TIP conform to the MVEBs established in the Mid-Course Review SIP.

2.1 Overview

The *2035 Regional Transportation Plan* (RTP) considers the transportation needs of the eight-county HGB region. It is a long-range plan that identifies mobility and access goals for our region, strategies to meet these goals, and priority actions to be implemented by 2035. The area covered by this plan includes Harris, Galveston, Brazoria, Fort Bend, Montgomery, Liberty, Chambers, and Waller counties. These counties comprise the consolidated metropolitan statistical area (CMSA), a region of more than 7,000 square miles and 5.5 million residents.

2.2 Submittal Frequency

According to the *2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)*, which was signed into law on August 10, 2005, the RTP is required to be updated every four years. The TIP is the four-year program of transportation investments and is considered the implementation tool of the long range plan. When either the RTP or the TIP is updated, a new conformity analysis must be conducted. Additional conformity triggers include the publication of SIPs containing new MVEBs and expiration of the four-year period for which a conformity determination lasts.

2.3 Reasonable Available Control Measures

The 2008-2011 TIP includes and clearly identifies the reasonable available control measures committed to in the SIP for our region. The transportation activities in the 2008-2011 TIP conform to the regional air quality goals. The MPO is committed to completing these projects within the required attainment timeframe. The emissions benefits for these projects are located in Appendix H of the TIP. The project selection process for the TIP requires project sponsors to provide information pertaining to their public involvement and environmental justice process. Each sponsor is encouraged to provide documentation including meeting schedules, minutes, comments and petitions/surveys. Information regarding outreach materials and meeting locations are also identified through the selection process. Sponsors include information regarding advertising and meetings conducted in multiple languages, low-income and elderly areas, and meeting locations accessible to transit.

2.4 Regionally Significant Projects

The 2008-2011 TIP includes all regionally significant projects regardless of funding source, since the HGB region is a nonattainment area. Regionally significant projects using federal or state funds are located in Chapter 2 and locally funded regionally significant projects are identified in Chapter 4 of the TIP.

Regionally significant roads are identified as: interstate/toll roads, other urban freeways or expressways, rural principal arterials, and minor arterial roads or streets. Regionally significant projects are defined as:

1. The project must be a non-exempt roadway project which meets the following criteria:
 - a. Proposed roads that will likely meet federal criteria for all-arterial or higher functional classification.
 - b. Upgrade to arterial or higher functional classification.
 - c. An adding capacity project being constructed on new alignments as a bypass to a principal arterial/interstate.
 - d. Addition of thru traffic lanes of 1 mile or more on roads that are functionally classified as an arterial or higher as defined in the travel model.
 - e. New interchanges on roads that are functionally classified as an arterial or higher, that represent new connections.
 - f. Adding or extending freeway auxiliary/weaving lanes from one interchange to a point beyond the next interchange.
2. As traffic conditions change in the future, the MPO in consultation with the interagency consultation group, will consider regional significant all future roadways facilities that carry an average of 11,000 vehicles per day for a 2 lane facility and 20,000 vehicles per day for a 4 lane or greater facility between logical termini.
3. Any fixed guideway transit service including light rail, commuter rail, or portions of bus rapid transit that involve exclusive right-of-way (including barrier separated HOV lanes) shall be considered regionally significant.
4. Non-exempt projects not addressed in the above statements will be decided on a case-by-case basis through the interagency consultation process. The consultation will occur before taking the plan to TPC (either plan or TIP revision), and previous to the environmental determination.

2.5 Regionally Significant Travel Programs

The 2035 RTP proposes a collection of solutions to minimize the growth of congestion associated with our growing population. The strategies to maximize mobility include a variety of approaches which have developed and evolved since the previous transportation plan. The 2035 RTP includes a combination of strategies, programs, and projects to improve regional mobility and quality of life for all citizens. Public Outreach comments over the years consistently articulate an urgent need for congestion reduction, improved mobility, and an increase in travel choices. The 2035 RTP employs four major strategies to aid in the goals of improving regional mobility and safety, and reducing congestion, while minimizing the associated negative air quality impacts. This RTP recommends maximizing the following strategies:

- System Capacity – increasing highway and transit capacity

- Demand Management -- for peak-period travel
- Operations Management –improving the efficiency of existing facilities
- Livable Centers – coordinating land use and transportation investments

2.5.1 System Capacity

This section provides an overview of the recommended system capacity improvements contained in the 2035 RTP including roadways, transit (inside and outside of the METRO service area), and port/airport expansions.

Transit

The 2035 METRO Long Range Plan is an iterative process incorporating the 2035 METRO Solutions Plan and future mobility needs identified in regional planning efforts. The plan recommends significant expansion of the current transit system and includes a network of integrated high capacity transit facilities on major travel corridors. METRO’s 2035 Long Range Plan also identifies significant service expansions beyond the METRO service area.

HOT/HOV Lanes

Begin the conversion to dual direction tolled facilities in major corridors in existing Bus/HOV Corridors.

Ports and Airports Expansion Plans:

- Continued development of a major container and cruise terminal complex called the Bayport Terminal Project, developed by the Port of Houston Authority
- The Port of Galveston expansion plans reflect increases in their cruise ship activity
- The Port of Freeport’s major expansion plans include cargo handling capabilities
- The northeast side of Bush Intercontinental Airport may provide access to the proposed I-69 NAFTA Superhighway
- Expansion of passenger facilities at Hobby Airport

2.5.2 Demand Management

Travel demand management focuses on moving people, rather than moving vehicles. Its primary goal is to modify travel habits so that demand is lessened through incentive or disincentive programs. Such programs encourage increased utilization of other transportation modes, travel during non-rush hour periods, and alternate routing. Examples of travel demand management programs include teleworking, vanpools, and congestion pricing.

2.5.3 Operations Management

Operational improvements include the continued installation and usage of Computerized Traffic Management Systems (CTMS) with video camera surveillance and incident detection and response, ramp metering and Arterial Traffic Management Systems (ATMS) that will interconnect traffic signals along specific corridors. Additional strategies are recommended related to Intelligent Transportation Systems (ITS).

