

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

DALLAS-FORT WORTH 1997 EIGHT-HOUR OZONE STANDARD  
NONATTAINMENT AREA



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

**DALLAS-FORT WORTH REASONABLE FURTHER  
PROGRESS STATE IMPLEMENTATION PLAN REVISION  
FOR THE 1997 EIGHT-HOUR OZONE STANDARD**

Project Number 2010-023-SIP-NR

Adoption December 7, 2011

*This page intentionally left blank*

## **EXECUTIVE SUMMARY**

The 1990 Federal Clean Air Act (FCAA) Amendments, §182, require ozone nonattainment areas with air quality classified as moderate or higher to submit plans showing reasonable further progress (RFP) toward attainment of the ozone National Ambient Air Quality Standard (NAAQS). The Dallas-Fort Worth (DFW) nonattainment area (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, and Tarrant Counties) is classified as a serious nonattainment area for the 1997 eight-hour ozone standard, with an attainment date of June 15, 2013. While the attainment date for the DFW area is June 15, 2013, the DFW area must implement all RFP reductions by the end of 2012, the attainment year. This state implementation plan (SIP) revision is not required or intended to demonstrate attainment of the ozone NAAQS, but rather to demonstrate that the DFW nonattainment area will meet the RFP requirements for serious ozone nonattainment areas. RFP requirements for serious ozone nonattainment areas, as specified in Section 182(c)(2) of the 1990 FCAA Amendments and in federal regulations (40 Code of Federal Regulations §51.910), involve reducing ozone precursor emissions (nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC)) at annual increments between the 2002 base year and the 2012 attainment year.

The DFW RFP analysis has two RFP milestone years: 2011 and 2012. Between 2002 and 2008, 15% VOC emissions reductions were calculated for the five counties (Ellis, Johnson, Kaufman, Parker, and Rockwall Counties) added to the DFW nonattainment area under the 1997 eight-hour ozone standard, and 15% VOC and/or NO<sub>x</sub> emissions reductions were calculated for the four original DFW nonattainment counties (Collin, Dallas, Denton, and Tarrant Counties). While emissions and reductions were calculated from 2002 through 2008, 2008 was not considered a milestone year for this SIP revision because the United States Environmental Protection Agency (EPA) already approved the 2008 milestone year in the 2007 DFW Eight-Hour Ozone Nonattainment Area RFP SIP revision submittal (Project No. 2006-031-SIP-NR). The additional milestone year requirements for this RFP plan are:

- a 9% emissions reduction for the three-year period from January 1, 2009, through December 31, 2011, for the entire DFW nonattainment area;
- a 3% emissions reduction for the one-year period from January 1, 2012, through December 31, 2012, for the entire DFW nonattainment area; and
- a 3% emissions reduction for the one-year period from January 1, 2013, through December 31, 2013, as attainment year RFP contingency for the entire DFW nonattainment area.

The TCEQ took comment at proposal on using the EPA's MOBILE and Motor Vehicle Emission Simulator (MOVES) models. The proposal included RFP analyses and motor vehicle emissions budgets using an on-road mobile source emissions inventory based on the MOBILE6.2 model and a preliminary on-road mobile source emissions inventory based on the MOVES model. Between proposal and adoption, a final on-road mobile source emissions inventory was completed using an updated version of the MOVES model, MOVES2010a. That inventory was used to develop the RFP analysis presented in this SIP revision. This SIP revision demonstrates RFP for the 2011 and 2012 milestone years as well as milestone year and attainment year RFP contingency. The RFP calculations include reported emissions reductions from the Texas Emissions Reduction Plan (TERP) between 2008 and 2010.

The RFP methodology involves development of the base year and milestone year emissions inventories, emissions reductions for each milestone year, and an estimate of the effects of non-creditable reductions due to rules promulgated prior to the 1990 FCAA Amendments. The amount of emissions reductions is determined through the RFP methodology. Once calculated,

the milestone target levels and emissions inventories are compared to determine if the forecasted post-control emissions inventories are less than the target level, thus meeting FCAA RFP requirements. The results of the DFW RFP milestone year comparisons are displayed in Chapter 3: *Target Emissions Levels and Reasonable Further Progress Demonstration Table 3-4: Calculation of Required 15% and 3% per Year NO<sub>x</sub> and VOC Reductions for the DFW RFP.*

This SIP revision also sets the NO<sub>x</sub> and VOC motor vehicle emissions budgets (MVEBs) for transportation conformity purposes for 2011 and 2012. An MVEB is the on-road mobile source allocation of the total allowable emissions for each applicable criteria pollutant or precursor, as defined in the SIP. Transportation conformity determinations must be performed using the budget test once the EPA determines the budget adequate for transportation conformity purposes. To pass the budget test, areas must demonstrate that the estimated emissions from transportation plans, programs, and projects do not exceed the MVEB for the established year.

Because the DFW nonattainment area has been reclassified as a serious nonattainment area for the 1997 eight-hour ozone NAAQS, the RFP milestone years adopted in the previous 2007 DFW Eight-Hour Ozone Nonattainment Area RFP SIP revision (Project No. 2006-031-SIP-NR) have been revised to reflect the area's extended attainment date. Chapter 5: *Motor Vehicle Emissions Budgets* documents the development of the revised RFP MVEBs for the DFW ozone nonattainment area.

## **SECTION V: LEGAL AUTHORITY**

### General

The Texas Commission on Environmental Quality (TCEQ) has the legal authority to implement, maintain, and enforce the National Ambient Air Quality Standards and to control the quality of the state's air, including maintaining adequate visibility.

The first air pollution control act, known as the Clean Air Act of Texas, was passed by the Texas Legislature in 1965. In 1967, the Clean Air Act of Texas was superseded by a more comprehensive statute, the Texas Clean Air Act (TCAA), found in Article 4477-5, Vernon's Texas Civil Statutes. The legislature amended the TCAA in 1969, 1971, 1973, 1979, 1985, 1987, 1989, 1991, 1993, 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009, and 2011. In 1989, the TCAA was codified as Chapter 382 of the Texas Health and Safety Code.

Originally, the TCAA stated that the Texas Air Control Board (TACB) is the state air pollution control agency and is the principal authority in the state on matters relating to the quality of air resources. In 1991, the legislature abolished the TACB effective September 1, 1993, and its powers, duties, responsibilities, and functions were transferred to the Texas Natural Resource Conservation Commission (TNRCC). With the creation of the TNRCC, the authority over air quality is found in both the Texas Water Code and the TCAA. Specifically, the authority of the TNRCC is found in Chapters 5 and 7. Chapter 5, Subchapters A - F, H - J, and L, include the general provisions, organization, and general powers and duties of the TNRCC, and the responsibilities and authority of the executive director. Chapter 5 also authorizes the TNRCC to implement action when emergency conditions arise and to conduct hearings. Chapter 7 gives the TNRCC enforcement authority. In 2001, the 77th Texas Legislature continued the existence of the TNRCC until September 1, 2013, and changed the name of the TNRCC to the Texas Commission on Environmental Quality (TCEQ). In 2009, the 81st Texas Legislature, during a special session, amended §5.014 of the Texas Water Code, changing the expiration date of the TCEQ to September 1, 2011, unless continued in existence by the Texas Sunset Act. In 2011, the 82nd Texas Legislature continued the existence of the TCEQ until 2023.

The TCAA specifically authorizes the TCEQ to establish the level of quality to be maintained in the state's air and to control the quality of the state's air by preparing and developing a general, comprehensive plan. The TCAA, Subchapters A - D, also authorize the TCEQ to collect information to enable the commission to develop an inventory of emissions; to conduct research and investigations; to enter property and examine records; to prescribe monitoring requirements; to institute enforcement proceedings; to enter into contracts and execute instruments; to formulate rules; to issue orders taking into consideration factors bearing upon health, welfare, social and economic factors, and practicability and reasonableness; to conduct hearings; to establish air quality control regions; to encourage cooperation with citizens' groups and other agencies and political subdivisions of the state as well as with industries and the federal government; and to establish and operate a system of permits for construction or modification of facilities.

Local government authority is found in Subchapter E of the TCAA. Local governments have the same power as the TCEQ to enter property and make inspections. They also may make recommendations to the commission concerning any action of the TCEQ that affects their territorial jurisdiction, may bring enforcement actions, and may execute cooperative agreements with the TCEQ or other local governments. In addition, a city or town may enact and enforce

ordinances for the control and abatement of air pollution not inconsistent with the provisions of the TCAA and the rules or orders of the commission.

Subchapters G and H of the TCAA authorize the TCEQ to establish vehicle inspection and maintenance programs in certain areas of the state, consistent with the requirements of the Federal Clean Air Act; coordinate with federal, state, and local transportation planning agencies to develop and implement transportation programs and measures necessary to attain and maintain the National Ambient Air Quality Standards; establish gasoline volatility and low emission diesel standards; and fund and authorize participating counties to implement vehicle repair assistance, retrofit, and accelerated vehicle retirement programs.

#### Applicable Law

The following statutes and rules provide necessary authority to adopt and implement the state implementation plan (SIP). The rules listed below have previously been submitted as part of the SIP.

#### Statutes

All sections of each subchapter are included, unless otherwise noted.

TEXAS HEALTH & SAFETY CODE, Chapter 382

September 1, 2011

TEXAS WATER CODE

September 1, 2011

#### Chapter 5: Texas Natural Resource Conservation Commission

Subchapter A: General Provisions

Subchapter B: Organization of the Texas Natural Resource Conservation Commission

Subchapter C: Texas Natural Resource Conservation Commission

Subchapter D: General Powers and Duties of the Commission

Subchapter E: Administrative Provisions for Commission

Subchapter F: Executive Director (except §§5.225, 5.226, 5.227, 5.2275, 5.231, 5.232, and 5.236)

Subchapter H: Delegation of Hearings

Subchapter I: Judicial Review

Subchapter J: Consolidated Permit Processing

Subchapter L: Emergency and Temporary Orders (§§5.514, 5.5145, and 5.515 only)

Subchapter M: Environmental Permitting Procedures (§5.558 only)

#### Chapter 7: Enforcement

Subchapter A: General Provisions (§§7.001, 7.002, 7.0025, 7.004, and 7.005 only)

Subchapter B: Corrective Action and Injunctive Relief (§7.032 only)

Subchapter C: Administrative Penalties

Subchapter D: Civil Penalties (except §7.109)

Subchapter E: Criminal Offenses and Penalties: §§7.177, 7.179-7.183

#### Rules

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

Chapter 7: Memoranda of Understanding, §§7.110 and 7.119

December 13, 1996 and May 2, 2002

Chapter 19: Electronic Reporting

March 15, 2007

Chapter 35: Subchapters A-C, K: Emergency and Temporary Orders and Permits; Temporary Suspension or Amendment of Permit Conditions	July 20, 2006
Chapter 39: Public Notice, §§39.201; 39.401; 39.403(a) and (b)(8)-(10); 39.405(f)(1) and (g); 39.409; 39.411 (a), (b)(1)-(6), and (8)-(10) and (c)(1)-(6) and (d); 39.413(9), (11), (12), and (14); 39.418(a) and (b)(3) and (4); 39.419(a), (b), (d), and (e); 39.420(a), (b) and (c)(3) and (4); 39.423 (a) and (b); 39.601-39.605	June 24, 2010
Chapter 55: Requests for Reconsideration and Contested Case Hearings; Public Comment, §§55.1; 55.21(a) - (d), (e)(2), (3), and (12), (f) and (g); 55.101(a), (b), and (c)(6) - (8); 55.103; 55.150; 55.152(a)(1), (2), and (6) and (b); 55.154; 55.156; 55.200; 55.201(a) - (h); 55.203; 55.205; 55.209, and 55.211	June 24, 2010
Chapter 101: General Air Quality Rules	May 15, 2011
Chapter 106: Permits by Rule, Subchapter A	May 15, 2011
Chapter 111: Control of Air Pollution from Visible Emissions and Particulate Matter	July 19, 2006
Chapter 112: Control of Air Pollution from Sulfur Compounds	July 16, 1997
Chapter 113: Standards of Performance for Hazardous Air Pollutants and for Designated Facilities and Pollutants	May 14, 2009
Chapter 114: Control of Air Pollution from Motor Vehicles	December 13, 2010
Chapter 115: Control of Air Pollution from Volatile Organic Compounds	February 17, 2011
Chapter 116: Permits for New Construction or Modification	March 17, 2011
Chapter 117: Control of Air Pollution from Nitrogen Compounds	May 15, 2011
Chapter 118: Control of Air Pollution Episodes	March 5, 2000
Chapter 122: §122.122: Potential to Emit	December 11, 2002
Chapter 122: §122.215: Minor Permit Revisions	June 3, 2001
Chapter 122: §122.216: Applications for Minor Permit Revisions	June 3, 2001
Chapter 122: §122.217: Procedures for Minor Permit Revisions	December 11, 2002
Chapter 122: §122.218: Minor Permit Revision Procedures for Permit Revisions Involving the Use of Economic Incentives, Marketable Permits, and Emissions Trading	June 3, 2001

## **SECTION VI: CONTROL STRATEGY**

- A. Introduction (No change)
- B. Ozone (Revised)
  - 1. Dallas-Fort Worth (Revised)
    - Chapter 1: General
    - Chapter 2: Emissions Inventories
    - Chapter 3: Target Emissions Levels and Reasonable Further Progress Demonstration
    - Chapter 4: Control Measures to Achieve Target Emissions Levels
    - Chapter 5: Motor Vehicle Emissions Budget
  - 2. Houston-Galveston-Brazoria (No change)
  - 3. Beaumont-Port Arthur (No change)
  - 4. El Paso (No change)
  - 5. Regional Strategies (No change)
  - 6. Northeast Texas (No change)
  - 7. Austin Area (No change)
  - 8. San Antonio Area (No change)
  - 9. Victoria Area (No change)
- C. Particulate Matter (No change)
- D. Carbon Monoxide (No change)
- E. Lead (No change)
- F. Oxides of Nitrogen (No change)
- G. Sulfur Dioxide (No change)
- H. Conformity with the National Ambient Air Quality Standards (No change)
- I. Site Specific (No change)
- J. Mobile Sources Strategies (No change)
- K. Clean Air Interstate Rule (No change)
- L. Transport (No change)
- M. Regional Haze (No change)

## **TABLE OF CONTENTS**

Executive Summary

Section V: Legal Authority

Section VI: Control Strategy

Table of Contents

List of Acronyms

List of Tables

List of Figures

List of Appendices

Chapter 1: General

1.1 Dallas-Fort Worth Reasonable Further Progress Background

1.2 RFP Requirements

1.2.1 RFP Demonstration

1.3 Public Hearing and Comment Information

1.4 Social and Economic Considerations

1.5 Fiscal and Manpower Resources

Chapter 2: Emissions Inventories

2.1 Introduction

2.1.1 Updated Uncontrolled Milestone Year Inventories

2.1.2 Updated Post-Control Milestone Year Inventories

2.1.3 Updated Adjusted Base Year Inventories

2.2 Point Sources

2.2.1 Emissions Inventory Development

2.2.2 2002 Base Year Inventory

2.2.3 Updated Uncontrolled Milestone Year Inventories

2.2.4 Updated Post-Control Milestone Year Inventories

2.3 Area Sources

2.3.1 Emissions Inventory Development

2.3.2 Updated 2002 Base Year Inventory

2.3.3 Updated Uncontrolled Milestone Year Inventories

2.3.4 Updated Post-Control Milestone Year Inventories

2.3.5 Ongoing Initiatives: Barnett Shale Special Emissions Inventory

2.4 Non-Road Mobile Sources

2.4.1 NONROAD Model Categories Emissions Estimates Methodology

2.4.2 Airport Emissions Estimation Methodology

2.4.3 Locomotive Emissions Estimation Methodology

2.4.4 Drilling Rig Diesel Engines Emissions Estimation Methodology

- 2.4.5 Updated 2002 Base Year Inventory
  - 2.4.5.1 Base Year Updates for NONROAD Model Categories
  - 2.4.5.2 Base Year Updates for Airports
  - 2.4.5.3 Base Year Updates for Locomotives
  - 2.4.5.4 Base Year Updates for Drilling Rig Diesel Engines
- 2.4.6 Updated Uncontrolled Milestone Year Inventories
- 2.4.7 Updated Post-Control Milestone Year Inventories
- 2.5 On-Road Mobile Sources
  - 2.5.1 Emissions Inventory Development
  - 2.5.2 Updated 2002 Base Year Inventory
  - 2.5.3 Updated 2002 Adjusted Base Year Inventories for the Base and Milestone Years
  - 2.5.4 Updated Uncontrolled Milestone Year Emissions Inventories
  - 2.5.5 Updated Post-Control Milestone Year Emissions Inventories
- 2.6 Biogenic Sources
- 2.7 Emissions Summary
- Chapter 3: Target Emissions Levels and Reasonable Further Progress Demonstration
  - 3.1 Introduction
  - 3.2 Target Level Methodology
  - 3.3 Calculation of Target Emissions Levels
  - 3.4 Growth
  - 3.5 Reasonable Further Progress Demonstration Analysis
    - 3.5.1 NO<sub>x</sub> Substitution
    - 3.5.2 RFP Demonstration
- Chapter 4: Control Measures to Achieve Target Levels
  - 4.1 Overview of Control Measures
  - 4.2 Point Source Controls
  - 4.3 Area Source Controls
  - 4.4 Non-Road Mobile Source Controls
    - 4.4.1 NONROAD Model Categories
    - 4.4.2 Non-Road Categories Not Included in the EPA NONROAD Model
    - 4.4.3 Texas Emissions Reduction Plan (Non-Road and Locomotive)
  - 4.5 On-Road Mobile Source Controls
    - 4.5.1 MOVES-Based On-Road Mobile Source Controls
  - 4.6 Vehicle Miles Traveled, On-Road Emissions, and Transportation Control Measures
  - 4.7 Contingency Measures
- Chapter 5: Motor Vehicle Emissions Budgets
  - 5.1 Introduction
  - 5.2 Overview of Methodologies and Assumptions