Smart Streets is another operations management concept. Smart Street enhancements will help decrease vehicle delay through a range of options, such as traffic light synchronization, deployment of roundabouts, medians, constructing or extending turn bays (as needed), consolidation of duplicate driveways and partial grade separation of some traffic lanes at major intersections, as appropriate.

A viable safety evaluation and improvement program is an integral component of the 2035 RTP.

A Security-Evacuation plan is being developed in the case of hurricanes or major regional emergencies.

2.5.4 Livable Centers: Connecting transportation and land use

The 2035 RTP has shown that more significant mobility gains are possible through better coordinated land use and transportation planning. H-GAC has identified a three-pronged land use and transportation coordination strategy that calls for the: creation of bicycle and pedestrian friendly **Centers**; establishment of better **Connections** between the centers, and designs based on the **Context** of the surrounding land uses. In addition to enhancing mobility choices, this **3C's** strategy is expected to produce economic, environmental and “quality of place” benefits for the region.

2.6 Locally Funded Projects/Programs

Federal and state revenues for building and maintaining the region’s transportation network are not keeping pace with demand. One method of generating additional resources is through the creation of toll facilities that provide additional sources of funding. These additional sources of revenue may provide the necessary funding for implementing regional improvements to the transportation network without necessarily requiring federal funds. The following projects may be supported with toll revenue:

- I-10 West (Katy freeway) HOT lane (under construction)
- SH 99 (Grand Parkway) Full corridor (proposed)
- Northwest corridor (new facility) New corridor (proposed)
- SH 35 New corridor (proposed)
- U.S. 290 HOT lane (proposed)
- SH 288 HOT lane (proposed)
- Hardy Toll Road extension
- Westpark expansion

2.7 Exempt Projects/Programs

Exempt projects include safety, landscaping and those projects with minimal environmental impacts, please refer to the transportation conformity regulations 93.126 and 93.127 for a complete list of exempt projects. Examples of such projects are:

Safety

- Hazard elimination program
- Shoulder improvements

- Pavement resurfacing and rehab
- Fencing
- Increasing sight distance
- Traffic control devices other than signalization

Mass Transit

- Purchase of support vehicles
- Construction of passenger shelters
- Purchase of office equipment
- Operating assistance to transit agencies

Other

- Projects that do not lead to construction activities
- Planning and technical studies
- Sign removal
- Landscaping
- Engineering to access social, economic or environmental impacts
- Repair of damage by natural disasters

2.8 Constraints

The EPA has designated the eight-county HGB area as nonattainment for ground-level ozone (O₃). While transportation is not this region's only source of ozone precursor pollutants, continued reductions of pollutants from on-road vehicles is an essential part of our plan to attain clean air standards. Consequently, the RTP and TIP are required to conform to emission limits set by the Texas Commission on Environmental Quality (TCEQ) and approved by the EPA.

In addition to the conformity requirements discussed above, the RTP and TIP must meet certain statutory planning requirements, as set out in 23 CFR Part 450⁵ (Federal Highway Administration) and 49 CFR part 613⁶ (Federal Transit Administration). The sections below discuss these constraints.

2.8.1 Long-Range Financial Constraint (RTP)

The fiscal constraint requirement is intended to ensure that the total estimated costs of projects included in the RTP and the estimated cost of constructing, operating, and maintaining the total (existing plus planned) transportation system over the period of the RTP does not exceed reasonably available estimated revenues. A conformity determination on fiscally constrained plans ensures that conformity findings are based on realistic plans and programs, and that TCMs and other projects which may be beneficial to air quality are funded.

The total estimated revenue of expenditures through the 2035 RTP planning horizon is \$128.4 billions (as calculated in nominal, i.e., year of expenditure, dollar values). The

⁵ Regulation may be found at: http://www.access.gpo.gov/nara/cfr/waisidx_07/23cfr450_07.html

⁶ Regulation may be found at: http://www.access.gpo.gov/nara/cfr/waisidx_06/49cfr613_06.html

total of all anticipated expenditures for this time period is estimated at \$128.4 billion. With revenues equaling expenditures, the 2035 RTP is considered fiscally constrained.

On-road mobile transportation is one of several broad categories contributing to the formation of ground-level ozone. To meet the federal air quality standard in this region, reductions are needed from all source sectors. The 2035 RTP recommends increased funding for H-GAC's mobile source emission reducing programs, such as:

- \$460 million for the Clean Vehicle Program over the life of the RTP
- \$198.8 million for the vanpool program through 2035
- \$11.6 million for FY 2007-2035 for implementation of the Commute Solution's telework initiative
- \$136.4 million for other Commute Solution programs, including: marketing and advertising of Commute Solution programs and Clean Air Action, TMO development, Best Workplaces for Commuters, and Commuter and Transit Services Pilot Programs.

2.8.2 Short-Range Financial Constraint (TIP)

The TIP was developed within the estimated allocations for the HGB region for FY 2008-2011. The fiscal constraint for the TIP ensures that those projects committed to can be implemented within the four-year timeframe. Fiscal constraint of the TIP also ensures that our region will be financially able to maintain and operate the existing transportation infrastructure.

2.8.3 Air Quality/Motor Vehicle Emissions Budgets

The MVEBs for the Attainment Demonstration (AD) of the Mid-Course Review SIP are as follows:

Attainment Demonstration MVEBs 2007	
NO _x	186.13 tpd
VOC	89.99 tpd

The 2007 budgets also apply to the years 2009, 2019, 2025 and 2035. The 2007 budget was calculated by TCEQ according to EPA guidance on the development of budgets under the one-hour ozone standard. As no eight-hour SIP has been developed for the HGB area, this analysis makes use of the July 1, 2004 EPA Conformity Rule. This rule allows eight-hour nonattainment areas to use existing MVEBs providing that the one-hour nonattainment area has the same boundaries as the 8-hour area. Once an eight-hour SIP is developed, the budgets located therein will be used for conformity purposes.

3.0 Modeled Activity

This section describes the demographic modeling, as well as the travel demand modeling completed for the conformity analysis years.

3.1 Land-Use Model

Base Year (2005) Data

The three major data sources for the base year are appraisal data (from county appraisal districts), demographic data (from the U.S. Bureau of the Census), and employment data (company-level data from a proprietary Info-USA database).

Forecast Process

There are two major phases in the forecasting process. In phase I, H-GAC develops county-level control totals for population, households and employment. In phase II, H-GAC allocates these control totals to specific areas within each county.

Phase I

The development of county-level totals for population, number of households, and number of jobs for future years (from 2005 through 2035) is a multi-step process. H-GAC starts by forecasting the total population in the region (all eight counties combined) using a national population projection from the U.S. Bureau of the Census and applying to it our projection of the region's share in the total U.S. population. In the next step, H-GAC allocates the regional population forecast to the counties using the shares from the two projections (known as "0.5" and "1.0" scenarios) of the county population growth developed by the Texas State Data Center and the Office of the State Demographer. Then, H-GAC derives the forecast for the number of households in each county from the ethnic and age compositions (drawn from the scenarios) of the forecasted county populations and demographic statistical relationships obtained from the 2000 Census data. H-GAC's regional employment forecast is driven by the available future population in the working age labor force. The regional employment forecast is then allocated to the counties using projected shares in the regional employment.

Phase II

For small area allocation H-GAC uses the UrbanSim Land Use Forecasting and Simulation Model. The model breaks the region up into very small, regularly spaced squares where each square has an area of one million square feet, or approximately 23 acres. UrbanSim then analyzes land use dynamics, and determines statistical relationships between different types of land uses and various factors, such as proximity to population and employment, land values, and accessibility over the transportation network. Based on that information, the model makes predictions about the likelihood of certain type of development in certain parts of the region. The model works by "creating" housing units and job slots (non-residential square footage) and then allocating population and employment growth (defined by county control totals) into available housing and job locations.

While the elementary geographic unit of the forecast is the UrbanSim grid cell, the forecast results are available for different geographic units (Regional Analysis Zones, Transportation Analysis Zones, Census Tracts, cities, zip codes). For travel demand modeling purposes, the forecast for Travel Analysis Zones (TAZ) is derived by aggregating (summing up) results for individual UrbanSim grid cells located within TAZ.

The development of the forecast was overseen by the Forecast Advisory Committee comprised of local experts on demographic, economic, and development trends in the H-GAC region. During summer and fall of 2006, H-GAC conducted five forecast workshops, open to general public, throughout the region where the preliminary results were presented and feedback was received. Once the committee approved the draft forecast for public review and comment, the forecast results were provided to all local governments within the TMA, and were placed on H-GAC's website for review by the public. The H-GAC's Board of Directors adopted the forecast in February 2006.

Conformity Analysis Years

The H-GAC forecast includes county control totals and small TAZ-level data for every year from 2005 through 2035. The summary forecast data for the conformity years is presented in a table below.

Table 3: Comparison of Forecast Data for Conformity Years

		Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller	Region
Population (Thousands)	2007	293	32	474	283	3,894	83	401	41	5,501
	2009	306	34	504	289	4,016	86	429	44	5,710
	2019	377	41	665	345	4,660	103	578	56	6,825
	2025	420	46	775	374	5,075	113	680	64	7,547
	2035	496	53	958	412	5,840	131	865	80	8,835
Households (Thousands)	2007	101	11	154	109	1,385	28	144	14	1,946
	2009	106	12	168	112	1,434	29	156	14	2,032
	2019	135	16	236	137	1,693	36	219	19	2,490
	2025	153	18	275	150	1,863	40	261	22	2,782
	2035	184	21	344	169	2,173	47	336	28	3,302
Jobs (Thousands)	2007	96	8	143	110	2,140	22	115	14	2,649
	2009	100	9	153	115	2,221	23	123	14	2,758
	2019	117	10	201	135	2,561	27	162	17	3,230
	2025	127	11	233	146	2,754	29	187	19	3,507
	2035	148	13	298	169	3,145	34	240	23	4,069

Source: H-GAC, February 2006

3.2 Travel Demand Model

3.2.1 Model Description

To address the conformity tests, analysis year networks were developed for 2007, 2009, 2019, 2025, and 2035. Results from the 2002 base year network, developed for the Base Year Emission Inventory, are used for comparison. The HGB regional travel models were used to estimate the daily travel inputs to this conformity analysis.

3.2.2 Model Validation

These models have been validated for the 2002 base year. Documentation of this validation is presented in Appendix 9.3. The procedures used to develop disaggregate time-of-day travel and speed inputs are the same as those used in the development of the MVEBs located in the Mid-Course Review SIP for the HGB nonattainment area.

3.2.3 Network Development

The regional roadway networks used in the conformity analysis represent the system of roadways assumed to be operational in each of the five analysis years. For example, the 2007 roadway network represents current roadways, plus roadways under construction, and roadways expected to be operational by the end of FY 2007. The 2009 network includes all roadways in the 2007 roadway network plus all roadways expected to be operational by the end of FY 2009. This procedure is likewise repeated for all the other analysis years.

3.2.4 Model Adjustments

Travel Demand output is adjusted by two factors: highway performance monitoring system (HPMS) and seasonal adjustment factors. The HPMS adjustment factor was used to adjust the 2002 travel demand model (TDM) for HPMS consistency. The current TDM validation year is 2002. This factor was developed for this conformity using the 2002 TDM validation document (H-GAC, November 2006), the estimated intrazonal VMT for the 2002 TDM, and the 2002 HPMS vehicle miles of travel (VMT) reported by TxDOT. The HPMS factor is calculated as:

$$\text{HPMS VMT (AADT)} \times \text{ANSWT Adjustment Factor} = \text{HPMS VMT (ANSWT)}$$

(where average annual daily traffic is AADT, and average non-summer weekday travel is ANSWT)

$$\text{HPMS VMT (ANSWT)} / \text{Model VMT (ANSWT)} = \text{HPMS Factor}$$

The HPMS VMT (AADT) component was the eight-county total 2002 HPMS VMT (reported by TxDOT in the 2002 Roadway Inventory Functional Classification Record [RIFCREC] Report). The ANSWT adjustment factor (i.e., used to convert AADT to ANSWT) was based on automated traffic recorder (ATR) data aggregated from all ATR stations within the Houston-Galveston Area (HGA) eight-county TDM network area. The model VMT (ANSWT) was produced from the 2002 travel model assignments and estimated intrazonal VMT. The actual values for the HPMS factor calculation are:

$$122,832,328 \times 1.0558338 = 129,690,523.6$$

$$129,690,523.6 / 129,044,406.0 = 1.00500694$$

This HPMS factor used in the conformity analysis was not the same that was utilized in the SIP. The seasonal factor used in this analysis also differs from that used in the SIP.