**5.3 Motor Vehicle Emissions Budgets for RFP Milestone Years**  
**References For Guidance Documents**

## LIST OF ACRONYMS

ABY	Adjusted Base Year
ATP	Anti-Tampering Program
APU	Auxiliary Power Unit
CFR	Code of Federal Regulations
DFW	Dallas-Fort Worth
EGAS	Economic Growth Analysis System
EGU	Electric Generating Unit
EIQ	Emissions Inventory Questionnaire
EPA	United States Environmental Protection Agency
ERC	Emissions Reduction Credit
DERC	Discrete Emissions Reduction Credit
FCAA	Federal Clean Air Act
FMVCP	Federal Motor Vehicle Control Program
FR	<i>Federal Register</i>
GSE	Ground Support Equipment
HDDV	Heavy Duty Diesel Vehicles
HGB	Houston-Galveston-Brazoria
HPMS	Highway Performance Monitoring System
I/M	Inspection and Maintenance
MOVES	Motor Vehicle Emission Simulator
MVEB	Motor Vehicle Emissions Budget
NAAQS	National Ambient Air Quality Standard
NCTCOG	North Central Texas Council of Governments
NLEV	National Low Emission Vehicle Program
NO <sub>x</sub>	Nitrogen Oxides
Pechan	E.H. Pechan and Associates, Inc.
PEI	Periodic Emissions Inventory
PN	Percent of Nitrogen Oxides
ppb	Parts per Billion
PV	Percent of Volatile Organic Compounds
REMI	Regional Economic Modeling, Inc.
RFG	Reformulated Gasoline
RFP	Reasonable Further Progress

ROP	Rate of Progress
RRC	Railroad Commission of Texas
RVP	Reid Vapor Pressure
SI	Spark Ignition
SIP	State Implementation Plan
STARS	State of Texas Air Reporting System
TAC	Texas Administrative Code
TACB	Texas Air Control Board
TCAA	Texas Clean Air Act
TCEQ	Texas Commission on Environmental Quality (commission)
TCMs	Transportation Control Measures
TDM	Travel Demand Model
TERP	Texas Emissions Reduction Plan
TexN	Texas NONROAD Model
TNRCC	Texas Natural Resource Conservation Commission
tpd	Tons per Day
TxLED	Texas Low Emission Diesel
USC	United States Code
VMEP	Voluntary Mobile Emission Reduction Program
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

## **LIST OF TABLES**

Table 2-1:	DFW RFP Point Source NO <sub>x</sub> and VOC Emissions (tons per day)
Table 2-2:	DFW RFP Area Source NO <sub>x</sub> and VOC Emissions (tons per day)
Table 2-3:	DFW RFP NO <sub>x</sub> and VOC Emissions for NONROAD Model Categories (tons per day)
Table 2-4:	DFW RFP NO <sub>x</sub> and VOC Emissions for the Airport Non-Road Mobile Source Category (tons per day)
Table 2-5:	DFW RFP NO <sub>x</sub> and VOC Emissions for the Locomotives Non-Road Mobile Source Category (tons per day)
Table 2-6:	DFW RFP NO <sub>x</sub> and VOC Emissions for the Drilling Rigs Non-Road Mobile Source Category (tons per day)
Table 2-7:	DFW RFP Total NO <sub>x</sub> and VOC Emissions for Non-Road Mobile Sources (tons per day)
Table 2-8:	DFW RFP Ozone Season Weekday On-Road Mobile Source VMT (miles per day)
Table 2-9:	DFW RFP Ozone Season Weekday On-Road Mobile Source Adjusted Base Year NO <sub>x</sub> and VOC Emissions (tons per day)
Table 2-10:	DFW RFP Ozone Season Weekday On-Road Mobile Source Uncontrolled and Post-Control NO <sub>x</sub> and VOC Emissions (tons per day)
Table 2-11:	Summary of DFW RFP On-Road Mobile Source Non-Creditable NO <sub>x</sub> Reductions (tons per day)
Table 2-12:	Summary of DFW RFP On-Road Mobile Source Non-Creditable VOC Reductions (tons per day)
Table 2-13:	2008 DFW RFP Ozone Season Weekday On-Road Mobile Source NO <sub>x</sub> and VOC Emissions and Control Strategy Reductions
Table 2-14:	2011 DFW RFP Ozone Season Weekday On-Road Mobile Source NO <sub>x</sub> and VOC Emissions and Control Strategy Reductions
Table 2-15:	2012 DFW RFP Ozone Season Weekday On-Road Mobile Source NO <sub>x</sub> and VOC Emissions and Control Strategy Reductions
Table 2-16:	Summary of the 2002 Base Year Ozone Season Weekday NO <sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)
Table 2-17:	Summary of the 2008 Ozone Season Weekday NO <sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)
Table 2-18:	Summary of the 2011 Ozone Season Weekday NO <sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)
Table 2-19:	Summary of the 2012 Ozone Season Weekday NO <sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)
Table 3-1:	Summary of the Calculation Process for 2011 DFW RFP Target Levels
Table 3-2:	Summary of Non-Creditable NO <sub>x</sub> Fleet Turnover Reduction (tons per day)
Table 3-3:	Summary of Non-Creditable VOC Fleet Turnover Reduction (tons per day)

- Table 3-4: Calculation of Required 15% and 3% per Year NO<sub>x</sub> and VOC Reductions for the DFW RFP
- Table 3-5: Post-2002 RFP Target Level of NO<sub>x</sub> Emissions (tons per day)
- Table 3-6: Post-2002 RFP Target Level of VOC Emissions (tons per day)
- Table 3-7: Summary of the 2011 DFW RFP NO<sub>x</sub> Substitution
- Table 3-8: Summary of the 2012 DFW RFP NO<sub>x</sub> Substitution
- Table 3-9: Summary of the 2011 DFW RFP Demonstration (tons per day)
- Table 3-10: Summary of the 2012 DFW RFP Demonstration (tons per day)
- Table 4-1: Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2002 through 2008 (tons per day)
- Table 4-2: Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2008 through 2011 (tons per day)
- Table 4-3: Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2011 through 2012 (tons per day)
- Table 4-4: DFW RFP 2008 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-5: DFW RFP 2011 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-6: DFW RFP 2012 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-7: DFW RFP 2008 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-8: DFW RFP 2011 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-9: DFW RFP 2012 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-10: DFW RFP 2008 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-11: DFW RFP 2011 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-12: DFW RFP 2012 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-13: On-Road Mobile Control Programs Modeled for 2008, 2011, 2012, and 2013 RFP Control Scenarios
- Table 4-14: DFW RFP 2008 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-15: DFW RFP 2011 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)
- Table 4-16: DFW RFP 2012 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)

- Table 4-17: DFW RFP On-Road Mobile Post-Control NO<sub>x</sub> Emissions, VOC Emissions and Vehicle Miles Traveled**
- Table 4-18: DFW RFP Contingency Demonstration for the 2011 Milestone Year (tons per day)**
- Table 4-19: DFW RFP Contingency Demonstration for the 2012 Attainment Year (tons per day)**
- Table 5-1: 2011 RFP Motor Vehicle Emissions Budgets for the DFW Ozone Nonattainment Area (tons per day)**
- Table 5-2: 2012 RFP Motor Vehicle Emissions Budgets for the DFW Ozone Nonattainment Area (tons per day)**

## **LIST OF FIGURES**

Figure 1 : RFP VMT Trends

Figure 2: RFP Controlled On-Road NO<sub>x</sub> and VOC Emissions Trends

## **LIST OF APPENDICES**

**Appendix 1: Dallas-Fort Worth Nonattainment Area Reasonable Further Progress Demonstration Calculations Spreadsheet**

**Appendix 2: Development of Reasonable Further Progress Point Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area**

**Appendix 3: Development of Reasonable Further Progress Area Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area**

**Appendix 4: Development of Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Source Categories in the United States Environmental Protection Agency's NONROAD Model**

**Appendix 5: Development of Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Airports Source Categories**

**Appendix 6: Development of Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Locomotives Source Category**

**Appendix 7: Development of Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Drilling Rigs Source Category**

**Appendix 8: Development of Reasonable Further Progress On-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area**

**Appendix 9: Emission Reduction Efficiency for Nitrogen Oxides and Volatile Organic Compounds**

**Appendix 10: Additional Information for On-Road Mobile Emissions for the Proposed Dallas-Fort Worth Nonattainment Area Reasonable Further Progress State Implementation Plan Revision for the 1997 Eight-Hour Ozone Standard**

## CHAPTER 1: GENERAL

### 1.1 DALLAS-FORT WORTH REASONABLE FURTHER PROGRESS BACKGROUND

The *History of the Texas State Implementation Plan*, a comprehensive overview of the state implementation plan (SIP) revisions submitted to the United States Environmental Protection Agency (EPA) by the State of Texas, is available on the [Introduction to the SIP Web page](http://www.tceq.texas.gov/airquality/sip/sipintro.html/) (<http://www.tceq.texas.gov/airquality/sip/sipintro.html/>) through the Texas Commission on Environmental Quality ([TCEQ](http://www.tceq.texas.gov)) [main Web page](http://www.tceq.texas.gov) (<http://www.tceq.texas.gov>).

Under the revoked one-hour ozone standard, the Dallas-Fort Worth (DFW) nonattainment area comprised Collin, Dallas, Denton, and Tarrant Counties. For those four counties, the EPA approved a rate of progress (ROP) SIP revision on April 12, 2005, which demonstrated a 15% reduction in volatile organic compounds (VOC) between 1990 and 1996 (*70 Federal Register* (FR) 18993).

On April 30, 2004, nonattainment area designations were published as part of the first phase of the EPA's implementation rule for the 1997 eight-hour ozone standard (69 FR 23936). The DFW nonattainment area was redefined as Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, and Tarrant Counties, which includes the original four-county one-hour ozone standard nonattainment area. The DFW 1997 eight-hour ozone nonattainment area was classified as a moderate nonattainment area, for which the TCEQ was required to submit attainment demonstration and reasonable further progress (RFP) SIP revisions to the EPA by June 15, 2007.

Phase II of the EPA's implementation rule for the 1997 eight-hour ozone standard (70 FR 71612) established RFP submittal guidelines that required nonattainment areas partially composed of one-hour ozone standard nonattainment areas with approved 15% ROP SIP revisions, like the DFW area, to choose between two options: (1) submit a 1997 eight-hour ozone standard RFP SIP revision demonstrating 15% VOC emissions reductions for the entire eight-hour nonattainment area; or (2) submit a 1997 eight-hour ozone standard RFP SIP revision demonstrating 15% VOC emissions reductions for the newly designated portion of the eight-hour nonattainment area and VOC and/or nitrogen oxides (NO<sub>x</sub>) emissions reductions for the portion of the nonattainment area containing an approved one-hour ozone standard 15% ROP SIP revision. On May 23, 2007, the commission adopted the 2007 Dallas-Fort Worth Eight-Hour Ozone Nonattainment Area Reasonable Further Progress State Implementation Plan Revision (Project No. 2006-031-SIP-NR) based on the second option. Phase II of the EPA's implementation rule for the 1997 eight-hour ozone standard allows ozone nonattainment areas to substitute NO<sub>x</sub> reductions for VOC reductions, but use of NO<sub>x</sub> emissions reductions must meet the criteria in §182(c)(2)(C) of the Federal Clean Air Act (FCAA).<sup>1</sup> With both of the EPA's eight-hour ozone SIP options, NO<sub>x</sub> may be substituted for VOC after the initial 15% VOC emissions reduction requirement is met. A minimum 3% NO<sub>x</sub> and/or VOC emissions reduction is required for each year until the attainment date, beyond the initial 15% reduction.

Effective January 19, 2011, the EPA finalized a determination that the DFW nonattainment area did not attain the 1997 eight-hour ozone standard by June 15, 2010, the deadline included in the 2007 DFW RFP SIP revision and established in Phase I of the 1997 eight-hour ozone standard

---

<sup>1</sup> NO<sub>x</sub> may be substituted for VOC under conditions defined in the EPA's December 1993 [NO<sub>x</sub> Substitution Guidance](http://www.epa.gov/ttncaaa1/t1/memoranda/noxsubst.pdf) (<http://www.epa.gov/ttncaaa1/t1/memoranda/noxsubst.pdf>).

implementation rule for areas classified as moderate (75 FR 79302). An area attains the 1997 eight-hour ozone standard (0.08 parts per million) when an area's design value from the previous ozone season does not exceed 84 parts per billion (ppb). The DFW area's 2009 design value of 86 ppb exceeded that standard. Based on the EPA's determination of failure to attain, the DFW nonattainment area was reclassified to serious, and January 19, 2012, was set as the deadline for the state to submit an attainment demonstration SIP revision that addresses the 1997 eight-hour ozone standard serious nonattainment area requirements, including RFP. The DFW area's new attainment date for the 1997 eight-hour ozone standard is as expeditiously as practicable, but no later than June 15, 2013.

## **1.2 RFP REQUIREMENTS**

The 1990 FCAA amendments, 42 United States Code §7410, require states to submit SIP revisions that contain enforceable measures to achieve the National Ambient Air Quality Standards. The FCAA also requires states with nonattainment areas classified as moderate or above to submit plans showing reasonable further progress toward attainment of the ozone standard. This RFP SIP revision is neither required for, nor intended to demonstrate attainment of the ozone standard, but rather to demonstrate that ozone precursor emissions (NO<sub>x</sub> and/or VOC) will be reduced by specified amounts between the 2002 base year and the DFW nonattainment area's attainment year. The official attainment date for the DFW area is June 15, 2013, but the area's attainment year is 2012, the year containing the ozone season immediately preceding the area's attainment date. Phase II of the EPA's 1997 eight-hour ozone standard implementation plan states that RFP requirements must be implemented by the end of the attainment year (70 FR 71649).

Section 182(b)(1)(A) of the FCAA requires states with ozone nonattainment areas classified as moderate or higher to submit plans providing for a 15% reduction in VOC emissions in those areas. Section 182(c)(2) of the FCAA requires states with ozone nonattainment areas classified as serious or higher to submit plans providing for additional 3% annual combined reductions of NO<sub>x</sub>, and VOC averaged over three-year increments, until the area's attainment deadline. This SIP revision includes RFP target emissions reductions for:

- 2002 to 2008, which includes a 15% NO<sub>x</sub> and/or VOC reduction for the four original DFW nonattainment counties and a 15% VOC reduction for the five counties added to the DFW nonattainment area under the 1997 eight-hour ozone standard;
- 2008 to 2011, which includes a 9% NO<sub>x</sub> and/or VOC reduction for all nine DFW nonattainment counties; and
- 2011 to 2012, which includes a 3% NO<sub>x</sub> and/or VOC reduction for all nine DFW nonattainment counties.

This plan contains two milestone years, 2011 and 2012. Emissions inventories and RFP control reductions between 2002 and 2008 are included in the calculations for this SIP revision, but this plan does not include a 2008 milestone year. The EPA approved the 2008 milestone year RFP demonstration included in the 2007 DFW RFP SIP revision (73 FR 58475).

In addition to the RFP analysis, this SIP revision provides updated 2011 and 2012 RFP on-road motor vehicle emissions budgets and updated 2002 emissions inventories for point, area, non-road mobile, and on-road mobile sources. Emissions inventories were updated from the previous 2007 DFW RFP SIP revision to account for improved methods and to provide the most accurate representation of DFW area emissions. Chapter 2: *Emissions Inventories* provides descriptions of the emissions inventory updates accomplished. This SIP revision also includes

existing contingency measures requirements to be implemented if the area fails to achieve an RFP milestone.

A summary of the calculations performed to demonstrate the DFW area's progress toward meeting RFP requirements can be found in Appendix 1: *Dallas-Fort Worth Nonattainment Area Reasonable Further Progress Demonstration Calculations Spreadsheet*.

### **1.2.1 RFP Demonstration**

The TCEQ took comment at proposal on using the EPA's MOBILE and Motor Vehicle Emission Simulator (MOVES) models. The proposal included RFP analyses and motor vehicle emissions budgets using an on-road mobile emissions inventory based on the MOBILE6.2 model and a preliminary on-road mobile emissions inventory based on the MOVES model. Between proposal and adoption, a final on-road mobile emissions inventory was completed using an updated version of the MOVES model, MOVES2010a. That inventory was used to develop the RFP analysis presented in this SIP revision. This SIP revision demonstrates RFP for the 2011 and 2012 milestone years. Milestone year and attainment year RFP contingency are also demonstrated.

### **1.3 PUBLIC HEARING AND COMMENT INFORMATION**

The commission held public hearings for this SIP revision and associated rulemaking on July 14, 2011, at 10:00 a.m. and 6:30 p.m., at the Arlington City Council Chambers in Arlington, Texas, and on July 22, 2011, at 2:00 p.m., at the TCEQ headquarters in Austin, Texas. Question and answer sessions were held 30 minutes prior to the hearings. At the 10:00 a.m. public hearing in Arlington, the North Texas Clean Air Steering Committee provided oral comments concerning the RFP SIP revision, the Regional Transportation Council of the North Central Texas Council of Governments (NCTCOG), and other stakeholders provided oral comments at the 6:30 p.m. public hearing in Arlington. At the 2:00 p.m. public hearing in Austin, Public Citizen and the Sierra Club provided oral comments concerning the RFP SIP revision.

The public comment period opened on June 24, 2011, and was originally scheduled to close on July 25, 2011; however, the comment period was extended to August 8, 2011. The extension was granted to allow the public 30 days to review and comment on supplemental information<sup>2</sup> concerning on-road mobile source emissions inventories based on MOVES2010a. Notice of public hearings for this SIP revision was published in the *Texas Register* and various newspapers. Written comments were accepted via mail, fax, and through the [eComments](http://www5.tceq.state.tx.us/rules/ecomments) system (<http://www5.tceq.state.tx.us/rules/ecomments>).