The HGA regional ATR-based seasonal day-type factors adjust the travel model and estimated intrazonal VMT to VMT estimates characteristic of the day used to produce the MVEB. The factors are average episode day-type traffic count divided by the ANSWT traffic count.

3.2.5 Transit Systems

In September 1994, the Metropolitan Transit Authority (METRO) Board of Directors approved a fare increase. Prior to September 1994, there had been no transit fare increase since the previous conformity determination of the MTP. However, since summer 1997, ridership levels have risen. The analysis of marketing/survey data appears that revised fare structures and increased marketing efforts have played a role in the enhanced ridership levels.

Assumptions regarding the level of transit service for the conformity determination of the MTP are consistent with METRO's 2035 Regional Transit Plan and subsequently completed Major Investment Studies. Transit fares were assumed to remain at existing levels throughout the analysis period. Both existing and future toll facilities were evaluated assuming currently reflected toll pricing would remain at a fixed amount.

3.2.6 Roadway VMT

Base Year (2002) Inventory

Using the 2002 household and employment information for the eight-county Transportation Management Area (TMA), trip generation (i.e., production and attraction) estimates were developed for each of twelve trip purposes: home-based work (HBW), home-base-non-work-retail (HBNW-Retail), home-base-non-work-education-1 (HBNW-Ed1), home-base-non-work-school-bus (HBNW-Sch-Bus), home-base-non-work-other (HBNW-Other), home-base-non-work-airport, (HBNW-Airport), non-home-base-workbased (NHB-Workbased), non-home-base-Other (NHB-Other), external-local-auto (Ext-Loc-Auto), External-local-truck (Ext-Loc-truck), Truck trips (TR) and Taxi trips (TX). The trip production models used to produce these estimates are cross-classification models based on household size and income, while the attraction models are based on employment. The 2002 external-local and external-through trip tables were based on 2002 external station (cordon) volumes.

Table 5 details the resulting person and vehicle trip estimates by purpose for the year 2002. The HBSCH, HBSHP and HBO trips have been summed to a home-based, non-work (HBNW) total.

Table 4: Base Year (2002) Internal Trips by Purpose for the Eight-County Transportation Planning Region

Purpose	2002	% of Total
HBW Person Trips	3,097,497	19
HBNW Person Trips	7,788,474	47
NHB Person Trips	4,765,089	29
TRTX Vehicle Trips	879,624	5
Total Internal Trips	16530684	100

Source: H-GAC, 2007

Using a 2002 highway network and a set of F-factors calibrated and validated to the year 2002, person trips by purpose, as well as the truck-taxi and external-local vehicle trips, were distributed using the Disaggregate Trip Distribution Model (the Atomistic Model) of the TxDOT Trip Distribution Package (TTDP).

Table 6 details, by a general facility type structure, the 2002 network, which was used in the trip distribution, as well as the assignment phases of this scenario analysis.

Table 5: 2002 Network for the Eight-County Transportation Planning Region

Miles	Freeway/Tollway	Principal Arterial	Other Arterial	Collector	HOV Lanes ^A
Centerline	497.0	810.0	3,230.0	1,135.0	44.0
Lane	2,820.0	3,372.0	8,754.0	2,368.0	44.0

Source: H-GAC; A: excluding ramp structures, 2007

Transit mode shares were estimated based on Metro's 1995 Transit On-Board Survey. Following the estimation of transit mode share, the mezzo-level high-occupancy vehicle (HOV) carpool model of the TTDP was used to account for and estimate the level of usage of the HOV lane system by carpools and convert the person trip tables to vehicle trip tables. The HOV carpool demand on the 1995 HOV lane system was estimated based on the transit mode share estimates produced by METRO and the auto occupancy estimates from the 1984 H-GAC Regional Travel Survey (subsequently revised based on the 1990 Nationwide Personal Transportation Survey (NPTS)).

The vehicle trip tables were factored by trip purpose to represent the time periods desired for the estimation of time-of-day travel demand following the conversion of the person trip tables to vehicle trip tables. The procedure used by H-GAC to factor trip tables relies on time-of-day trip table factors by trip purpose and the trip table factoring procedures of the TTDP. The trip table factors were developed based on an analysis of the 1995 H-GAC Regional Travel Survey data. Because the Regional Travel Survey contained no data on truck/taxi and external travel, survey data from other urban areas was used to

develop trip table factors for those trip purposes.

In addition to factoring the 24-hour trips to represent the desired time period, the trip tables were converted from production-to-attraction orientation to origin-destination orientation. The factors used to perform this step were also based on the 1995 H-GAC Regional Travel survey.

Time-of-Day Trip Table Factors

Based on analyses of the trip table factors developed in 60 minute intervals, the daily vehicle trip tables were separated into the following time periods:

A.M. Peak: 6:01 a.m. - 9:00 a.m.

Midday: 9:01 a.m. - 3:00 p.m.

P.M. Peak: 3:01 p.m. - 7:00 p.m.

Overnight: 7:01 p.m. - 6:00 a.m.

Following the separation of the 24-hour trip tables by purpose for each of the four time periods, the trip tables for each trip purpose were summed to develop a single time-of-day trip table (e.g., A.M. Peak trip table). Each time-of-day trip table was then assigned to the appropriate 2002 time-of-day network.

The time-of-day networks are the 2002 network with capacities reflective of the appropriate time-of-day. For example, the facilities represented in the 2002 a.m. peak network have three-hour, peak-period capacities that vary by facility type, number of lanes, and area type.

The resulting time-of-day link volume estimates were then entered into H-GAC's post-assignment speed model to develop link-level time-of-day speed estimates. The post-assignment speed model is based on procedures recommended in Highway Vehicle Speed Estimation Procedures for Use in Emissions Inventories prepared by Cambridge Systematic for the EPA in September 1991.