During the comment period, written comments concerning the RFP SIP revision were received from COPPs for Clean Air, the EPA, KIDS for Clean Air, NCTCOG, the North Texas Clean Air Steering Committee, and 355 individuals. Summaries of public comments and TCEQ responses are included as part of this SIP revision.

An electronic version of the RFP SIP revision and appendices can be found at the TCEQ's [Texas State Implementation Plan Web page](http://www.tceq.texas.gov/airquality/sip/texas-sip) (<http://www.tceq.texas.gov/airquality/sip/texas-sip>).

---

<sup>2</sup> The supplemental information was released on July 8, 2011, and is contained in Appendix 10: *Additional Information for On-Road Mobile Emissions for the Proposed Dallas-Fort Worth Nonattainment Area Reasonable Further Progress State Implementation Plan Revision for the 1997 Eight-Hour Ozone Standard* of this SIP revision.

#### **1.4 SOCIAL AND ECONOMIC CONSIDERATIONS**

There are no social or economic issues of concern attributable to this DFW RFP SIP revision.

#### **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.

## CHAPTER 2: EMISSIONS INVENTORIES

### 2.1 INTRODUCTION

The Federal Clean Air Act (FCAA) Amendments of 1990 require that reasonable further progress (RFP) emissions inventories be prepared for ozone nonattainment areas. Tropospheric ozone is produced when ozone precursors, volatile organic compounds (VOC) and nitrogen oxides (NO<sub>x</sub>), undergo photochemical reactions in the presence of sunlight. The Texas Commission on Environmental Quality (TCEQ) maintains an emissions inventory of current information for sources of NO<sub>x</sub> and VOC that identifies the types of emissions sources present in an area, the amount of each pollutant emitted, and the types of processes and control devices employed at each plant or source category. The emissions inventory also provides data for a variety of air quality planning tasks, including establishing baseline emissions levels, calculating reduction targets, developing control strategies to achieve emissions reductions, developing emissions inputs for air quality models, and tracking actual emissions reductions against established emissions growth and control budgets. The total inventory of NO<sub>x</sub> and VOC emissions for an area is derived from estimates developed for five general categories of emissions sources: point, area, non-road mobile, on-road mobile, and biogenic.

The TCEQ submitted a Dallas-Fort Worth (DFW) moderate ozone nonattainment area RFP state implementation plan (SIP) revision (Project No. 2006-031-SIP-NR) to the United States Environmental Protection Agency (EPA) in May 2007, which was approved by the EPA on October 7, 2008 (73 *Federal Register* (FR) 58475). Effective January 19, 2011, the EPA reclassified the DFW nonattainment area to serious for the 1997 eight-hour ozone National Ambient Air Quality Standard (75 FR 79302).

To satisfy RFP requirements under §182(b)(1) of the FCAA, states must demonstrate at least a 15% reduction in VOC emissions within the first six years from the baseline year. For serious areas, states are additionally required by §182(c)(2)(B) of the FCAA to demonstrate an average of at least 3% combined annual reductions of NO<sub>x</sub><sup>3</sup> and VOC emissions, beyond the 15% VOC reduction in the first six years, out to an area's attainment date. To complete the RFP calculations, a set of inventories and control measures reductions estimates is required. In accordance with the requirement for emissions inventories and control measures reductions estimates, this SIP revision includes the documentation of emissions inventories for the 2002 base year, for the 2011 and 2012 milestone years, and for the attainment year RFP contingency requirement. Those emissions inventories provide the basis for demonstrating how the required RFP emissions reductions will be met.

To develop an RFP SIP revision, states must: (1) determine the base year emissions for NO<sub>x</sub> and VOC, which includes adjusting the inventory to remove certain emissions reductions for which credit cannot be taken; (2) calculate RFP target emissions reductions levels based on the 3% per year requirement; and (3) subtract post-control emissions reductions from milestone year uncontrolled NO<sub>x</sub> and VOC emissions growth. When the RFP post-control emissions reductions meet or exceed the calculated target emissions reductions, then RFP is demonstrated.

This DFW RFP SIP revision includes:

- a 2002 base year emissions inventory;

---

<sup>3</sup> NO<sub>x</sub> may be substituted for VOC under conditions defined in the EPA's December 1993 [NO<sub>x</sub> Substitution Guidance](http://www.epa.gov/ttncaaa1/t1/memoranda/noxsubst.pdf) (<http://www.epa.gov/ttncaaa1/t1/memoranda/noxsubst.pdf>).

The base year emissions inventory is the starting point for calculating the target levels of emissions. All base year emissions inventories, with the exception of the point source category, have been updated from the 2007 DFW RFP SIP revision (Project No. 2006-031-SIP-NR).

- 2008, 2011, and 2012 adjusted base year (ABY) emissions inventories;

The current ABY emissions inventories are adjusted for the fleet turnover effects of the pre-1990 Federal Motor Vehicle Control Program (FMVCP) and the 1992 Reid Vapor Pressure (RVP) control. Because the defeat device for heavy duty diesel vehicles (HDDV) was affecting an FMVCP that was implemented prior to the 1990 FCAA, the HDDV NO<sub>x</sub> off-cycle emissions effects and associated mitigation program effects are also considered non-creditable. All of these controls are on-road mobile source controls; therefore, only the on-road mobile source is adjusted as part of calculating the ABY emissions inventories for this RFP SIP revision. The Motor Vehicle Emission Simulator (MOVES) has a toggle switch that automates the process of calculating emission rates for the on-road adjusted base year inventories.

- 2008, 2011, and 2012 uncontrolled emissions inventories;

The RFP analysis requires an uncontrolled emissions inventory with growth between the base year and a milestone year. The uncontrolled emissions inventories serve as the basis for determining the amount of emissions reductions required to meet the RFP target for each milestone year.

- 2011 and 2012 milestone year control reductions;

The RFP analysis requires the calculations of emissions reductions for control strategies, which are then subtracted from the uncontrolled emissions to determine the post-control RFP inventory value. The RFP emissions reductions for each control strategy for all source categories are individually quantified. The post-control projected RFP emissions inventory is the result of subtracting the emissions reductions for controls that are used to demonstrate RFP from the uncontrolled projected emissions inventory. A discussion of RFP control strategies is provided in Chapter 4: *Control Measures to Achieve Target Levels*; therefore, the individual RFP control reductions are not discussed any further in this chapter.

- 2008, 2011, and 2012 post-control emissions inventories; and

The post-control emissions inventories represent the projected emissions inventories with all controls implemented, even controls not used or not creditable to demonstrate RFP. The projected post-control emissions inventories may be less than the post-control RFP emissions inventories that include only controls that are used to demonstrate RFP.

- 2012 attainment year RFP contingency control reductions.

The RFP analysis requires the calculation of the emissions reductions for control strategies for the year following the attainment year. These control reductions can be implemented in case there is a failure to meet a milestone requirement. A discussion of the RFP contingency control strategies for this SIP revision is provided in Chapter 4.

### **2.1.1 Updated Uncontrolled Milestone Year Inventories**

Uncontrolled milestone year emissions inventories represent what milestone year emissions inventories for each milestone year would be if no further action to control emissions were taken beyond the controls already accounted for in the 2002 base year emissions inventory. First, emissions inventories are calculated for each source category using EPA-approved methodologies. The inventories are then combined to derive the total uncontrolled milestone year emissions inventory for NO<sub>x</sub> and VOC. The uncontrolled milestone year emissions inventories include pre-2002 FCAA controls as well as growth in activity from 2002 to the milestone year, but the inventories do not include post-2002 FCAA controls.

### **2.1.2 Updated Post-Control Milestone Year Inventories**

The post-control milestone year emissions inventories represent each milestone year, along with growth from the 2002 base year, with all RFP controls taken into account. Emissions inventories are calculated for each major source category using EPA-approved methodologies. Then, the inventories are combined to obtain the total post-control milestone year emissions inventories for NO<sub>x</sub> and VOC. The post-control milestone year emissions inventories include pre-2002 FCAA controls, growth in activity from the base year to the milestone year, and post-2002 FCAA controls used to meet RFP target emissions levels, but the inventories do not include post-2002 FCAA controls that are not used to meet RFP target emissions levels.

### **2.1.3 Updated Adjusted Base Year Inventories**

The 2008, 2011, and 2012 RFP ABY emissions inventories represent the 2002 base year emissions inventory adjusted to account for reductions from non-creditable control programs that were promulgated prior to the 1990 FCAA Amendments. The controls that are non-creditable for this SIP revision include the fleet turnover effects of the pre-1990 FMVCP and the 1992 RVP control. Both of these non-creditable controls are for on-road mobile sources; therefore, only the on-road mobile source is adjusted as part of calculating the ABY emissions inventories for this RFP SIP revision. For point, area, and non-road mobile sources, the ABY emissions inventory is equal to the base year emissions inventory. For each milestone year, the ABY emissions inventory for on-road mobile sources is added to the base year emissions inventories for the other source categories to obtain the total ABY emissions inventories for VOC and NO<sub>x</sub>. The 2008, 2011, and 2012 ABY emissions inventories are used to calculate the RFP percent reductions. The on-road mobile source ABY emissions inventories are also used to quantify the non-creditable reductions that are used in the RFP target calculations.

## **2.2 POINT SOURCES**

### **2.2.1 Emissions Inventory Development**

Stationary point source emissions data are collected annually from sites that meet the reporting requirements of 30 Texas Administrative Code (TAC) §101.10. To collect the data, the TCEQ mailed emissions inventory questionnaire (EIQ) requests to all sites identified as meeting the reporting requirements. Companies were required to report emissions data and to provide samples of calculations used to determine their emissions. Information characterizing the process equipment, the abatement units, and the emissions points was also required. All data submitted to the TCEQ are reviewed for quality assurance purposes and then stored in the State of Texas Air Reporting System (STARS) database.

### **2.2.2 2002 Base Year Inventory**

The 2002 base year point source inventory data were extracted from STARS on September 15, 2010. The extracted data contained ozone season daily emissions of NO<sub>x</sub> and VOC from each site in the DFW nonattainment area that submitted an EIQ for 2002 and the data reflected

revisions made on or before the extract date. No significant changes to the 2002 emissions have occurred since the previously submitted 2007 DFW RFP SIP revision.

### **2.2.3 Updated Uncontrolled Milestone Year Inventories**

In the development of the uncontrolled milestone year inventories for point sources, the TCEQ projected emissions from the 2008 inventory. Emissions were projected for major and minor sources separately and then emissions credits were applied.

The TCEQ designated the 2008 inventory as the baseline year because it was the baseline year for the modeling inventory and it is the most recent National Emissions Inventory year available. The 2008 point source inventory data were extracted from STARS on September 15, 2010; the dataset was composed of reported ozone season daily emissions of NO<sub>x</sub> and VOC for each site in the DFW area that submitted a 2008 EIQ and reflected revisions made on or before the extract date. To determine the uncontrolled projections, the TCEQ accounted for reductions from controls with compliance deadlines before 2008.

Major source emissions were projected by adding the daily averages of nonattainment major modification thresholds for each site to the 2008 emissions. Minor source emissions were projected by using two sets of growth factors. Growth factors were derived from the Regional Economic Modeling, Inc. 5.5 (REMI) factor set of 2005 as well as the 2005 Moody's Economy, Inc. factor set updated in 2010.<sup>4,5</sup>

Uncontrolled milestone year inventory projections were adjusted to account for emissions credits. Emissions credits are banked emissions reductions that may be added back to the airshed in the future. To account for the possible use of the banked NO<sub>x</sub> and VOC emissions, Emissions Reduction Credits (ERCs) and Discrete Emissions Reduction Credits (DERCs) were applied to the inventories.

To determine the amount of emissions that could be added into the airshed from the use of banked ERCs, the New Source Review permitting offsets offset ratio of 1.2 to 1 was applied to the banked credits. ERCs listed in the Emissions Banking and Trading database as of March 7, 2011, were used, including transactions with available information for the period 2006 to 2010. All of the banked ERCs were assumed to be allocated by 2011.

For the NO<sub>x</sub> DERCs, the NO<sub>x</sub> flow control value was used. The flow control value is the maximum amount of NO<sub>x</sub> DERCs that can be applied on a daily basis. The DERC flow control value was developed under the 2007 DFW Attainment Demonstration (Project No. 2006-013-SIP-NR) using the emissions reductions from fleet turnover less emissions reductions associated with contingency requirements combined with decreases of four tons per day from 2011 to 2012. For the VOC DERCs, the credits were averaged over the 2011 to 2012 milestone years.

### **2.2.4 Updated Post-Control Milestone Year Inventories**

In the development of the post-control milestone year inventories for point sources, the TCEQ determined the effects of controls on 2008 emissions, projected the post-control emissions from

---

<sup>4</sup>Eastern Research Group, Inc., "Development of County Level Growth Factors from 1990 through 2020," TCEQ Contract No. 582-04-65564, Work Order No. 65564-05-18, August 2005.

<sup>5</sup> Eastern Research Group, Inc., "Projection Factors for Point and Area Source," TCEQ Contract No. 582-07-84003, Work Order No. 582-07-84003-FY10-27, August 2010.

major and minor sources separately, and then applied unused emissions credits to the inventories.

The 2008 point source NO<sub>x</sub> emissions were projected to the attainment year after the application of controls. Existing point source controls were accounted for in the 2008 emissions for electric generating units (EGU). Title 30 TAC Chapter 117 NO<sub>x</sub> controls on non-EGUs were reviewed to determine post-control baseline emissions for NO<sub>x</sub> projections. The post-control baseline emissions were projected using the methods detailed for uncontrolled sources, and emissions credits were added in the same manner as for the uncontrolled inventories. Point source VOC emissions were projected from 2008 and emissions credits were added, using the methods detailed for uncontrolled point sources.

A summary of the point source RFP emissions inventories is presented in Table 2-1: *DFW RFP Point Source NO<sub>x</sub> and VOC Emissions (tons per day)*, and details on the point source projection method are available in Appendix 2: *Development of Reasonable Further Progress Point Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area*.

**Table 2-1: DFW RFP Point Source NO<sub>x</sub> and VOC Emissions (tons per day)**

RFP Analysis Year Inventory	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002	79.24	79.24	26.43	26.43
2008	85.14	49.21	31.34	31.19
2011	105.86	62.79	39.89	39.73
2012	102.10	58.87	40.74	40.58

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1: *Dallas-Fort Worth Nonattainment Area Reasonable Further Progress Demonstration Calculations Spreadsheet* for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

## 2.3 AREA SOURCES

### 2.3.1 Emissions Inventory Development

Stationary source emissions data from sites and processes that do not meet the reporting requirements for point sources are classified as area sources. Area sources are small-scale industrial, commercial, and residential sources that generate emissions. Emissions are calculated as county-wide totals rather than as individual facilities. Area sources are divided according to emissions mechanism: hydrocarbon evaporative emissions or fuel combustion emissions. Examples of evaporative emissions sources include: oil and gas production sources; printing operations; industrial coatings; degreasing solvents; house paints; gasoline service station underground tank filling; and vehicle refueling operations. Examples of fuel combustion emissions sources include: oil and gas production sources; stationary source fossil fuel combustion at residences and businesses; outdoor refuse burning; structural fires; and wildfires. With some exceptions, area source emissions are calculated by multiplying an established emission factor (emissions per unit of activity) by the appropriate activity or activity surrogate responsible for generating emissions. Population is one of the more commonly used activity surrogates for area sources. Other activity data include the amount of gasoline sold in an area, employment by industry type, and crude oil and natural gas production.

### **2.3.2 Updated 2002 Base Year Inventory**

The 2002 base year area source emissions inventory was updated for this SIP revision. The current SIP's 2002 base year area source emissions inventory was developed by backcasting<sup>6</sup> most of the 2008 Periodic Emissions Inventory (PEI) using factors based on the EPA's Economic Growth Analysis System (EGAS), version 5.0. Backcasting the 2002 base year inventory provided consistency with improved methodologies and activities available for the 2008 PEI submitted to the EPA. Those improved methodologies were not available when the 2007 DFW RFP SIP revision was developed.

The 2008 PEI area source emissions inventory was developed using updated activity data and methods. Most of the inventory's source categories were developed by the EPA contractor compiling the national PEI. The individual inventories were made available for states to use from the EPA emissions inventory Web site. The categories included: industrial coatings; degreasing; residential, commercial/institutional, and industrial fuel use; commercial cooking; aviation fuel use; and consumer products. These EPA-developed inventories not only used current activity data, but also used updated emission factors that were not available for the 2007 DFW RFP SIP revision. Another improvement to the 2008 area source emissions inventory resulted from a survey of gasoline stations, which was the first comprehensive survey of the category and the activity data collected improved the 2008 inventory greatly.

The most significant updates to the area source inventory were in the oil and gas production categories. These are the largest sources of area source emissions. Many changes in the oil and gas inventory occurred between the 2007 and current SIP revisions. A new calculator was developed to calculate emissions from individual categories including compressors, condensate and oil storage tanks, loading, heaters, dehydrators, and fugitives. The EPA developed new Source Classification Codes to accommodate these categories. The Railroad Commission of Texas (RRC) actual county-level 2002 oil and gas production data were used as inputs into the new calculator to determine emissions from oil and gas production.

### **2.3.3 Updated Uncontrolled Milestone Year Inventories**

For most area source categories, the 2008 emissions inventory was projected to 2011 and 2012 using county level growth factors developed from REMI data.<sup>7</sup> Texas State Data Center projections were used to project future emissions for those area source categories that were not projected using REMI growth factors.

### **2.3.4 Updated Post-Control Milestone Year Inventories**

The post-control 2011 and 2012 area source emissions inventories were developed by first projecting the 2008 emissions inventory to specific years and then applying controls. Area source VOC emissions controls that were applied included the federal portable fuel container rule that was published in the *Federal Register* on February 26, 2007 (72 FR 8428). Controls in NO<sub>x</sub> emissions included 30 TAC Chapter 117 Subchapter D controls on minor sources in ozone nonattainment areas. Rules controlling emissions from industrial coatings and gasoline station underground tank filling (Stage I) and vehicle refueling (Stage II) were accounted for in the base year numbers.

---

<sup>6</sup> Backcasting refers to developing emissions for a target year that is previous to an inventory baseline year using the EGAS growth factors in the TexAER Projected Emission System. The system will develop emissions for any target year from any inventory baseline year.

<sup>7</sup> See footnote 4.

A summary of the area source RFP inventories is presented in Table 2-2: *DFW RFP Area Source NO<sub>x</sub> and VOC Emissions (tons per day)*, and more details on area source method development are available in Appendix 3: *Development of Reasonable Further Progress Area Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area*.

**Table 2-2: DFW RFP Area Source NO<sub>x</sub> and VOC Emissions (tons per day)**

RFP Analysis Year Inventory	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002	38.63	38.63	247.03	247.03
2008	150.39	150.39	323.59	320.44
2011	168.66	40.56	352.63	346.64
2012	175.61	41.34	362.95	356.15

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

### 2.3.5 Ongoing Initiatives: Barnett Shale Special Emissions Inventory

The TCEQ is committed to improving air quality in the DFW nonattainment area and continues to work toward identifying and reducing ozone precursors. Texas is investing resources into technological research and development for advancing pollution control technology, improving the science for ozone modeling and analysis, and refining quantification of emissions. Refining emissions quantification helps improve understanding of ozone formation, which benefits the SIP. Additionally, the TCEQ is working with the EPA, area leaders, the scientific community, and the public to identify new measures for reducing ozone precursors. Toward that goal, the TCEQ is currently developing the Barnett Shale Special Inventory, one of several ongoing technical projects that will be beneficial to improving air quality in Texas and the DFW area.

The Barnett Shale is a geological formation that produces natural gas and is located in part of the DFW 1997 eight-hour ozone nonattainment area. The Barnett Shale formation extends west and south from the city of Dallas, covering 5,000 square miles. Drilling permits for wells located in the Barnett Shale formation had been issued in 24 counties in north Texas as of 2010. The TCEQ has recently conducted the second phase of a special inventory under the authority of 30 TAC §101.10(b)(3) to gather detailed information about Barnett Shale emissions sources on the source (unit) level, including emissions data and authorization information.

The first phase of this inventory was completed in 2010 and gathered information about the location, number, and type of emission sources associated with upstream and midstream oil and gas operations in the Barnett Shale. The results of the first phase were used to improve the compressor engine population profile in the DFW area. The improved profile was used to determine emissions estimates for the area source category.

The second phase of the inventory began in late 2010 and involved requesting information about emissions. The TCEQ contacted 279 companies in the Barnett Shale area and requested companies with 2009 production or transmission of oil or gas from the Barnett Shale formation to complete standardized forms detailing source emissions data, source location, information on receptors located within one-quarter mile of a source, and authorization information. Data for over 8,000 sites were received in 2011, and point source data were filtered out.

Barnett Shale area emissions results were still under review at the time of the compilation of the inventory for this DFW RFP SIP revision. For activities in the Barnett Shale formation, initial

draft NO<sub>x</sub> special inventory emissions were commensurate to those estimated for this SIP revision, while initial draft VOC special inventory emissions were below those estimated for this SIP revision. Final results will be considered to improve emissions estimates in future SIP revisions for the DFW ozone nonattainment area.

## **2.4 NON-ROAD MOBILE SOURCES**

Non-road vehicles do not normally operate on roads or highways and are often referred to as off-road or off-highway vehicles. The broad non-road source category is composed of a diverse collection of machines, many of which are powered by diesel engines. Non-road emissions sources include, but are not limited to: agricultural equipment; commercial and industrial equipment; construction and mining equipment; lawn and garden equipment; aircraft and airport equipment; locomotives; and commercial marine vessels and equipment. For this RFP SIP revision, emissions inventories for non-road sources were developed as subcategories: NONROAD Model categories; aircraft; ground support equipment (GSE); locomotive; and drilling rigs. The aircraft and GSE categories are sometimes added together and presented as a total for airports. The sections below describe the emissions estimates methodologies used for the non-road mobile source subcategories.

### **2.4.1 NONROAD Model Categories Emissions Estimates Methodology**

A Texas-specific version of the EPA's latest NONROAD 2008a model, called the Texas NONROAD (TexN) model, was used to calculate emissions from all non-road mobile source equipment and recreational vehicles, with the exception of aircraft and GSE (airports), locomotives, and oilfield drilling rigs. Because emissions for airports and locomotives are not included in either the EPA NONROAD model or the TexN model, their emissions are estimated using other EPA methods and guidance. Though emissions for oilfield drilling rigs are included in the EPA NONROAD model, alternate emissions calculations were developed for that source category in order to provide more accurate inventories<sup>8</sup>; therefore, equipment populations for oilfield drilling rigs were set to zero in the TexN model.

The TexN model is a software tool for estimating emissions for non-road mobile source categories that are included in the EPA NONROAD model, and it was developed to help build high quality non-road emissions inventories for Texas. The model allows air quality planners to replace the EPA's default data with more specific local survey data, a practice encouraged by the EPA. Local, county-level data are incorporated into the TexN model as they become available to the TCEQ. Several equipment survey studies have been conducted in Texas to improve upon the default data available in the EPA NONROAD model. Those studies focused on various equipment categories operating in different areas of the state, including: diesel construction equipment; liquid propane gas powered forklifts; transportation refrigeration units; commercial lawn and garden equipment; agricultural equipment; and recreational marine vessels. Data used for the TexN model produce a more accurate representation of non-road emissions for the DFW nonattainment area.

A summary of the RFP emissions inventories for the NONROAD Model categories is presented in Table 2-3: *DFW RFP NO<sub>x</sub> and VOC Emissions for NONROAD Model Categories (tons per day)*. A detailed listing of the non-road mobile source equipment studies and surveys conducted in Texas, and documentation of procedures used in developing the non-road mobile source RFP emissions inventories, can be found in Appendix 4: *Development of Reasonable Further*

---

<sup>8</sup> Eastern Research Group, Inc., "Oil and Gas Exploration – Drilling Rig Engines," TCEQ Contract No. 582-07-83985, Work Order No. 582-07-83985-FY09-01, July 15, 2009.

*Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Source Categories in the United States Environmental Protection Agency's NONROAD Model.*

**Table 2-3: DFW RFP NO<sub>x</sub> and VOC Emissions for NONROAD Model Categories (tons per day)**

RFP Analysis Year Inventory	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002	115.23	103.53	105.92	73.49
2008	126.24	79.36	122.93	55.12
2011	132.10	67.75	131.04	46.01
2012	135.16	63.57	133.77	42.57

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

**2.4.2 Airport Emissions Estimation Methodology**

The airport non-road source category is not included in the EPA NONROAD Model or the TexN Model, so emissions were calculated using alternate means. Emissions from airport activities in the DFW nonattainment area were estimated for Dallas Love Field, Dallas/Fort-Worth Intercontinental Airport, and eleven reliever airports: Addison; Alliance; Arlington Municipal; Collin County; Dallas Executive; Denton Municipal; Grand Prairie; Lancaster; Meacham; Mesquite; and Spinks. Emissions were calculated using the Federal Aviation Administration Emissions and Dispersion Modeling System, version 5.1. The airport emissions categories considered for this RFP analysis included aircraft (commercial air carriers, air taxis, general aviation, and military), auxiliary power units (APU), and GSE operations. The 2002, 2008, 2011, and 2012 aircraft, APU, and GSE emissions were prepared by TCEQ staff with data obtained from the North Central Texas Council of Governments (NCTCOG). A summary of the RFP emissions inventories for the airport non-road mobile source category is presented in Table 2-4: *DFW RFP NO<sub>x</sub> and VOC Emissions for the Airport Non-Road Mobile Source Category (tons per day)*, and the documentation of procedures used in developing the airport emissions inventories can be found in Appendix 5: *Development of Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Airports Source Categories*.

**Table 2-4: DFW RFP NO<sub>x</sub> and VOC Emissions for the Airport Non-Road Mobile Source Category (tons per day)**

RFP Analysis Year Inventory	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002	10.91	10.91	6.39	6.39
2008	9.87	9.87	5.28	5.28
2011	8.24	8.24	4.03	4.03
2012	8.36	8.36	5.54	5.54

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

### 2.4.3 Locomotive Emissions Estimation Methodology

Locomotive emissions, which are not included in the EPA NONROAD or TexN models, were developed from a TCEQ-commissioned study conducted by E.H. Pechan and Associates, Inc. (Pechan)<sup>9</sup>. Post-control emissions estimates for 2002, 2008, 2011, and 2012 were extracted from the study by Pechan.

Estimates for uncontrolled emissions for 2002, 2008, 2011, and 2012 were developed by applying uncontrolled emissions rates to the same line haul and switchyard activity estimates described in Section II and Section III of the June 2010 Pechan study. A summary of the locomotive RFP emissions inventories is presented in Table 2-5: *DFW RFP NO<sub>x</sub> and VOC Emissions for the Locomotives Non-Road Mobile Source Category (tons per day)*, and the documentation of procedures used in developing the locomotive emissions inventories can be found in Appendix 6: *Development of Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Locomotives Source Category*.

**Table 2-5: DFW RFP NO<sub>x</sub> and VOC Emissions for the Locomotives Non-Road Mobile Source Category (tons per day)**

RFP Analysis Year Inventory	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002	32.65	30.14	1.51	1.51
2008	28.15	20.03	1.30	1.19
2011	27.09	17.84	1.26	1.08
2012	27.47	15.97	1.27	0.95

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

### 2.4.4 Drilling Rig Diesel Engines Emissions Estimation Methodology

Oilfield drilling rig diesel engines are included in the NONROAD model category “Other Oilfield Equipment,” which includes various types of equipment; however, due to significant growth in the oil and gas exploration and production industry, the emissions inventory for diesel drilling rigs was included in a contract with ERG.<sup>10</sup> The emissions inventory developed by ERG was used for this DFW RFP SIP revision. Emissions trends were developed using oil and gas production data trends for 2002, 2008, 2011, and 2012 emissions estimates. A summary of the drilling rigs RFP emissions inventories is presented in Table 2-6: *DFW RFP NO<sub>x</sub> and VOC Emissions for the Drilling Rigs Non-Road Mobile Source Category (tons per day)*, and the documentation of procedures used in developing the drilling rigs emissions inventories can be found in Appendix 7: *Development of Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Drilling Rigs Source Category*.

---

<sup>9</sup> E.H. Pechan and Associates, Inc., “Development of Locomotive and Commercial Marine Emissions Inventory 1990 through 2040,” TCEQ Contract No. 582-07-84008-04, June 30, 2010.

<sup>10</sup> See footnote 6.

**Table 2-6: DFW RFP NO<sub>x</sub> and VOC Emissions for the Drilling Rigs Non-Road Mobile Source Category (tons per day)**

RFP Analysis Year	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002	8.83	8.83	0.66	0.66
2008	22.42	21.03	1.22	1.22
2011	18.78	17.62	0.86	0.86
2012	17.41	16.33	0.78	0.78

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

### 2.4.5 Updated 2002 Base Year Inventory

Various sources were used to update the 2002 base year non-road mobile source emissions inventory for this SIP revision. The 2002 non-road mobile source emissions inventory for the NONROAD model categories was developed using the latest version of the TexN model, which incorporates all of the recently updated county-specific input data. The 2002 aircraft and GSE emissions were prepared by TCEQ staff with data obtained from the NCTCOG. The 2002 base year emissions inventory for locomotive sources was developed from the June 2010 Pechan study. The 2002 base year emissions inventory for drilling rigs was developed from data provided by the ERG study. Details regarding these updates are provided below.

#### 2.4.5.1 Base Year Updates for NONROAD Model Categories

The NONROAD model categories 2002 base year emissions inventory was updated for this DFW RFP SIP revision. Several equipment survey studies have been conducted to improve non-road emissions inventories for Texas since the 2007 DFW RFP SIP revision base year emissions inventory was developed. Those equipment survey studies focused on various equipment categories operating in different areas of the state, including: diesel construction equipment; agricultural equipment; and recreational marine vessels. The data from those studies were incorporated into the TexN/EPA's NONROAD 2008a model, and the model was used to develop the updated inventories used for this SIP revision.

#### 2.4.5.2 Base Year Updates for Airports

The airport source category 2002 base year emissions inventory was updated for this DFW RFP SIP revision. The methodology was the same as that used in developing airport emissions for the 2007 DFW RFP SIP revision; however, the airport activity data used to estimate the airport emissions for the 2007 DFW RFP SIP revision were developed in 1999 and projected to the 2002 base year. For this SIP revision, the airport activity data used to estimate base year airport emissions were exact local activity data obtained from NCTCOG.

#### 2.4.5.3 Base Year Updates for Locomotives

The locomotives source category 2002 base year emissions inventory was updated for this DFW RFP SIP revision. For the previous 2007 DFW RFP SIP revision, fuel use data were obtained from rail lines, and REMI EGAS growth factors were used to update the 2002 base year locomotive emissions inventory. For this DFW RFP SIP revision, the 2002 base year locomotive emissions inventory has been updated with data from the 2010 Pechan study. The Pechan study includes updated fuel use from rail lines by county and updated emission factors using tier-level distributions and EPA fleet-average emission factors by forecast year.

#### 2.4.5.4 Base Year Updates for Drilling Rig Diesel Engines

The drilling rig diesel engines source category was updated for this DFW RFP SIP revision. The drilling rig emissions inventory includes various fuel combustion equipment used on and around oil well drilling rigs. Significant units that make up this category include the large generators used for rig operations and electrical generation. Prior to the 2002 emissions inventory, this category was included under the heading of “Other Oilfield Equipment” as part of the EPA NONROAD model. Updates to the model involved changes to county employment populations using the U. S. Census Bureau’s County Business Patterns; however, it was determined that the North American Industry Classification System standard industry code used in this document included not only actual oilfield workers but corporate office workers associated with the oil industry. This process created inconsistencies by inflating the emissions in some areas. For the 2002 emissions inventory, as an alternative, the actual numbers of drilling rigs located in individual counties were used as a surrogate. Numbers of rigs were obtained from privately owned drilling rig reporting services. Actual numbers of drilling rigs by county were used to prorate the NONROAD model statewide total emissions by fuel type.

For the 2008 PEI, a contractor conducted a survey of actual oil and gas drilling activities and developed a 2008 emissions inventory of drilling rig engines. The survey focused on collecting information on the number of engines on a drilling rig; the make, model, year and size of the engines; engine functions; hours of usage; fuel used; and well depth and completion time. Once the final 2008 emissions inventory was developed, activity data scaling factors for 2002 were developed based on the ratio of the oil and gas well completions for those years relative to the number of oil and gas well completions in 2008 as reported by the RRC. This analysis was performed at the RRC district level which allowed for geographic variations in drilling trends across the state from 2002 through 2008. This report resulted in an updated 2002 emissions inventory based on actual activity data. This revised 2002 drilling rig emissions inventory was used for this DFW RFP SIP revision. The drilling rig emissions inventory is maintained as a separate emissions inventory and is no longer included in the NONROAD model emissions inventory or in the area source inventory.

#### **2.4.6 Updated Uncontrolled Milestone Year Inventories**

The NONROAD model category uncontrolled emissions for each analysis year (2002, 2008, 2011, and 2012) were calculated by adding the sum of all of the individual control reductions to the post-control emissions for that year. Since data were not available to calculate RFP control reductions for aircraft or GSE, the uncontrolled and post-control airport emissions inventories are the same value. The locomotive uncontrolled emissions inventories were obtained from the June 2010 Pechan study. The RRC provided actual annual oil and gas production data for each county, which were used to develop emissions trends for diesel drilling rigs emissions trends.

#### **2.4.7 Updated Post-Control Milestone Year Inventories**

To evaluate the effects of federal and state control programs for the NONROAD model categories, the TexN model was run with 2002, 2008, 2011, 2012, and 2013 ozone season daily emissions for the NONROAD model categories. Emissions reductions for individual control measures were assessed through a series of TexN model runs for both uncontrolled and post-control scenarios for each federal and state control program. Airport landings and take-offs were projected for 2011 and 2012 using the growth factors from the Terminal Area Forecast summary for fiscal years 2008 through 2025.<sup>11</sup> Locomotive post-control emission estimates were

---

<sup>11</sup> Airport landings and take-offs for 2008 were projected based on the United States Department of Transportation, Federal Aviation Administration, “[Terminal Area Forecast Summary, Fiscal Years 2008-](#)

obtained from the June 2010 Pechan study. Diesel drilling rigs emissions trends were developed for 2002, 2008, 2011, and 2012, based on 2002 data from the RRC, but no post-control emissions reductions apply to drilling rigs.

Summaries for all of the non-road mobile source RFP emissions inventories are presented in Table 2-7: *DFW RFP Total NO<sub>x</sub> and VOC Emissions for Non-Road Mobile Sources (tons per day)*.

**Table 2-7: DFW RFP Total NO<sub>x</sub> and VOC Emissions for Non-Road Mobile Sources (tons per day)**

RFP Analysis Year Inventory	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002	167.62	153.41	114.48	82.05
2008	186.67	130.29	130.73	62.81
2011	186.20	111.44	137.18	51.98
2012	188.40	104.23	141.36	49.84

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

## 2.5 ON-ROAD MOBILE SOURCES

On-road mobile source category emissions inventories presented in the DFW RFP proposal were developed using the EPA’s MOBILE6.2 and MOVES models. MOVES-based inventories presented in the proposal were preliminary and were included because the TCEQ took comment on using on-road mobile source emissions inventories based on MOBILE6.2 and MOVES for the adopted DFW RFP SIP revision. In June and July of 2011, the NCTCOG completed the final, SIP-quality MOVES2010a-based on-road mobile source emissions inventory estimates for the 2002 RFP base year, 2008, 2011, 2012, and 2013. The final, SIP-quality MOVES values were developed using methods consistent with EPA SIP inventory development guidance and consistent with the requirements of transportation conformity. Draft MOVES values used in the proposed SIP were the best available estimates and were provided for comment purposes. The final SIP-quality inventories developed by NCTCOG are used for the RFP analysis conducted for this SIP revision.