The speed estimation model relies primarily on the speed estimation techniques described in the Highway Capacity Manual (HCM). The HCM relationships are used to estimate the speeds for estimated volume-to-capacity ratios from zero to one. The extensions of the models for volume-to-capacity ratios exceeding one are based on the traditional Bureau of Public Roads (BPR) impedance adjustment function. The methods rely on the estimated volume-to-capacity ratio as a key measure of congestion for estimating the congested speed based on the constrained equilibrium volume of a link. Separate procedures are used for freeways and non-freeway streets.

The speed model was developed and calibrated by applying speeds to the 2002 a.m. and p.m. peak-period assignments for the HGB region, and comparing the modeled directional speeds to more than 22,000 observed directional link speeds encoded in the link data. The models were also validated to year 2002 observed directional speeds.

The centroid connectors in the HGB TMA networks represent local street facilities that provide access to higher-level roadway facilities. Local streets are generally low-volume, uncongested streets. Since there is not a one-to-one correspondence between centroid connectors and the local streets (i.e., a single centroid connector usually represents more than one local street) and since local streets generally operate without significant congestion, the speed models were not used to estimate the centroid connector speeds. The speeds for the VMT represented on centroid connectors were estimated based on the area type of the zone, which is connected to the roadway network by the centroid connector and the length of the centroid connector. The estimated speed for intrazonal VMT (travel within a zone) is developed from the average of the centroid connector speeds for the zone.

The estimated level of travel (VMT) and congestion (speed) by link serve as inputs to the emissions model.

Analysis Years (2007, 2009, 2019, 2025 and 2035)

Using the household and employment forecasts for 2007, 2009, 2019, 2025, and 2035, trip generation estimates (i.e., production and attraction) were developed for each of twelve trip purposes. The trip production models used to produce these estimates are cross-classification models based on household size and income, while the attraction models are based on employment. Trip generation estimates for external-local and extrapolating historic growth in traffic between 1995 and 2002 developed external-through vehicle trips for all scenarios. The results are shown in the table below.

Table 6: Internal Trips by Purpose for the Eight-County Transportation Planning Region for 2007, 2009, 2019, 2025 and 2035

Purpose	2007	% Of Total	2009	% Of Total	2019	% Of Total	2025	% Of Total	2035	% Of Total
HBW Person Trips	3,559,085	19.2	3,705,775	18.9	4,497,731	19.0	5,023,284	19.1	5,913,730	19.2
HBNW Person Trips	8,661,730	46.8	9,227,890	47.0	11,053,979	46.7	12,294,175	46.7	14,379,083	46.6
NHB Person Trips	5,310,988	28.7	5,677,061	28.9	6,868,557	29.1	7,652,123	29.1	8,997,730	29.1
TRTX Vehicle Trip	964,988	5.3	1,031,438	5.3	1,225,439	5.2	1,355,068	5.1	1,589,095	5.1
Total Trips	18,496,791	100	19,642,164	100	23,645,706	100	26,324,650	100	30,879,638	100

Source: H-GAC, April 26 2007

As noted in Section 3.2.3, the regional roadway networks used in the conformity analysis represent the system of roadways assumed to be operational in each of the five analysis years. Table 7 summarizes the regional roadway networks for the years 2007, 2009, 2019, 2025 and 2035. 9.7 contains a link-level listing of the roadway modeling networks used in the analysis.

Table 7: Roadway Networks for the Eight-County Transportation Planning Region for 2007, 2009, 2019, 2025 and 2035

	Miles	Freeway/Tollway	Principal Arterial	Other Arterial	Collector	Managed Lanes ^A	TOTAL
2007	Centerline	661	1386	3113	1707	73	6,939
	Lane	4003	6020	9263	4087	148	23,520
2009	Centerline	673	1410	3143	1709	73	7,009
	Lane	4139	6169	9563	4162	148	24,182
2019	Centerline	942	1570	3222	1731	160	7,625
	Lane	5628	7335	10770	4696	522	28,951
2025	Centerline	963	2243	2892	1617	183	7,899
	Lane	5869	10618	10178	4672	579	31,916
2035	Centerline	965	3072	2684	1645	204	8,572
	Lane	5877	11423	9495	4672	579	32,046

Source: H-GAC, April 26 2007; A: excluding ramp structures

The estimates of person trips by trip purpose, along with network descriptions of the roadway and transit facilities and services, were then put into the regional mode choice model. This model developed forecasts of person trips by eight auto sub modes (single-occupant non-toll, single-occupant toll, two-person non-toll, two-person toll, three-person non-toll, three-person toll, four-plus-person non-toll and four-plus-person toll) and six transit sub modes (walk to local bus, walk to express bus, walk to commuter bus, walk to urban rail, drive to park and ride and drive to kiss and ride) for each of the analysis years.

Travel Model Results

The results of the travel models reflect the expected demographic trends in the region over the next couple of decades, as shown in Table 8. From 2007 to 2035, VMT is forecasted to climb more than 80 percent from about 130 million to a total of nearly to 240 million VMT per day in the region. For a summary of HPMS and seasonal factors affecting the final VMT, please refer to the Pre-Analysis Consensus Plan in 9.15. This document is part of the interagency consultation process.

Table 8: Vehicle Miles Traveled for the Eight-County Transportation Planning Region
for 2007, 2009, 2019, 2025 and 2035

Analysis Year	Vehicle Miles of Travel (VMT)
2007	133,887,822.8
2009	147,409,162.9
2019	186,549,856.4
2025	212,570,201.6
2035	260,976,886.2

Source: H-GAC, April 26 2007 (VMT HPMS Adjusted)

4.0 Emission Factors/MOBILE Model

The U.S. EPA MOBILE model is at the center of this conformity analysis. This model generates emission factors (in grams/mile) for 28 vehicle categories for a wide variety of years. This conformity analysis utilized MOBILE6.2.03, which is the most recent version of this model. Emissions analysis methodologies in this conformity are consistent with procedures used to estimate the emissions budgets in the Mid-Course Review SIP. The interagency consultative process was used to define any necessary changes to emission calculations due to federal or state control measures that have been promulgated since the modeling for the Mid-Course Review SIP was conducted.