The development of on-road mobile source inventories used for SIP revisions includes use of the latest available data, most current models and the most current planning assumptions. Some changes in the base and milestone year inventories can be expected when a SIP revision is done if there have been changes in any of the underlying tools or data used in the inventory development. Details of the inventory development process and changes are provided in Appendix 8: *Development of Reasonable Further Progress On-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area*. A summary of the changes that have been incorporated into the on-road mobile source emissions inventory since the adoption of the 2007 DFW RFP SIP revision includes:

- expanding the DFW travel demand model (TDM) to cover 12 full counties;

---

[2025](http://www.faa.gov/data_statistics/aviation/taf_reports/media/TAF2008-2025%20Summary.pdf) ([http://www.faa.gov/data\\_statistics/aviation/taf\\_reports/media/TAF2008-2025%20Summary.pdf](http://www.faa.gov/data_statistics/aviation/taf_reports/media/TAF2008-2025%20Summary.pdf)),” FAA-APO-06-1, January 2009.

This expansion includes the addition of 656 zones and 22 external stations. Ellis, Johnson, Kaufman and Parker Counties have been fully incorporated into the DFW TDM network where they were only partially represented in the previous TDM. These four counties previously used vehicle miles travelled (VMT) based upon a highway performance monitoring system (HPMS) with VMT aggregated by facility type. With incorporation into the DFW TDM, these counties now use a link-based VMT method. Hood, Hunt, and Wise Counties are also now included in the TDM Network.

- validating the DFW TDM using 2004 data; and

The model was previously validated using 1999 data.

- updating several components of the DFW TDM.

The updates include the following:

- calibrating the *New Mode Choice Model* against the 2007 *Dallas Area Rapid Transit Onboard Survey* and the 2008 *Fort Worth Transit Authority and Denton County Transportation Authority Onboard Survey*;
- deriving *External Counts* from 2005 *External Survey*;
- incorporating a new *Vehicle Availability Model*;
- updating *Traffic Assignment Convergence Criteria*;
- incorporating a new volume-delay function in *Traffic Assignment* that utilizes a conical volume-delay function for calculating the congestion delay with horizontal and vertical shifts; and
- updating the *Consumer Price Index*, *Cost Per Mile*, and *Value of Time* used by the TDM.

### **2.5.1 Emissions Inventory Development**

On-road mobile emissions sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on public roadways. On-road mobile source emissions are usually categorized as either combustion-related emissions or evaporative hydrocarbon emissions. Combustion-related emissions are estimated for vehicle engine exhaust. Evaporative hydrocarbon emissions are estimated for the fuel tank and other evaporative leak sources on the vehicle. To calculate emissions, both the rate of emissions per unit of activity (emission factors) and the number of units of activity must be determined.

In March 2010, the EPA replaced the MOBILE6.2 model with MOVES as the official emission factor model for developing on-road mobile source category emissions inventories. Although MOVES represents a new approach to assessing on-road emissions, the sources are the same, and the opportunity to use local inputs for meteorological conditions, control programs and fleet characteristics is the same. The primary approach to developing an on-road inventory is the same with either MOVES or MOBILE6.2. With both models, emissions rates are produced for subsets of the on-road fleet, and the emissions rates are multiplied by the activity level of each vehicle type or source use type. The development of on-road mobile SIP inventories requires that the level of disaggregation of the VMT be done at the roadway link level. The methods used, and the results of the MOVES inventory assessment, are documented in Appendix 8.

Emission factors for this SIP revision were developed using the latest version of EPA's mobile emission factor model, MOVES2010a. The MOVES2010a model may be run using default information, or the default information may be modified to simulate the driving behavior, meteorological conditions, and vehicle characteristics specific to the DFW area. Because

modifications to the inputs significantly influence the emission factors calculated by the MOVES2010a model, every effort was made to input parameters reflecting local conditions rather than relying on national default values. The localized inputs used for the DFW RFP on-road mobile source emissions inventory development include vehicle speeds for each roadway link, temperature, humidity, vehicle age distributions for each vehicle type, percentage of miles traveled for each vehicle type, type of inspection and maintenance (I/M) program, fuel control programs, and gasoline vapor pressure controls.

To estimate on-road mobile source emissions, emission rates calculated by the MOVES2010a model must be multiplied by the level of vehicle activity. On-road mobile source emission factors are expressed in units of grams per mile; therefore, the activity information that is required to complete the inventory calculation is VMT in units of miles per day. The level of vehicle travel activity is developed using TDM run by the Texas Department of Transportation or by the local metropolitan planning organizations. The TDMs are validated against a large number of ground counts, i.e., traffic passing over counters placed in various locations throughout a county or area. For SIP inventories, VMT estimates are calibrated against outputs from the federal HPMS, a model built from a different set of traffic counters.

In addition to the number of miles traveled on each roadway link, the speed on each roadway type or segment is also needed to complete an on-road emissions inventory. Roadway speeds, required inputs for the MOVES2010a model, are calculated by using the activity volumes from the TDM and a post-processor speed model.

A summary of the on-road mobile source VMT used to develop the various NO<sub>x</sub> and VOC emissions levels is presented in Table 2-8: *DFW RFP Ozone Season Weekday On-Road Mobile Source VMT (miles per day)*. The on-road mobile source ABY emissions inventories are summarized in Table 2-9: *DFW RFP Ozone Season Weekday On-Road Mobile Source Adjusted Base Year NO<sub>x</sub> and VOC Emissions (tons per day)*. The RFP uncontrolled and post-control on-road mobile source emissions inventories are summarized in Table 2-10: *DFW RFP Ozone Season Weekday On-Road Mobile Source Uncontrolled and Post-Control NO<sub>x</sub> and VOC Emissions (tons per day)*. For complete documentation of the development of the on-road mobile source emissions inventories for the DFW RFP demonstration, refer to Appendix 8. The complete set of input and output files are available upon request from the TCEQ's Air Quality Division.

**Table 2-8: DFW RFP Ozone Season Weekday On-Road Mobile Source VMT (miles per day)**

RFP Analysis Year	Adjusted Base Year	Uncontrolled Emissions Inventory	Post-control emissions Inventory
2002	141,011,956	141,011,956	141,011,956
2008	141,011,956	165,898,504	165,898,504
2011	141,011,956	181,923,319	181,923,319
2012	141,011,956	186,387,869	186,387,869

**Table 2-9: DFW RFP Ozone Season Weekday On-Road Mobile Source Adjusted Base Year NO<sub>x</sub> and VOC Emissions (tons per day)**

RFP Analysis Year Inventory	ABY NO <sub>x</sub>	ABY VOC
2002	509.45	224.60
2008	511.22	213.71
2011	510.00	207.07
2012	514.62	211.37

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

**Table 2-10: DFW RFP Ozone Season Weekday On-Road Mobile Source Uncontrolled and Post-Control NO<sub>x</sub> and VOC Emissions (tons per day)**

RFP Analysis Year Inventory	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
2002 Base Year	509.45	354.01	224.60	139.70
2008	632.28	235.30	262.06	104.67
2011	707.87	197.05	293.76	89.54
2012	728.83	177.63	301.33	82.20

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

### 2.5.2 Updated 2002 Base Year Inventory

The 2002 base year emissions inventory for on-road mobile sources was updated using emission factors calculated using the latest version of the MOVES model, MOVES2010a. Additional updates were made to incorporate the latest activity estimates from the DFW TDM 2002 network. Only control strategies implemented prior to 2002 were included in the input to the emissions inventory development for the 2002 on-road mobile source base year emissions inventory. Those controls include: pre-1990 FMVCP; fleet turnover to Tier 1 FMVCP; reformulated gasoline (RFG); and the DFW vehicle I/M program. The activity levels used to calculate the emissions inventory reflect the 2002 roadway network with 2002 VMT and speeds. A summary of the emissions inventory is presented in Table 2-10, and a detailed explanation of updates to the on-road mobile source emissions inventory is discussed in Section 2.5: *On-Road Mobile Sources* of this chapter. For complete documentation of the development of the emissions inventory and details on MOBILE6.2 model inputs, refer to Appendix 8.

### 2.5.3 Updated 2002 Adjusted Base Year Inventories for the Base and Milestone Years

The RFP planning process includes calculating the ABY emissions inventory, from which required percent emission reductions are calculated. The ABY emissions inventory is calculated by subtracting non-creditable controls from the base year emissions inventory. As specified by the FCAA, certain on-road mobile source emissions reductions are not creditable toward the required percentage reductions. The non-creditable reductions include reductions from controls that were promulgated prior to the 1990 FCAA. The two rules that are non-creditable for this

RFP SIP revision are pre-1990 FMVCP and pre-1990 promulgated federal fuel volatility regulations (summertime gasoline RVP limits beginning in 1992). Because the defeat device for HDDV was affecting an FMVCP that was implemented prior to the 1990 FCAA, the HDDV NO<sub>x</sub> off-cycle emissions effects and associated mitigation program effects are also considered non-creditable. Therefore, for this DFW RFP demonstration, on-road mobile pre-1990 non-creditable emissions reductions include pre-1990 FCAA FMVCP, 1992 summertime RVP limits, and HDDV NO<sub>x</sub> off-cycle emissions and mitigation programs. All those controls are for on-road mobile sources and are accounted for in the on-road mobile source ABY emissions inventories.

An ABY emissions inventory for on-road mobile sources, which reflects only control strategies implemented prior to 1990, is developed for each milestone year using emission factors from the MOVES2010a model. By projecting the pre-1990 FMVCP into future years, the effects of additional fleet turnover benefit due to the new standards is reflected in the emission factors. The controls included in the ABY emissions inventory development include pre-1990 FCAA FMVCP and the 1992 summertime RVP control. The activity levels used to calculate the ABY emissions inventories reflect the 2002 roadway network with 2002 VMT and speeds. The estimated non-creditable emissions reductions due to pre-1990 controls are calculated by subtracting the 2002 ABY emissions inventory, relative to the target year, from the actual 2002 base year emissions inventory. A summary of the emissions inventories and associated non-creditable emissions reductions is presented in Tables 2-11: *Summary of DFW RFP On-Road Mobile Source Non-Creditable NO<sub>x</sub> Reductions (tons per day)* and 2-12: *Summary of DFW RFP On-Road Mobile Source Non-Creditable VOC Reductions (tons per day)*. Creditable controls are discussed in Section 2.5.5: *Updated Post-Control Milestone Year Emissions Inventories*. For complete documentation of the development of the emissions inventory and details on MOVES2010a model inputs, refer to Appendix 8.

**Table 2-11: Summary of DFW RFP On-Road Mobile Source Non-Creditable NO<sub>x</sub> Reductions (tons per day)**

Analysis Year	ABY NO <sub>x</sub>	Non-creditable NO <sub>x</sub> Emission Reductions
2002	509.45	N/A
2008	511.22	-1.77
2011	510.00	1.22
2012	514.62	-4.62

Notes: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area. Non-creditable reductions are calculated based on output from the MOVES2010a model and VMT. Negative non-creditable reductions reflect increases rather than decreases. Non-creditable reductions may become negative as reductions from the pre-1990 fleet turn over effects approach zero.

**Table 2-12: Summary of DFW RFP On-Road Mobile Source Non-Creditable VOC Reductions (tons per day)**

Analysis Year	ABY VOC	Non-creditable VOC Emission Reduction
2002	224.60	N/A
2008	213.71	10.89
2011	207.07	6.64
2012	211.37	-4.30

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area. Non-creditable reductions are calculated based on output from the MOVES2010a model and VMT. Negative non-creditable reductions reflect increases rather than decreases. Non-creditable reductions may become negative as reductions from the pre-1990 fleet turn over effects approach zero.

#### **2.5.4 Updated Uncontrolled Milestone Year Emissions Inventories**

The uncontrolled on-road mobile emissions inventories for each RFP milestone year were developed using emission factors that reflect only control strategies implemented prior to 2002. The latest version of the MOVES model, MOVES2010a, was used to develop the emissions inventories for this SIP revision. The activity levels were updated to include the latest output from the DFW TDM. Those controls include pre-1990 FMVCP, the 1992 RVP control, fleet turnover to Tier 1 FMVCP, RFG, and the DFW vehicle I/M program. The activity levels used to calculate the emissions inventory reflect the milestone roadway network, with milestone year VMT and speeds. A summary of the emissions inventories is presented in Table 2-10. For complete documentation of the development of the emissions inventory and details on MOVES2010a model inputs, refer to Appendix 8.

#### **2.5.5 Updated Post-Control Milestone Year Emissions Inventories**

The post-control on-road mobile emissions inventories for each RFP milestone year were developed using emission factors that reflect both the control strategies implemented prior to 2002 and the control strategies used to demonstrate compliance with RFP requirements. Those controls include pre-1990 FMVCP, fleet turnover to Tier 1 of the FMVCP, fleet turnover to Tier 2 of the FMVCP, the 2007 heavy duty diesel FMVCP, summer RFG, the DFW vehicle I/M program, the anti-tampering program, and Texas Low Emission Diesel (TxLED). Control scenario inventory values include both the post-control emissions inventory and the level of reductions for each control strategy. Uncontrolled on-road mobile emissions inventories, on-road mobile control reductions, and the resulting post-control on-road mobile emissions inventories for 2008, 2011, and 2012 are summarized in Tables 2-13: *2008 DFW RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> and VOC Emissions and Control Strategy Reductions*, 2-14: *2011 DFW RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> and VOC Emissions and Control Strategy Reductions*, and 2-15: *2012 DFW RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> and VOC Emissions and Control Strategy Reductions*. MVEB calculations for the 2011 and 2012 milestone years are documented in Chapter 5: *Motor Vehicle Emissions Budgets*.

The activity levels used to calculate the emissions inventory reflect the milestone roadway network, with milestone year VMT and speeds. For complete documentation of the development of the emissions inventory and details on MOVES2010a model inputs, refer to Appendix 8.

**Table 2-13: 2008 DFW RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> and VOC Emissions and Control Strategy Reductions**

On-Road Mobile Emissions Inventory Strategies	NO <sub>x</sub> (tons per day)	VOC (tons per day)
2008 uncontrolled inventory	632.28	262.06
Tier 1 FMVCP, RFG, I/M Program, ATP, Tier 2 FMVCP, 2007 HDDV FMVCP, On-road TxLED	396.98	157.40
2008 post-control inventory	235.30	104.67

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

**Table 2-14: 2011 DFW RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> and VOC Emissions and Control Strategy Reductions**

On-Road Mobile Emissions Inventory Strategies	NO <sub>x</sub> (tons per day)	VOC (tons per day)
2011 uncontrolled inventory	707.87	293.76
Tier 1 FMVCP, RFG, I/M Program, ATP, Tier 2 FMVCP, 2007 HDDV FMVCP, On-road TxLED	510.82	204.22
2011 post-control inventory	197.05	89.54

**Table 2-15: 2012 DFW RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> and VOC Emissions and Control Strategy Reductions**

On-Road Mobile Emissions Inventory Strategies	NO <sub>x</sub> (tons per day)	VOC (tons per day)
2012 uncontrolled inventory	728.83	301.33
Tier 1 FMVCP, RFG, I/M Program, ATP, Tier 2 FMVCP, 2007 HDDV FMVCP, On-road TxLED	551.21	219.13
2012 post-control inventory	177.63	82.20

## 2.6 BIOGENIC SOURCES

Biogenic sources include VOC emissions from crops, lawn grass, and trees as well as a small amount of NO<sub>x</sub> emissions from soils. Plants are sources of VOC such as isoprene, monoterpene, and alpha-pinene. Biogenic emissions are estimated using the EPA's Biogenic Emissions Inventory tool. Biogenic emissions are important in determining the overall emissions profile of an area; therefore, these emissions are required for regional air quality modeling and to meet periodic EPA reporting requirements. Since the 2002 base year emissions inventory is based on the inventory developed to meet EPA periodic reporting requirements, the 2002 base year emissions inventory includes biogenic emissions.

Biogenic emissions are excluded from the RFP methodology; therefore, biogenic emissions were subtracted from the 2002 base year emissions inventory for this SIP revision. The resulting anthropogenic emissions inventory, composed of point, area, non-road, and on-road emissions sources, is the 2002 DFW RFP base year emissions inventory. Biogenic emissions inventories are not used for RFP determinations.

## 2.7 EMISSIONS SUMMARY

Uncontrolled and post-control base year NO<sub>x</sub> and VOC emissions in the DFW area for each RFP source category are summarized in Table 2-16: *Summary of the 2002 Base Year Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)*. DFW-area uncontrolled and post-control NO<sub>x</sub> and VOC emissions for each RFP source category and milestone year are summarized in Tables 2-17: *Summary of the 2008 Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)*, 2-18: *Summary of the 2011 Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)*, and 2-19: *Summary of the 2012 Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)*. Where there is no difference between the uncontrolled and post-control emissions for the base year and all milestone years, there were no controls applied to the projected source inventories.

**Table 2-16: Summary of the 2002 Base Year Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)**

Emissions Inventory Source	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
Point Sources	79.24	79.24	26.43	26.43
Area Sources	38.63	38.63	247.03	247.03
Non-Road Mobile Sources	167.62	153.41	114.48	82.05
On-Road Mobile Sources with MOVES2010a	509.45	354.01	224.60	139.70
Total of All Sources	794.94	625.29	612.54	495.21

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

**Table 2-17: Summary of the 2008 Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)**

Emissions Inventory Source	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
Point Sources	85.14	49.21	31.34	31.19
Area Sources	150.39	150.39	323.59	320.44
Non-Road Mobile Sources	186.67	130.29	130.73	62.80
On-Road Mobile Sources with MOVES2010a	632.28	235.30	262.06	104.67
Total of All Sources	1054.48	565.18	747.72	519.10

Note: 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

**Table 2-18: Summary of the 2011 Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)**

Emissions Inventory Source	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
Point Sources	105.86	62.79	39.89	39.73
Area Sources	168.66	40.56	352.63	346.64
Non-Road Mobile Sources	186.20	111.43	137.18	51.98
On-Road Mobile Sources with MOVES2010a	707.87	197.05	293.76	89.54
Total of All Sources	1168.59	411.84	823.46	527.88

**Table 2-19: Summary of the 2012 Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)**

Emissions Inventory Source	Uncontrolled NO <sub>x</sub>	Post-control NO <sub>x</sub>	Uncontrolled VOC	Post-control VOC
Point Sources	102.10	58.87	40.74	40.58
Area Sources	175.61	41.34	362.95	356.15
Non-Road Mobile Sources	188.40	104.23	141.36	49.84
On-Road Mobile Sources with MOVES2010a	728.83	177.63	301.33	82.20
Total of All Sources	1194.94	382.07	846.38	528.77

## **CHAPTER 3: TARGET EMISSIONS LEVELS AND REASONABLE FURTHER PROGRESS DEMONSTRATION**

### **3.1 INTRODUCTION**

This chapter describes how the Dallas-Fort Worth (DFW) reasonable further progress (RFP) demonstration is calculated, documents the RFP calculations, and provides a summary of the DFW RFP demonstration for all RFP milestone years. For nonattainment areas required to submit RFP demonstrations that have already achieved the required 15% reduction in volatile organic compounds (VOC), the RFP guidance in the Phase I implementation rule for the 1997 eight-hour ozone standard requires an average 3% reduction of VOC and/or nitrogen oxides<sup>12</sup> (NO<sub>x</sub>) per year out to an area's attainment. Guidance from the United States Environmental Protection Agency (EPA) requires states to demonstrate RFP every third year as well as the attainment year. The RFP calculations documented in this state implementation plan (SIP) revision rely on an RFP base year of 2002 and a June 15, 2013, attainment date. This DFW RFP analysis has two RFP milestone years: 2011 and 2012. Between 2002 and 2008, 15% VOC emissions reductions were calculated for the five counties (Ellis, Johnson, Kaufman, Parker, and Rockwall Counties) added to the DFW nonattainment area under the 1997 eight-hour ozone standard, and 15% VOC and NO<sub>x</sub> emissions reductions were calculated for the four original DFW nonattainment counties (Collin, Dallas, Denton, and Tarrant Counties). While emissions were calculated between 2002 and 2008, 2008 was not considered a milestone year for this SIP revision because the EPA already approved the 2008 milestone year in the 2007 DFW Eight-Hour Ozone Nonattainment Area RFP SIP revision submittal (Project No. 2006-031-SIP-NR). The additional RFP milestone year requirements for this plan are:

- a 9% emissions reduction for the three-year period between 2008 and 2011 for the entire DFW nonattainment area;
- a 3% emissions reduction for the one-year period between 2011 and 2012 for the entire DFW nonattainment area; and
- a 3% emissions reduction for the one-year period between 2012 and 2013 as attainment year RFP contingency for the entire DFW nonattainment area.

Progress toward meeting the 2011 and 2012 milestone year emissions reductions requirements is demonstrated using EPA methodologies to calculate the elements of the RFP demonstration and complete the RFP analyses. First, the emissions inventories, control reductions, and non-creditable emissions reductions are developed for each milestone year. Second, the target level of emissions is calculated for each milestone year. Third, the RFP control measures reductions for each milestone year are subtracted from the uncontrolled emissions inventory for the corresponding milestone year. The difference includes growth from the base year to the selected milestone year. When the uncontrolled projected inventory for each milestone year minus the RFP controls is less than or equal to the target level of emissions for VOC and/or NO<sub>x</sub>, the RFP requirement has been met. Required RFP elements include:

- the 2002 base year emissions;
- non-creditable reductions for 2002, 2008, 2011, and 2012;
- 2008, 2011, and 2012 emissions target levels;
- 2008, 2011, and 2012 projected emissions, with growth; and

---

<sup>12</sup> NO<sub>x</sub> may be substituted for VOC under conditions defined in the EPA's December 1993 [NO<sub>x</sub> Substitution Guidance](http://www.epa.gov/ttncaaa1/t1/memoranda/noxsubst.pdf) (<http://www.epa.gov/ttncaaa1/t1/memoranda/noxsubst.pdf>).

- individually quantified emissions reductions from control measures for 2008, 2011, and 2012.

The timing of the release of the EPA’s Motor Vehicle Emission Simulator (MOVES) model did not allow for the SIP revision to be based on MOVES analyses at proposal; however, in addition to the on-road mobile source emissions inventories developed using the EPA’s MOBILE6.2 model, the proposal included preliminary on-road mobile source emissions inventories, a preliminary RFP demonstration, and preliminary motor vehicle emissions budgets based on the MOVES model. The TCEQ took comment on using on-road mobile emissions inventories based on the MOBILE6.2 model and the MOVES model for the DFW RFP SIP revision. The DFW RFP analyses presented in this plan are based on DFW area inventories that include on-road mobile emissions inventories based on MOVES2010a that were developed by the North Central Texas Council of Governments (NCTCOG) in June and July of 2011.

### 3.2 TARGET LEVEL METHODOLOGY

EPA guidance specifies the method states should use to calculate the maximum amount of emissions a nonattainment area can emit for each RFP milestone year. Those RFP target levels of emissions are calculated using a six step process, which is used for this SIP revision.

1. Determine the 2002 base year emissions inventory.
2. Determine the 2002 RFP base year emissions inventory.
3. Determine the adjusted base year (ABY) emissions inventories for 2002, 2008, 2011, and 2012.
4. Calculate the non-creditable fleet turnover correction for each RFP milestone year.
5. Calculate the required 3% per year emissions reduction amount.
6. Calculate the 2011 and 2012 emissions target levels for VOC and NO<sub>x</sub>.

### 3.3 CALCULATION OF TARGET EMISSIONS LEVELS

A summary of the six step process described above for target calculations for 2011 is presented in Table 3-1: *Summary of the Calculation Process for 2011 DFW RFP Target Levels*. The summary table serves as an example of how all target levels for each milestone year are calculated. A summary of all target levels is found in Tables 3-5: *Post-2002 RFP Target Level of NO<sub>x</sub> Emissions (tons per day)* and 3-6: *Post-2002 RFP Target Level of VOC Emissions (tons per day)*.

**Table 3-1: Summary of the Calculation Process for 2011 DFW RFP Target Levels**

Description	NO <sub>x</sub>	VOC
1: Step 1: 2002 base year emissions inventory (see Table 2-16)	625.29 tpd	495.21 tpd
2: Step 2: Add or subtract emissions that are to be included from outside the nonattainment area	0.00 tpd	0.00 tpd
3: Revised 2002 RFP Base Year emissions inventory (see Table 2-16) <b>(1 minus 2)</b>	625.29tpd	495.21 tpd
4: Step 3: 2002 On-road ABY emissions inventory (see Tables 2-11 and 2-12)	509.45tpd	224.60tpd
5: 2011 On-road ABY emissions inventory (see Tables 2-11 and 2-12)	510.00tpd	207.07tpd
6: Step 4: Calculate non-creditable reductions 2002 to 2011(see Tables 2-11 and 2-12) <b>(4 minus 5)</b>	-0.55 tpd	17.53tpd
7: 2008 ABY emissions inventory for 5 newly designated counties	137.44tpd	66.85tpd

Description	NO <sub>x</sub>	VOC
<b>8:</b> 15% VOC to meet 15% VOC reduction requirement for newly designated counties	0%	15%
<b>9:</b> 2008 ABY emissions inventory for 4 previously designated counties	489.62tpd	417.47tpd
<b>10:</b> Percent of NO <sub>x</sub> (PN) and VOC (PV) to meet 15% reduction requirement for 4 previously designated counties, PN + PV = 15	15%	0%
<b>11:</b> 2011 ABY emissions inventory	625.84tpd	477.67tpd
<b>12:</b> PN and PV to meet 9% reduction requirement, PN + PV = 9	9%	0%
<b>13:</b> Step 5A: Calculate the 2002-to-2008 15% VOC reduction requirement for 5 newly designated counties ( <b>7 x 8</b> )	N/A	10.03 tpd
<b>14:</b> Step 5B: Calculate the 2002-to-2008 15% NO <sub>x</sub> and VOC reduction requirement for 4 previously designated counties ( <b>9 x 10</b> )	73.44tpd	0.00 tpd
<b>15:</b> Step 5C: Calculate the 2008-to-2011 9% reduction requirement ( <b>11 x 12</b> )	56.33tpd	0.00 tpd
<b>16:</b> Step 5D: Calculate the total 2002-to-2011 percent reduction requirement ( <b>13+14+15</b> )	129.77tpd	10.03 tpd
<b>17:</b> Step 6: Calculate the target level of emissions ( <b>3 minus 6 minus 16</b> )	496.07tpd	467.65tpd

Step one of the RFP target calculation process involves the development of the 2002 base year emissions inventory. EPA guidance specifies the method states must use to develop the base year emissions inventory and all other SIP emissions inventories.<sup>13</sup> Details of the development of the 2002 DFW base year emissions inventory are discussed in Chapter 2: *Emissions Inventories*. Summaries for the 2002 DFW base year NO<sub>x</sub> and VOC emissions inventories are presented in Table 2-16: *Summary of the 2002 Base Year Ozone Season Weekday NO<sub>x</sub> and VOC Emissions for the DFW RFP (tons per day)*.

Step two of the RFP target calculation process adds or subtracts any emissions from outside the nonattainment area that need to be included with or excluded from the nonattainment area emissions inventory. The resulting, revised emissions inventory becomes the 2002 RFP base year emissions inventory, which represents the total anthropogenic emissions for the area. For this DFW RFP SIP revision, the revised 2002 RFP base year emissions inventory is the same as the 2002 base year emissions inventory.

Step three of the RFP target calculation process involves the development of the on-road ABY emissions inventories for 2002, 2008, 2011, and 2012. Those emissions inventories are mathematical interpretations of what projected inventories would be if vehicle miles traveled (VMT) and base year controls remained static at 2002 levels. The inventories are used only to calculate the effects of the pre-1990 Federal Clean Air Act (FCAA) Amendments controls projected to the RFP base and milestone years. As such, those emissions inventories can be used to estimate the effects of the pre-1990 FCAA controls between milestone years. That estimation allows for the calculation of the non-creditable control reduction, which occurs in step four. The emissions rates for an ABY emissions inventory are developed using the latest version of the

---

<sup>13</sup> References for guidance documents used for emissions inventory development in this RFP SIP revision are listed in the *References for Guidance Documents* section at the end of this document.

EPA's MOVES emission factor model, MOVES2010a. The model input file is set up to turn off all 1990 FCAA effects, and the model evaluation year is set to the RFP base or milestone year. The model is run to determine emission factors for each base or milestone year with only pre-1990 FCAA controls. The emission factors for all years are then multiplied by the 2002 base year VMT. Since all of the emissions inventories use the base year VMT, the emissions inventories are referred to as RFP ABY emissions inventories. Details of the development of the DFW RFP ABY emissions inventories are documented in Chapter 2 of this document and in Appendix 8: *Development of Reasonable Further Progress On-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area*.

Step four of the RFP target calculation process, calculating the non-creditable fleet turnover correction, is accomplished by subtracting the RFP ABY emissions inventory for each milestone year from the ABY emissions inventory for the previous RFP milestone year. Since the ABY emissions inventories estimate the effects of the non-creditable pre-1990 FCAA controls, the difference between RFP ABY emissions inventories represent an estimate of the non-creditable RFP emissions reductions, also referred to as the fleet turnover correction. Tables 3-2: *Summary of Non-Creditable NO<sub>x</sub> Fleet Turnover Reduction (tons per day)* and 3-3: *Summary of Non-Creditable VOC Fleet Turnover Reduction (tons per day)* provide a summary of the fleet turnover corrections for all RFP milestone years. Since the first target calculated for this RFP demonstration is 2011, the non-creditable reductions from both 2002 to 2008 and 2008 to 2011 are accounted for in the 2011 target calculation. The equations for calculating the fleet turnover correction between two milestone years are shown below:

**Equation 3-1A:**       $FTC_{MSY, VOC} = ABY_{(MSY-1), VOC} - ABY_{MSY, VOC}$

and

**Equation 3-1B:**       $FTC_{MSY, NO_x} = ABY_{(MSY-1), NO_x} - ABY_{MSY, NO_x}$

where:

- $FTC_{MSY, VOC}$  = VOC fleet turnover correction for year MSY
- $FTC_{MSY, NO_x}$  = NO<sub>x</sub> fleet turnover correction for year MSY
- $ABY_{MSY, VOC}$  = MSY adjusted base year emissions inventory for VOC
- $ABY_{MSY, NO_x}$  = MSY adjusted base year emissions inventory for NO<sub>x</sub>
- $ABY_{(MSY-1), VOC}$  = previous MSY adjusted base year emissions inventory for VOC
- $ABY_{(MSY-1), NO_x}$  = previous MSY adjusted base year emissions inventory for NO<sub>x</sub>
- MSY = RFP milestone year
- MSY – 1 = previous RFP milestone year

**Table 3-2: Summary of Non-Creditable NO<sub>x</sub> Fleet Turnover Reduction (tons per day)**

RFP Analysis Year	On-road Mobile ABY NO <sub>x</sub>	Non-creditable NO <sub>x</sub> Fleet Turnover Reduction	Non-creditable Pre-1990 FCAA Fleet Turnover Reduction Years
2002	509.45	N/A	N/A
2008	511.22	-1.77	2002-2008
2011	510.00	1.22	2008-2011
2012	514.62	-4.62	2011-2012

**Table 3-3: Summary of Non-Creditable VOC Fleet Turnover Reduction (tons per day)**

RFP Analysis Year	On-road Mobile ABY VOC	Non-creditable VOC Fleet Turnover Reduction	Non-creditable Pre-1990 FCAA Fleet Turnover Reduction Years
2002	224.60	N/A	N/A
2008	213.71	10.89	2002-2008
2011	207.07	6.64	2008-2011
2012	211.37	-4.30	2011-2012

Step five of the RFP target calculation process, calculating the required 3% per year emissions reduction amount, is accomplished by multiplying the RFP milestone year ABY emissions inventory values by the percent reduction needed to meet RFP requirements. For the DFW nonattainment area, the first requirement is to reduce emissions by 15% from 2002 to 2008, and the post-2008 requirement is to reduce emissions by 3% per year from 2008 to the attainment year. Phase II of the EPA's implementation rule for the 1997 eight-hour ozone standard allows ozone nonattainment areas to substitute NO<sub>x</sub> reductions for VOC reductions, but use of NO<sub>x</sub> emissions reductions must meet the criteria in §182(c)(2)(C) in the FCAA. For the five counties added to the DFW nonattainment area under the 1997 eight-hour ozone standard, the 15% requirement from 2002 to 2008 must be all VOC. The four counties originally designated nonattainment under the one-hour ozone standard have already satisfied the 15% VOC only requirement; therefore, an equivalent percentage of NO<sub>x</sub> reductions may be substituted for VOC reductions requirements in those counties between 2002 and 2008. After 2008, all nine DFW nonattainment counties may substitute NO<sub>x</sub> reductions for VOC under the conditions of the EPA's NO<sub>x</sub> substitution guidance.<sup>14</sup> The total of the percent NO<sub>x</sub> and VOC reductions must equal the total emissions reductions requirements for each milestone year. For 2008, the reduction requirement is met for the five nonattainment counties added under the 1997 eight-hour ozone standard through a 15% VOC reduction. The 2008 reduction requirement is met for the four original nonattainment counties through a 15% NO<sub>x</sub> reduction. For the 2011 and 2012 milestone years, the reduction requirement for this RFP SIP revision is satisfied by taking the entire 3% per year reduction from NO<sub>x</sub> emissions. Equation 3-2 describes the method to calculate the percentage of NO<sub>x</sub> emissions substituted for VOC emissions:

---

<sup>14</sup> See footnote 10.

**Equation 3-2:**  $N_{MSY} = [3 \times (CY_{MSY} - CY_{MSY-1})] - V_{MSY}$

Where:

- $N_{MSY}$  = percentage NO<sub>x</sub> reductions for year MSY
- CY = calendar year
- MSY = RFP milestone year
- MSY -1 = previous RFP milestone year
- $V_{MSY}$  = percentage VOC reductions for year MSY

Emissions reductions percentages are multiplied by their corresponding NO<sub>x</sub> and VOC milestone year ABY emissions inventories to calculate the required NO<sub>x</sub> and VOC emissions reductions for each milestone year. Table 3-4: *Calculation of Required 15% and 3% per Year NO<sub>x</sub> and VOC Reductions for the DFW RFP* provides a summary of the NO<sub>x</sub> and VOC reductions needed to satisfy the 3% per year requirement for all RFP milestone years. The equations for calculating the 3% required reductions for NO<sub>x</sub> and VOC are shown in Equations 3-3A and 3-3B.