4.1 Overview

This conformity analysis used a directional link-based hourly methodology to develop emissions estimates. This methodology replicates the methodology used in setting the MVEB. EPA's MOBILE6.2.03 model was used to develop emissions factors by:

- Hour;
- MOBILE6 road type (or drive cycle); and
- 28 vehicle types

The speed sensitive freeway and arterial emissions factors, and the fixed-speed ramp emissions factors were used. The freeway emissions factors were applied to links with interstate, freeway, and toll roads functional classification codes; the ramp emission factors were used with links coded as ramp (for freeway, toll roads, and frontage roads); and arterial emissions factors were applied to all other links. Emission factors are later combined with the TDM output that has been adjusted using the HPMS and seasonal adjustment factors. The TCEQ selected August 30 from the exceedance episode in the attainment demonstration (AD) SIP as being most representative of mobile emissions, and thus the day that sets the on-road MVEB. ATR-based hourly travel fractions were applied to allocate the episode day type VMT by hour-of-day. Hourly, directional, average operational speeds were modeled by link. Vehicle classification data were used to estimate time-of-day VMT mixes for apportioning fleetwide link VMT for the three road type groups (freeway, arterial and ramp) to the 28 EPA vehicle types. Link-level emissions by vehicle type were calculated by hour.

4.2 MOBILE Input Parameters

A full list of MOBILE6 input parameters can be found in Appendix 9.8. These parameters correspond to the parameters used in the on-road modeling for the attainment demonstration SIP, except where more recent planning assumptions have replaced the earlier data. New data includes updated registration distributions, diesel fractions, VMT mix, and new seasonal and HPMS adjustment factors. It should also be noted that the Mid-Course Review SIP removed the Inspection and Maintenance (I/M) program in the rural counties. This modification is reflected in the MOBILE setups. Appendix 9.8 presents all data inputs, including activity data, local meteorological data, state control programs, federal control programs, and vehicle fleet characteristics.

4.3 Emission Factor Adjustments

Emission factor post-processing was required to properly model the vehicle Anti-Tampering Program (ATP) and I/M Program, the Texas Low-Emissions Diesel Fuel Program (TxLED), and the implementation of new federal emission standards for motorcycles. The county-level, episode-day-specific emissions factors were organized into tables which were input to the emissions calculations (Section 6).

5.0 Mobile Source Emission Reduction Strategies

This section covers a variety of on-road emission control programs.

5.1 TCMs

A Transportation Control Measure (TCM) is a measure specifically committed in a SIP for the purpose of reducing emissions from transportation sources. TCMs are further defined in 40 CFR §93.101⁷, as amended by 62 FR 43780, 43803⁸. The CAA required that TCMs be included in SIPs for regions designated as moderate and above ozone nonattainment areas. The HGB area is designated as “moderate” for the 8-hour ozone standard. As a result TCMs must be included in the region’s SIP. The TCMs committed to in the SIP are listed in Appendix 9.13.

5.1.1 Timely Implementation of TCMs

The transportation conformity rule includes specific criteria for determining if TCMs that are included in a SIP are being implemented in a timely manner. The intent of these provisions is to ensure that TCMs which are eligible for federal funding receive priority and that the SIP schedules and commitments are enforced. Appendix 9.13 details the current status of regional TCMs. The TCM Appendix has emission estimates associated with each project. These were developed using the mobile source emission reduction strategies (MoSERS⁹) methodology in combination with MOBILE6 emission factors. While emissions were calculated for each project, these credits were not applied in this conformity analysis. Please refer to Section 6.

5.1.2 Project “Slippage”

For TCM projects that have slipped behind schedule, regions are required to identify the obstacle that caused the slippage and to document how the issue will be resolved. These requirements are detailed in 40 CFR §93.113(c)(1-3)¹⁰, as amended by 62 FR 43780, 43809-10¹¹. Any slippage that has occurred has been identified in Appendix 9.13 on TCM listing.

⁷ Regulation may be found at:

http://a257.g.akamaitech.net/7/257/2422/22jul20061500/edocket.access.gpo.gov/cfr_2006/julqtr/pdf/40cfr93.101.pdf

⁸ Rules may be found at: <http://frwebgate2.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=233891213529+0+0+0&WAISaction=retrieve> and <http://frwebgate2.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=234003217289+0+0+0&WAISaction=retrieve>

⁹ For more information on the Mobile Source Emission Reduction Strategy (MoSER) calculation methodologies, please see the handbook at <http://moser.tamu.edu/>.

¹⁰ Regulation may be found at:

http://a257.g.akamaitech.net/7/257/2422/22jul20061500/edocket.access.gpo.gov/cfr_2006/julqtr/pdf/40cfr93.113.pdf

¹¹ Rules may be found at: <http://frwebgate2.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=233891213529+0+0+0&WAISaction=retrieve>.

5.2 VMEPs

The Voluntary Mobile Emissions Reduction Program (VMEP) includes a number of on-road and off-road emission reduction programs that go beyond currently mandated programs. While each individual effort is voluntary, it is mandatory that the overall program achieve the emission reductions specified in the Mid-Course Review SIP. This region has committed to a range of VMEPs which are detailed in Appendix 9.4. This appendix also provides an updated estimate of emissions benefits resulting from these measures. The Conformity Consultation Committee has decided not to take credit for these on-road measures since the 2007 emission results are significantly under the budget.

5.3 CMAQ

The Congestion Mitigation and Air Quality Improvement Program (CMAQ) is a categorical funding program created with ISTEA and continued under TEA-21 and SAFETEA-LU. This program directs funding to projects that contribute to meeting NAAQS. CMAQ funds generally may not be used for projects that result in the construction of new capacity available to single-occupant vehicles. For a listing of TIP-funded CMAQ projects, please refer to Chapter 2 of the 2008-2011 TIP, and for their emission benefits please refer to Appendix H of the same document.

5.4 TERP

The Texas Emissions Reduction Plan (TERP), established by the legislature in 2001, is a comprehensive set of incentive programs aimed at improving air quality in Texas. The Texas Commission on Environmental Quality (TCEQ) administers TERP grants and other financial TERP incentives. The Mid-Course Review SIP adjusted the MVEB for the 2007 attainment demonstration by 3 tpd. The conformity consultation committee has decided that for this conformity analysis there is no need to take credit for this 3 tpd of NO_x reduced by TERP since the emission results for 2007 are significantly under the budget. Documentation of TERP progress to date is in Appendix 9.17. Further information on TERP can be found on the TCEQ website, <http://www.tnrcc.state.tx.us/oprd/sips/overview.html>.

5.5 Summary

The programs mentioned above typically cannot be modeled in the usual regional emissions modeling process. As a result, off-model credits are usually calculated and applied. Please, note that for this conformity it was decided by the committee not to take advantage of these off-model calculations because the emission results are significantly under the budget. For illustration, examples of these calculations are detailed in their respective appendices. These on-road programs illustrate the commitment this region has made to improving air quality.

<http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=233971505586+0+0+0&WAISaction=retrieve>, and <http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=234018506123+0+0+0&WAISaction=retrieve>

6.0 Determination of Regional Transportation Emissions

Estimates of on-road mobile source emissions are based on recent model runs of H-GAC's travel demand forecasting models (Section 3) and the EPA's MOBILE6.2.03 emission factor model (Section 4), post-process adjustments (this section), and off-model credits (Section 5). Regional emissions analyses for conformity must contain the following:

1. All federal projects and all regionally significant non-federal projects;
2. All regionally-significant projects, regardless of funding source, are required to be included in the model; and,
3. VMT from all other projects (including TCMs) that are not required to be explicitly modeled must be estimated based on reasonable professional practice (see Section 5).

Conformity analyses must estimate emissions for certain future years called horizon years. These horizon years have very specific requirements:

1. Horizon years may be no more than 10 years apart;
2. The first horizon year may be no more than 10 years from the base year used to validate the transportation demand planning model;
3. If the attainment year is in the time span of the transportation plan, the attainment year must be a horizon year; and
4. The last horizon year must be the last year of the transportation plan's forecast period.
5. If the budget year is in the time span of the transportation plan, the budget year must be a horizon year.

Based on these requirements, the years of 2007, 2009, 2019, 2025 and 2035 were selected for analysis in this conformity. Emissions calculations in a conformity must follow the calculations used in the SIP. This section summarizes the final steps in the emissions estimation process.

6.1 Procedure

The Texas Transportation Institute developed a suite of programs (hereafter referred to as the “TTI suite” or the “suite”) that facilitates the calculation of regional emissions. The suite works in conjunction with the MOBILE6 model, discussed in Section 4, to generate emission factors, and applies these factors to the Travel Demand Modeling results in Section 3.

Figure 3 is a basic flowchart of how the TTI suite of programs is applied. The hexagons in this flow chart indicate where data inputs are required. The “Start” in the upper left hand corner symbolizes the point where the air quality modeler has been given the travel demand modeling output. Following the down arrow, MOBILE6 input factors are

developed as described in Section 4. At this point POLFAC62 is utilized to run MOBILE6.2.03 to produce emission factors for:

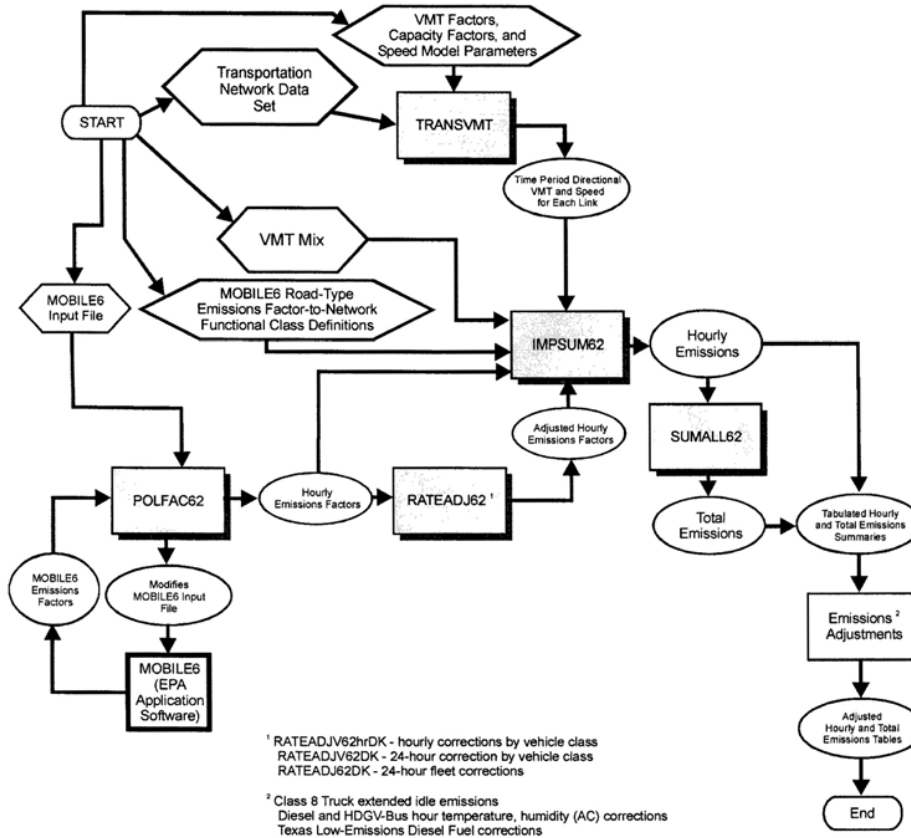
1. all control programs,
2. all counties,
3. all roadways,
4. all vehicle types, and
5. all hours of the day.

The resulting emission factor files are then fed into the RATADJ62 program, which takes the multiple sets of emission factors for each county and combines them into a single set of emission factors. At this point, the emission factors are ready to combine with the Travel Demand Model output.