**Equation 3-3A:**  $RPR_{MSY, VOC} = [BY_{2002, VOC} - (ABY_{2002, VOC} - ABY_{MSY, VOC})] \times PV_{MSY}$   
and,

**Equation 3-3B:**  $RPR_{MSY, NOx} = [BY_{2002, NOx} - (ABY_{2002, NOx} - ABY_{MSY, NOx})] \times PN_{MSY}$

Where:

- $RPR_{MSY, VOC}$  = required VOC emission reductions between 2002 and MSY
- $RPR_{MSY, NOx}$  = required NO<sub>x</sub> emission reductions between 2002 and MSY
- $BY_{2002, VOC}$  = 2002 base year emissions inventory for VOC
- $BY_{2002, NOx}$  = 2002 base year emissions inventory for NO<sub>x</sub>
- $ABY_{2002, VOC}$  = 2002 adjusted base year emissions inventory for VOC
- $ABY_{2002, NOx}$  = 2002 adjusted base year emissions inventory for NO<sub>x</sub>
- $ABY_{MSY, VOC}$  = MSY adjusted base year emissions inventory for VOC
- $ABY_{MSY, NOx}$  = MSY adjusted base year emissions inventory for NO<sub>x</sub>
- $PV_{MSY}$  = percentage VOC reductions for year MSY
- $PN_{MSY}$  = percentage NO<sub>x</sub> reductions for year MSY
- MSY = RFP milestone year

**Table 3-4: Calculation of Required 15% and 3% per Year NO<sub>x</sub> and VOC Reductions for the DFW RFP**

RFP Analysis Year	Total Percent Reduction Requirement	Percent NO <sub>x</sub>	Percent VOC	ABY Emissions Inventory NO <sub>x</sub> (tpd)	ABY Emissions Inventory VOC (tpd)	Required Reductions NO <sub>x</sub> (tpd)	Required Reductions VOC (tpd)
2008: Five New Counties	15	0	15	137.44	66.85	N/A	10.03
2008: Four Previously Designated Counties	15	15	0	489.62	417.47	73.44	0.00
2011	9	9	0	625.84	477.67	56.33	0.00
2012	3	3	0	630.46	481.97	18.91	0.00

Step six of the RFP target calculation process, calculating RFP target levels of emissions, is accomplished by subtracting the required emissions reductions (step five) and the fleet turnover correction factor (step four) from the 2002 base year emissions inventory. The target level represents the level of emissions for each RFP milestone year for the DFW nonattainment area to meet its 1997 eight-hour ozone standard RFP requirements. Because the fleet turnover correction affects both NO<sub>x</sub> and VOC emissions, target levels are calculated for both pollutants even when the entire reduction requirement is taken from one pollutant or the other. The method for calculating the target levels of emissions for the DFW RFP milestone years is shown in Equation 3-4.

**Equation 3-4:**  $TL_{MSY, X} = TL_{(MSY-1), X} - RPR_{MSY, X} - FTC_{MSY, X}$

Where:

$TL_{MSY, X}$  = target level of emissions for MSY

$TL_{(MSY-1), X}$  = target level of emissions for the previous RFP milestone year (Note: For 2008, the target level of emissions for the previous RFP milestone year is equal to the 2002 base year emissions inventory.)

$RPR_{MSY, X}$  = emission reduction requirement for MSY for pollutant X

$FTC_{MSY, X}$  = fleet turnover correction term for MSY for pollutant X

X = either VOC or NO<sub>x</sub>

MSY = RFP milestone year

MSY - 1 = previous RFP milestone year

Appendix 1: *Dallas-Fort Worth Nonattainment Area Reasonable Further Progress Demonstration Calculations Spreadsheet* documents the calculation of the target values for all RFP milestone years. Table 3-1 provides a step-by-step summary of the calculation of the target levels for 2011 for the DFW nonattainment area. Tables 3-5 and 3-6 summarize the calculation of the target levels of VOC and NO<sub>x</sub> for all RFP milestone years and provide the Federal Motor Vehicle Control Program (FMVCP) non-creditable emissions reductions. The following sections describe how the target levels are integrated into the RFP demonstration.

**Table 3-5: Post-2002 RFP Target Level of NO<sub>x</sub> Emissions (tons per day)**

RFP Milestone Year	Previous Target	FMVCP Non-Creditable Reduction	Post-2002 Percent Reduction Requirement NO <sub>x</sub>	NO <sub>x</sub> Target
2002	N/A	N/A	N/A	* 625.29
2008	625.29	-1.77	73.44	553.62
2011	553.62	1.22	56.33	496.07
2012	496.07	** -4.62	18.91	481.78

\*This number is the base year emissions inventory, which is the starting point for calculating target values.

\*\*Calculations, based on EPA guidance and on the MOVES model, produced a negative number due to the decreasing influence of Tier 0 FMVCP on emission factors.

**Table 3-6: Post-2002 RFP Target Level of VOC Emissions (tons per day)**

RFP Milestone Year	Previous Target	FMVCP Non-Creditable Reduction	Post-2002 Percent Reduction Requirement VOC	VOC Target
2002	N/A	N/A	N/A	* 495.21
2008	495.21	10.89	10.03	474.29
2011	474.29	6.64	0.00	467.65
2012	467.65	-4.30	0.00	471.95

\* This number is the base year emissions inventory, which is the starting point for calculating target values.

### 3.4 GROWTH

The DFW RFP SIP revision must account for any growth in emissions between 2002 and each RFP milestone year. The NO<sub>x</sub> and VOC uncontrolled projected milestone year emissions inventories are derived by applying the appropriate projection methodologies to the 2002 base year emissions inventory, emission factor development, and/or to activity level estimates. The resulting emissions inventories include any growth between 2002 and each projected year through 2013. The projection methodology for the uncontrolled RFP emissions inventory excludes changes in the emission factor due to control strategies so that the projections represent the total growth in emissions. When the creditable RFP control reductions are subtracted from uncontrolled projected emissions inventories that include growth, the result will be the forecast post-control RFP emissions. The post-control RFP emissions are compared to the target emissions levels to determine if a nonattainment area successfully demonstrates RFP, thereby meeting RFP requirements. The method for accounting for growth is based on

EPA guidance for performing RFP calculations.<sup>15</sup> The development of the uncontrolled projected emissions inventory is documented in Chapter 2. The development of the projected control reductions is documented in Chapter 4: *Control Measures to Achieve Target Levels*.

### **3.5 REASONABLE FURTHER PROGRESS DEMONSTRATION ANALYSIS**

Phase II of the EPA's implementation rule for the 1997 eight-hour ozone standard (40 *Code of Federal Regulations* §51.910) requires the RFP control strategy plan to show emissions reductions that will reduce post-control RFP milestone year emissions inventories to values less than the emissions target values for those milestone years. The creditable RFP control reductions are subtracted from the uncontrolled forecast emissions inventory for each RFP milestone year. For milestone years 2011 and 2012, the controls that are reserved to demonstrate contingency are added to the post-control RFP inventory because the creditable reductions for those years include the reductions reserved for contingency. Phase II of the implementation rule allows ozone nonattainment areas to substitute NO<sub>x</sub> reductions for VOC reductions, but use of NO<sub>x</sub> emissions reductions must meet the criteria in §182(c)(2)(C) of the FCAA. For the DFW nonattainment area counties, an equivalent NO<sub>x</sub> reduction may be substituted for VOC reduction requirements for all RFP milestone years. The RFP requirement is met for each milestone year if the resulting post-control RFP emissions inventory forecast is less than the target level of emissions.

#### **3.5.1 NO<sub>x</sub> Substitution**

For this RFP demonstration, a specific percentage of surplus NO<sub>x</sub> emissions reductions is transferred from the NO<sub>x</sub> post-control RFP forecast to the VOC post-control RFP forecast, i.e., the percentage is added to the NO<sub>x</sub> forecast and subtracted from the VOC forecast. The method used is consistent with EPA NO<sub>x</sub> substitution guidance. Equation 3.5 illustrates the first step, establishing the percent reduction achieved, which is determined by calculating the percent of the base year inventory that comprises the demonstrated emissions reductions. Equation 3.6 illustrates the second step, determining the percent target reductions. The percent target reductions are determined by calculating the target level of reductions and determining the percent of the base year inventory that comprises the target reductions. If the percent actual reductions are greater than the percent target reductions, then surplus reductions have been achieved. For both 2011 and 2012, there are surplus NO<sub>x</sub> emissions reductions and VOC emissions reduction shortfalls; therefore, a percentage of the surplus NO<sub>x</sub> is used to offset the VOC shortfall.

The percentage to be substituted is based on the milestone year target emissions reduction amount, so the percent of the base year that is surplus is converted to a percentage of the milestone year target emissions reduction amount needed to overcome the VOC shortfall. The substitution percentage is derived from the milestone year target because the target emissions reduction amount is the value modified by NO<sub>x</sub> substitution. The percent NO<sub>x</sub> transfer is a percentage of the milestone year target NO<sub>x</sub> value that is added back into the NO<sub>x</sub> inventory and a percentage of the milestone year target VOC that is subtracted from the VOC inventory. Once the substitution percentages have been applied, they are converted into tons per day of NO<sub>x</sub> and VOC. A summary of NO<sub>x</sub> substitution calculations for 2011 and 2012 is provided in Tables 3-7: *Summary of the 2011 DFW RFP NO<sub>x</sub> Substitution* and 3-8: *Summary of the 2012 DFW RFP NO<sub>x</sub> Substitution*. Further explanation of the NO<sub>x</sub> substitution method used to demonstrate RFP for this DFW RFP SIP revision is contained in Appendix 1.

---

<sup>15</sup> EPA, "Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard; Final Rule," *Federal Register* (70 FR 71631), November 29, 2005.

**Equation 3-5:**      **APR**<sub>MSY, X</sub> = [(BY<sub>X</sub> – RED<sub>MSY, X</sub>) / (BY<sub>X</sub>)]\*100

Where:

APR<sub>MSY, X</sub> = actual percent reduction for MSY, for pollutant X

BY<sub>X</sub> = base year emissions for pollutant X

RED<sub>MSY, X</sub> = control reductions for MSY, for pollutant X

X = either VOC or NO<sub>x</sub>

MSY = RFP milestone year

**Equation 3-6:**      **TPR**<sub>MSY, X</sub> = {[BY<sub>X</sub> – (BY<sub>X</sub> – TL<sub>MSY, X</sub>)] / (BY<sub>X</sub>)}\*100

Where:

TPR<sub>MSY, X</sub> = target percent reduction for MSY, for pollutant X

BY<sub>X</sub> = base year emissions for pollutant X

TL<sub>MSY, X</sub> = target level of emissions for MSY, for pollutant X

X = either VOC or NO<sub>x</sub>

MSY = RFP milestone year

**Equation 3-7:**      **PES**<sub>MSY, X</sub> = APR<sub>MSY, X</sub> – TPR<sub>MSY, X</sub>

Where:

PES<sub>MSY, X</sub> = percent surplus or shortfall for MSY, for pollutant X

APR<sub>MSY, X</sub> = actual percent reduction for MSY, for pollutant X

TPR<sub>MSY, X</sub> = target percent reduction for MSY, for pollutant X

X = either VOC or NO<sub>x</sub>

MSY = RFP milestone year

**Table 3-7: Summary of the 2011 DFW RFP NO<sub>x</sub> Substitution**

Line #	Description	NO <sub>x</sub>	VOC
Line 1	2002 base year emissions	625.29 tpd	495.21 tpd
Line 2	2011 post-control RFP EI	408.81 tpd	540.45 tpd
Line 3	Total actual reductions for 2002 to 2011 (Line 1 minus Line 2)	216.48 tpd	-45.24 tpd
Line 4	Percent actual reductions for 2002 to 2011 (percent Line 3 is of Line 1)*	34.62%	-9.14%
Line 5	2011 target RFP EI	496.07 tpd	467.65 tpd
Line 6	2011 total target reductions for 2002 to 2011 (Line 1 minus Line 5)	129.22 tpd	27.56 tpd
Line 7	Percent target reductions for 2002 to 2011 (percent Line 6 is of Line 1)*	20.67%	5.57%
Line 8	Percent surplus or shortfall (percent actual minus percent target, Line 4 minus Line 7)*	13.96%	-14.70%

Line #	Description	NO <sub>x</sub>	VOC
Line 9	Percent surplus of base year required for transfer (NO <sub>x</sub> percentage should be less than line 8)*	12.36%	14.71%
Line 10	Percent surplus for transfer in Line 9 converted to tons per day	77.29 tpd	Only NO <sub>x</sub> value required
Line 11	Percentage of target that comprises the amount for transfer in Line 10**	15.58%	15.58%
<b>Line 12</b>	<b>Tons equivalent to percent for transfer [Line 5 times (Line 11 divided by 100)]</b>	<b>77.29 tpd</b>	<b>72.86 tpd</b>

\* Percentage of base year emissions inventory

\*\* Percentage of milestone year target emissions inventory

**Table 3-8: Summary of the 2012 DFW RFP NO<sub>x</sub> Substitution**

Line #	Description	NO <sub>x</sub>	VOC
Line 1	2002 base year emissions	625.29 tpd	495.21 tpd
Line 2	2012 post-control RFP EI	398.00 tpd	532.49 tpd
Line 3	Total actual reductions for 2002 to 2012 (Line 1 minus Line 2)	227.29 tpd	-37.29 tpd
Line 4	Percent actual reductions for 2002 to 2012 (percent Line 3 is of Line 1)*	36.35%	-7.53%
Line 5	2012 target RFP EI	481.78 tpd	471.95 tpd
Line 6	2012 total target reductions for 2002 to 2012 (Line 1 minus Line 5)	143.51 tpd	23.26 tpd
Line 7	Percent target reductions for 2002 to 2012 (percent Line 6 is of Line 1)*	22.95%	4.70%
Line 8	Percent surplus or shortfall (percent actual minus percent target, Line 4 minus Line 7)*	13.40%	-12.23%
Line 9	Percent surplus of base year required for transfer (NO <sub>x</sub> percentage should be less than line 8)*	9.89%	12.24%
Line 10	Percent surplus for transfer in Line 9 converted to tons per day	61.86 tpd	Only NO <sub>x</sub> value required
Line 11	Percentage of target that comprises the amount for transfer in Line 10**	12.84%	12.84%
<b>Line 12</b>	<b>Tons equivalent to percent for transfer [Line 5 times (Line 11 divided by 100)]</b>	<b>61.68 tpd</b>	<b>60.60 tpd</b>

\* Percentage of base year emissions inventory

\*\* Percentage of milestone year target emissions inventory

### 3.5.2 RFP Demonstration

RFP demonstration calculations were completed for the 2011 and 2012 milestone years. Tables 3-9: *Summary of the 2011 DFW RFP Demonstration (tons per day)* and 3-10: *Summary of the 2012 DFW RFP Demonstration (tons per day)* summarize the demonstration of the RFP plan for the 2011 and 2012 milestone years. All RFP calculations, including the required reductions, the fleet turnover correction factor, and the target emissions levels, are calculated and shown in

Appendix 1. Details of the emissions reductions used to calculate the creditable RFP control reductions for each milestone year are documented in Chapter 4 and summarized in Tables 4-1: *Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2002 through 2008 (tons per day)*, 4-2: *Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2008 through 2011 (tons per day)*, and 4-3: *Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2011 through 2012 (tons per day)*.

This SIP revision demonstrates reasonable further progress toward attainment of the 1997 eight-hour ozone standard for both the 2011 and 2012 milestone years. This SIP revision also demonstrates contingency for the 2011 milestone year as well as the 2012 attainment year.

**Table 3-9: Summary of the 2011 DFW RFP Demonstration (tons per day)**

Line #	Description	NO <sub>x</sub>	VOC
Line 1	Uncontrolled emissions forecast with growth	1168.59	823.46
Line 2	Creditable RFP control reductions for five new counties 2008	80.59	25.89
Line 3	Creditable RFP control reductions for four existing counties 2008	408.21	202.96
Line 4	Creditable RFP control reductions 2008 to 2011	270.99	54.17
Line 5	Post-control RFP emissions forecast (Line 1 minus Line 2 minus Line 3 minus Line 4)	408.81	540.45
Line 6	Amount of NO <sub>x</sub> reduction substitution	77.29	-72.86
Line 7	Post-control RFP forecast accounting for NO <sub>x</sub> substitution (Line 5 plus Line 6)	486.09	467.59
Line 8	2011 RFP target level of emissions	496.07	467.65
Line 9	Surplus (+) / Shortfall (-) (Line 8 minus Line 7)	+9.98	+0.06
Line 10	<b>Is post-control RFP emissions inventory less than target level of emissions?</b>	<b>Yes</b>	<b>Yes</b>

Notes: The five new counties are the counties added to the DFW nonattainment area under the 1997 eight-hour ozone standard (Ellis, Johnson, Kaufman, Parker, and Rockwall Counties). The four existing counties are those designated nonattainment under the one-hour and eight-hour ozone standards (Collin, Dallas, Denton, and Tarrant Counties).

**Table 3-10: Summary of the 2012 DFW RFP Demonstration (tons per day)**

Line #	Description	NO <sub>x</sub>	VOC
Line 1	Uncontrolled emissions forecast with growth	1194.94	846.38
Line 2	Creditable RFP control reductions for 2008 to 2011	759.79	283.01
Line 3	Creditable RFP control reductions 2011 to 2012	56.07	30.87
Line 4	Post-control RFP emissions forecast (Line 1 minus Line 2 minus Line 3)	379.09	532.49
Line 5	Amount of creditable reductions reserved for milestone year 2011 contingency	18.91	0.00
Line 6	Amount of NO <sub>x</sub> reduction substitution	61.86	-60.60
Line 7	Post-control RFP forecast without reductions reserved for contingency and accounting for NO <sub>x</sub> substitution (Line 4 plus Line 5 plus Line 6)	459.86	471.89
Line 8	2012 RFP target level of emissions	481.78	471.95

Line #	Description	NO <sub>x</sub>	VOC
Line 9	Surplus (+) / Shortfall (-) (Line 8 minus Line 7)	+21.92	+0.05
Line 10	Is post-control RFP emissions inventory less than target level of emissions?	Yes	Yes

## CHAPTER 4: CONTROL MEASURES TO ACHIEVE TARGET LEVELS

### 4.1 OVERVIEW OF CONTROL MEASURES

This chapter describes the methods used to achieve the emissions reductions in volatile organic compounds (VOC) and nitrogen oxides (NO<sub>x</sub>) required to demonstrate reasonable further progress (RFP) for the Dallas-Fort Worth (DFW) nonattainment area (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, and Tarrant Counties). The projected emissions reductions reflect the identified federal and state emissions controls. All state control measures are codified in regulations for the State of Texas. Control measures used for RFP do not include all emission reduction programs for the DFW area. Only the controls used to meet the DFW RFP requirements for 2011 and 2012 are presented in Tables 4-1: *Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2002 through 2008 (tons per day)*, 4-2: *Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2008 through 2011 (tons per day)*, and 4-3: *Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2011 through 2012 (tons per day)*. Individual and total values shown in the summary tables have been extracted from the spreadsheet in Appendix 1: *Dallas-Fort Worth Nonattainment Area Reasonable Further Progress Demonstration Calculations Spreadsheet*. All values represent the numbers rounded to two significant figures. Since the totals in the tables are taken directly from the spreadsheet and rounded rather than summed from the rounded values in the table, there may be rounding discrepancies for the total values.