Figure 3: TTI Suite

Computational Process Flow

Travel Demand Model Network Link-Based Hourly MOBILE6 Emissions Estimates with Texas Mobile Source Emissions Software



Source: TTI, 2004

To the right of the “Start” in the flow chart is the TRANSVMT model. This model takes the Travel Demand Model output and puts it in the correct format. The TRANSVMT module operates in TransCAD®. These output are ready to be combined with the emission factors already generated. The IMPSUM program multiplies the appropriate emission factors with the appropriate VMT for each hour of the day. The hourly IMPSUM outputs are summed by SUMALL and reported in a tab delimited format (please see the “Emissions” folder in the electronic documentation). The post-process adjustments are made to the SUMALL output. Appendix 9.6 provides a more thorough explanation of the TTI Suite of programs.

6.2 Calculated Link-Based Emissions

The link-based emissions, as they are summarized by the SUMALL step, appear in Table 9. These emissions have further post-processing steps before they are final.

Table 9: Non-Adjusted Link-Based Emissions

Years	NOx (tpd)	VOC (tpd)
2007	182.63	88.09
2009	160.56	80.72
2019	51.90	46.16
2025	40.79	42.42
2035	44.40	51.72

6.3 Post-Process Adjustments

Referring to the flow chart again, post-process adjustments take place in the last square before the end labeled “emissions adjustments.” The SUMALL output is run through the TTI ADJ programs to adjust for diesel idling, temperature/humidity, motorcycle, and the TxLED and motorcycle measures. Detailed descriptions of these measures can be found in the Mid-Course Review SIP (also see Appendix 9.5). The adjustments applied in this step follow the same methodology that was developed for the SIP. These adjustments are outlined in Table 10. Please note that the “Idling” calculation is not an emission reduction: as in the SIP, this calculation redistributes 3 percent of the on-road heavy-duty vehicle emissions to idling vehicles at truck stops. Since no idling reduction measures are in place, no credit can be taken. This calculation was included in the conformity to ensure that the calculation process for conformity was as similar to the calculation in the SIP as possible.

Table 10: Post-Processing Emissions

Post Process Steps	2007 (tpd)		2009 (tpd)		2019 (tpd)		2025 (tpd)		2035 (tpd)	
	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC
Unadjusted	182.63	88.09	160.56	80.72	51.90	46.16	40.79	42.42	41.40	51.72
Idling	0	0	0	0	0	0	0	0	0	0
Temp/Humidity	-6.41	0	-5.56	0	-1.28	0	-0.77	0	-0.70	0.01
Motorcycle/TxLED	-4.87	-0.006	-4.14	-0.02	-1.02	-0.16	-0.68	-0.22	-0.65	-0.28
Final Emissions	171.35	88.09	150.86	80.70	49.60	46.00	39.34	42.20	43.05	51.43

*: Although the VMEP and TERP programs are designed to generate emissions benefits prior to and for the budget year (2007), no credits were taken from these programs since 2007 emission results are significantly under the budget.

6.4 Final Emission Analysis Results

Mobile source emissions estimated for the 2035 RTP and the 2008-2011 TIP are consistent with the most recent projections of population, employment, travel and congestion available. The 2035 RTP demonstrates timely attainment of TCM targets established in the SIP and provides for expeditious implementation of additional measures designed to reduce congestion and vehicular travel demand. VOC and NOx emission estimates from all the analysis years, shown in Table 11, are lower than those estimated for the 1990 base year. Additionally, final VOC and NOx emissions for the years 2007, 2009, 2019, 2025 and 2035 are lower than the VOC and NOx budgets established by the Mid-Course Review SIP. The 2035 RTP and the 2008–2011 TIP, therefore, pass all conformity tests required under the EPA's Final Conformity Rule. The transportation improvements in the 2035 RTP Update and the 2008 -2011 TIP conform to both the SIP and the Clean Air Act, as amended.

Table 11: Final Emission Results

Analysis Year	VOC Emissions (tpd)	VOC Budget (tpd)	NOx Emissions (tpd)	NOx Budget (tpd)
1990 Baseline	321.700	--	391.100	--
2007	88.09	89.99	171.35	186.13
2009	80.70	89.99	150.86	186.13
2019	46.00	89.99	49.60	186.13
2025	42.20	89.99	39.34	186.13
2035	51.43	89.99	43.05	186.13

7.0 Interagency Consultation

Interagency review and comment on the conformity finding was conducted in accordance with the consultative process identified in the Conformity SIP. Local, state, and federal transportation and air quality agencies affected by this conformity analysis were consulted on the scope, methodologies and products of the conformity finding. A conformity steering committee (Conformity Consultation Committee) composed of representatives of each of the following agencies was consulted regularly during the conformity process:

- Houston-Galveston Area Council (H-GAC)
- Metropolitan Transit Authority of Harris County (METRO)
- City of Houston (CoH)
- Harris County
- Texas Department of Transportation (TxDOT)
- Texas Commission on Environmental Quality (TCEQ)
- Texas Transportation Institute (TTI)
- Federal Highway Administration (FHWA)
- Federal Transit Administration (FTA)
- U.S. Environmental Protection Agency (EPA)

The purpose of this group was to ensure that the modeling methodology utilized in this conformity analysis was consistent with the on-road modeling utilized in the SIP and that the most recent planning assumptions were used. A comprehensive list of the CCC meeting agenda and decisions can be found in Appendix 9.15.

8.0 Public Participation

Public participation is an important part of the conformity process. A 30-day public comment period is required by Federal regulation. In an effort to better inform the public, H-GAC held an introductory conformity workshop on May 30, 2007 (“Clean Air and Mobility: Understanding the Process”) to explain the conformity process. Material from this workshop were posted on H-GAC’s website (<http://www.h-gac.com/HGAC/Departments/Transportation/Air+Quality/Conformity/default.htm>). The draft conformity material as it was developed by H-GAC and reviewed by the CCC was posted on:

<http://www.h-gac.com/HGAC/Departments/Transportation/Air+Quality/Conformity/2007+Transportation+Conformity+Documents.htm>.

The official public comment period was from June 1st to July 2nd, 2007, and it was extended due to public request and to an extensive modification of the TIP until August 3rd, 2007. A public meeting was held on June 14, 2007 at H-GAC (3555 Timmons Lane, Houston, Texas). Comments received were responded to in Appendix 9.16. The minutes from the public hearing can also be found in the same appendix.