**Table 4-1: Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2002 through 2008 (tons per day)**

Control Strategy Description	NO <sub>x</sub> Reductions	VOC Reductions
Chapter 117 NO <sub>x</sub> point source controls	35.93	0.00
Coating/printing rules	0.00	0.15
Portable fuel containers	0.00	1.86
Tier 1 Federal Motor Vehicle Control Program (FMVCP); Federal reformulated gasoline (RFG); Inspection and maintenance (I/M); anti-tampering; National Low Emissions Vehicles Program; Tier 2 FMVCP; 2007 heavy duty diesel FMVCP; On-road Texas low emission diesel (TxLED)	396.98	157.39
Tier I and II locomotive NO <sub>x</sub> standards	8.11	0.12
Small non-road spark-ignition (SI) phase I	-2.62	28.07
Heavy duty non-road engines	17.51	4.58
Tier 2 and 3 non-road diesel engines	12.73	3.30
Small non-road SI engines (phase II)	1.66	22.67
Large non-road SI & recreational marine	12.92	6.38
Non-road TxLED	5.64	0.00
Drilling rig TxLED	0.00	0.00
Non-road RFG	-0.71	3.87
Tier 4	0.00	0.00
Diesel recreational marine	0.00	0.00
Small SI phase III	0.00	0.45

Control Strategy Description	NO <sub>x</sub> Reductions	VOC Reductions
Chapter 117 NO <sub>x</sub> area source engine controls	0.00	0.00
TERP (non-road and locomotive)	0.65	0.00
<b>Sum of incremental reductions from projected uncontrolled emissions</b>	<b>488.80</b>	<b>228.84</b>

Notes: The negative emissions number in the New Non-Road Mobile SI Engines is attributed to fleet growth in light of more stringent standards. 2002 and 2008 NO<sub>x</sub> and VOC emissions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

**Table 4-2: Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2008 through 2011 (tons per day)**

Control Strategy Description	NO <sub>x</sub> Reductions	VOC Reductions
Chapter 117 NO <sub>x</sub> point source controls	7.14	0.00
Coating/printing rules	0.00	0.01
Portable fuel containers	0.00	2.09
Tier 1 FMVCP; RFG, I/M; anti-tampering; National Low Emissions Vehicles Program; Tier 2 FMVCP; 2007 heavy duty diesel FMVCP; On-road TxLED	113.84	46.83
Tier I and II locomotive NO <sub>x</sub> standards	1.14	0.06
Small non-road SI phase I	-0.49	1.56
Heavy duty non-road engines	1.98	0.72
Tier 2 and 3 non-road diesel engines	7.27	1.06
Small non-road SI engines (phase II)	0.43	4.75
Large non-road SI & recreational marine	7.07	-5.91
Non-road TxLED	0.15	0.00
Drilling rig TxLED	1.16	0.00
Non-road RFG	-0.11	0.49
Tier 4	0.59	0.05
Diesel recreational marine	0.00	0.00
Small SI phase III	0.42	2.46
Chapter 117 NO <sub>x</sub> area source engine controls	128.14	0.00
TERP (non-road and locomotive)	2.26	0.00
<b>Sum of incremental reductions from projected uncontrolled emissions</b>	<b>270.99</b>	<b>54.17</b>

Note: The negative emissions number in the New Non-Road Mobile SI Engines is attributed to fleet growth in light of more stringent standards.

**Table 4-3: Summary of DFW NO<sub>x</sub> and VOC Incremental Emissions Reductions from Control Strategies for 2011 through 2012 (tons per day)**

Control Strategy Description	NO <sub>x</sub> Reductions	VOC Reductions
Chapter 117 NO <sub>x</sub> point source controls	0.15	0.00
Coating/printing rules	0.00	0.00
Portable fuel containers	0.00	0.74
Tier 1 FMVCP; RFG; I/M; anti-tampering; National Low Emissions Vehicles Program; Tier 2 FMVCP; 2007 heavy duty diesel FMVCP; On-road TxLED	40.39	14.90
Tier I and II locomotive NO <sub>x</sub> standards	2.25	0.14
Small non-road SI phase I	-0.06	0.54
Heavy duty non-road engines	0.82	0.23
Tier 2 and 3 non-road diesel engines	2.34	0.34
Small non-road SI engines (phase II)	0.07	0.85
Large non-road SI & recreational marine	2.50	10.29
Non-road TxLED	-0.02	0.00
Drilling rig TxLED	-0.08	0.00
Non-road RFG	0.00	0.11
Tier 4	1.21	0.10
Diesel recreational marine	0.00	0.00
Small SI phase III	0.37	2.63
Chapter 117 NO <sub>x</sub> area source engine controls	6.13	0.00
Texas Emission Reduction Program (non-road and locomotive)	0.00	0.00
<b>Sum of incremental reductions from projected uncontrolled emissions</b>	<b>56.07</b>	<b>30.87</b>

Notes: The negative emissions number in the New Non-Road Mobile SI Engines is attributed to fleet growth in light of more stringent standards.

## 4.2 POINT SOURCE CONTROLS

Point source controls were calculated using the point source emissions inventory. Emissions reductions required by state rules were incorporated into future year projections for post-control inventories. Point source controls are detailed in Appendix 1. Primary NO<sub>x</sub> reductions strategies are detailed in the 30 Texas Administrative Code Chapter 117 rules. Affected source categories include: electric generating units; cement kilns; heaters and furnaces; internal combustion engines; and industrial boilers. VOC reductions from surface coating regulation were applied to the five additional nonattainment counties (Ellis, Johnson, Kaufman, Parker, and Rockwall Counties). These surface coating regulations were in effect in the other four counties (Collin, Dallas, Denton, and Tarrant Counties) prior to 2002. The summary of uncontrolled and post-control emissions for point sources in the DFW nonattainment area may be found in Tables 4-4: *DFW RFP 2008 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, 4-5: *DFW RFP 2011 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, and 4-6: *DFW RFP 2012 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*.

**Table 4-4: DFW RFP 2008 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	85.14	31.34
RFP Point Source Reduction	35.93	0.15
RFP Post-Control Emissions	49.21	31.19

Note: 2008 NO<sub>x</sub> and VOC emissions and control reductions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area.

**Table 4-5: DFW RFP 2011 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	105.86	39.89
RFP Point Source Reduction	43.07	0.16
RFP Post-Control Emissions	62.79	39.73

**Table 4-6: DFW RFP 2012 Point Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	102.10	40.74
RFP Point Source Reduction	43.23	0.16
RFP Post-Control Emissions	58.87	40.58

### 4.3 AREA SOURCE CONTROLS

Area source controls were calculated using the area source emissions inventory. Emissions reductions required by state and federal rules were incorporated into the future year projections for post-control inventories. Primary NO<sub>x</sub> emissions reduction strategies are detailed in Chapter 117 rules controlling emissions from stationary internal combustion reciprocating engines at minor sources. Compliance dates for the rules were in 2009 and 2010. Post-control emissions were determined by applying the emissions specifications for attainment demonstration. Area source VOC emissions reductions for this RFP demonstration are derived from the federal portable fuel container rule.

To develop the post-control emissions, rule effectiveness factors were applied for respective source categories. Post-control emissions were then projected in the same manner as uncontrolled sources. The summary of uncontrolled and RFP post-control emissions for area sources in the DFW nonattainment area may be found in Table 4-7: *DFW RFP 2008 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, 4-8: *DFW RFP 2011 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, and 4-9: *DFW RFP 2012 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*.

**Table 4-7: DFW RFP 2008 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	150.39	323.59
RFP Area Source Reduction	0.00	3.15
RFP Post-Control Emissions	150.39	320.44

Note: 2008 NO<sub>x</sub> and VOC emissions and control reductions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area. Emissions credit is not taken for all post-control reductions for the RFP demonstration; therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

**Table 4-8: DFW RFP 2011 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	168.66	352.63
RFP Area Source Reduction	128.10	5.99
RFP Post-Control Emissions	40.56	346.64

Note: Emissions credit is not taken for all post-control reductions for the RFP demonstration; therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

**Table 4-9: DFW RFP 2012 Area Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	175.61	362.95
RFP Area Source Reduction	134.27	6.80
RFP Post-Control Emissions	41.34	356.15

Note: Emissions credit is not taken for all post-control reductions for the RFP demonstration; therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

#### 4.4 NON-ROAD MOBILE SOURCE CONTROLS

Most non-road mobile source emissions were calculated using a Texas-specific version of the EPA's NONROAD 2008a model, called the Texas NONROAD (TexN) model. Although operating the EPA's model with all of the default surrogates is acceptable, the EPA encourages states to update the model with local, county-level data based on surveys and other relevant information. The TexN model is a software tool for developing emissions estimates for non-road mobile sources in Texas using county-specific activity data. The model allows air quality planning staff to replace the EPA's default data with local bottom-up data. Local, county-level data are incorporated into the TexN model as the information becomes available.

Emissions from the remaining non-road mobile sources that are not included in the EPA NONROAD model—locomotives, aircraft and ground support equipment (GSE), and oilfield drilling rigs—were calculated outside of the EPA NONROAD 2008a model using EPA-approved methodologies. Control strategies reductions for milestone years 2011 and 2012 are summarized in Tables 4-1, 4-2, and 4-3. Summaries of all non-road mobile source RFP emissions inventories are presented in Tables 4-10: *DFW RFP 2008 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, 4-11: *DFW RFP 2011 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, and 4-12 *DFW*

*RFP 2012 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day).*

In addition to the controls applied from the non-road mobile source category, this plan includes a portion of the non-road emissions reductions from the Texas Emission Reduction Plan (TERP) that occurred in the DFW nonattainment area in 2008, 2009, and 2010.

**Table 4-10: DFW RFP 2008 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	186.67	130.73
RFP Non-Road Source Reduction	56.38	67.93
RFP Post-Control Emissions	130.29	62.80

Note: 2008 NO<sub>x</sub> and VOC emissions and control reductions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area. Emissions credit is not taken for all post-control reductions for the RFP demonstration; therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

**Table 4-11: DFW RFP 2011 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	186.20	137.18
RFP Non-Road Source Reduction	74.77	85.20
RFP Post-Control Emissions	111.44	51.98

Notes: Emissions credit is not taken for all post-control reductions for the RFP demonstration; therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

**Table 4-12: DFW RFP 2012 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	188.40	141.36
RFP Non-Road Source Reduction	84.17	91.52
RFP Post-Control Emissions	104.23	49.84

Notes: Emissions credit is not taken for all post-control reductions for the RFP demonstration; therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

#### **4.4.1 NONROAD Model Categories**

For the DFW RFP SIP revision, the TexN model was run using county-specific population and activity files, where available. In some cases, custom allocation and technology type data files were also used. The technology type file identifies what percent of an equipment population is expected to use federal non-road equipment controls for the year of interest. The effects of federal and state control programs were evaluated. The TexN model was run for ozone season daily emissions for 2002, 2008, 2011, 2012, and 2013. To evaluate RFP requirements, a series of TexN model runs was performed for both uncontrolled and post-control scenarios for each federal and state control program and each analysis year. The documentation and procedures of applicable federal and state rules that were modeled is located in Appendix 4: *Development of*

*Reasonable Further Progress Non-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area: Source Categories in the United States Environmental Protection Agency's NONROAD Model.* The emissions inventories developed include county-level ozone season day uncontrolled and post-control emissions estimates for 2002, 2008, 2011, 2012, and 2013 for the DFW nonattainment area.

Once the individual uncontrolled and post-control emissions estimates were generated by the TexN model, the effectiveness of control strategies for each year of interest was evaluated. Emissions reductions from individual federal and state controls for non-road equipment were calculated by subtracting the post-control emissions estimates from the uncontrolled emissions estimates.

#### **4.4.2 Non-Road Categories Not Included in the EPA NONROAD Model**

Emissions from the non-road mobile sources that are not included in the EPA's NONROAD model include locomotives, aircraft and GSE, and oilfield drilling rigs. Emissions for those source categories were calculated using alternate methods. Locomotive emissions were developed by contract with E.H. Pechan and Associates, Inc. for the *Development of Locomotive and Commercial Marine Emissions Inventory 1990 through 2040* study. The emissions inventories developed include county level ozone season day uncontrolled and post-control emissions estimates for 2002, 2008, 2011, 2012, and 2013, for the nine-county DFW nonattainment area. Emissions for aircraft and GSE were calculated using the Federal Aviation Administration Emissions and Dispersion Modeling System, version 5.1. Oilfield drilling rig emissions were developed by contract using drilling permit data from the Railroad Commission of Texas.<sup>16</sup>

#### **4.4.3 Texas Emissions Reduction Plan (Non-Road and Locomotive)**

The TCEQ has incorporated emissions reductions from TERP into the DFW RFP SIP revision. TERP provides financial incentives to eligible individuals, businesses or local governments to reduce emissions from polluting vehicles and equipment. TERP was established by the 77th Texas Legislature in 2001, through enactment of [Senate Bill \(SB\) 5](http://www.legis.state.tx.us/tlodocs/77R/billtext/html/SB00005F.htm) (<http://www.legis.state.tx.us/tlodocs/77R/billtext/html/SB00005F.htm>). TERP includes a number of voluntary financial incentive programs, as well as other assistance programs, to help improve the air quality in Texas.

The emissions reductions incorporated into this SIP revision include a portion of the projected/expected emissions reductions from TERP-funded non-road and locomotive projects that became active beginning in 2008. The emissions reduction projections included in this SIP revision were validated based on the actual performance of those projects in 2008, 2009, and 2010.

### **4.5 ON-ROAD MOBILE SOURCE CONTROLS**

On-road mobile source emissions reductions estimates are provided in this section. In the previous SIP revision, MOBILE6.2 was used to develop the inventories and estimate control reductions presented. In March 2010, the EPA replaced the MOBILE6.2 model with MOVES as the official emission factor model for developing on-road mobile source category emissions

---

<sup>16</sup> Eastern Research Group, Inc., "Oil and Gas Exploration – Drilling Rig Engines," TCEQ Contract No. 582-07-83985, Work Order No. 582-07-83985-FY09-01, July 15, 2009.

inventories. The on-road mobile source emissions reductions based on MOVES are provided in Section 4.5.1: *MOVES-Based On-Road Mobile Source Controls*.

#### 4.5.1 MOVES-Based On-Road Mobile Source Controls

The on-road mobile source emissions inventories documented in Appendix 8: *Development of Reasonable Further Progress On-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area* include quantification of emissions reductions for all federal and state on-road mobile source control rules for each RFP milestone year for the DFW nonattainment area. A summary of the on-road mobile source controls included in the 2008, 2011, 2012, and 2013 RFP emissions inventories is presented in Table 4-13: *On-Road Mobile Control Programs Modeled for 2008, 2011, 2012, and 2013 RFP Control Scenarios*. The RFP reductions due to the control strategies for 2008, 2011, and 2012 are summarized Tables 4-1, 4-2, and 4-3. The summary of 2008, 2011, and 2012 uncontrolled and post-control emissions for on-road mobile sources in the DFW nonattainment area may be found in Tables 4-14: *DFW RFP 2008 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, 4-15: *DFW RFP 2011 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*, and 4-16: *DFW RFP 2012 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)*.

**Table 4-13: On-Road Mobile Control Programs Modeled for 2008, 2011, 2012, and 2013 RFP Control Scenarios**

Control Program Description	Strategy Notes	Year Control Program Started	Creditable for RFP
Pre-1990 FMVCP	Pre-1990 Control	Pre-1990	No
1992 Federal Controls on Gasoline Volatility	Pre-1990 Control. Maximum Reid Vapor Pressure of 7.8 pounds per square inch	1992	No
Anti-Tampering Program (Dallas and Tarrant counties only)	No Strategy Note	1986	Yes
I/M Program (Dallas and Tarrant counties only)	No Strategy Note	1990	Yes
Tier 1, FMVCP	No Strategy Note	1994	Yes
Reformulated Gasoline	Use EPA method to model rather than the RFG toggle	1995 for Phase One, 2000 for Phase Two	Yes
National Low Emission Vehicle Program	No Strategy Note	2001	Yes
Expanded I/M and ATP	Expanded to Collin, Denton counties	2002	Yes
Expanded I/M and ATP	Expanded to Five New Counties	2003	Yes
Tier 2, FMVCP	Phase in 2004 to 2009	2004	Yes

Control Program Description	Strategy Notes	Year Control Program Started	Creditable for RFP
TxLED	15 parts per million maximum for sulfur. Low aromatic hydrocarbon and high cetane number to control NO <sub>x</sub>	2006	Yes
Federal Low-Sulfur Highway Diesel	15 parts per million maximum sulfur content	2006	Yes
2007 Heavy duty FMVCP	Phase in 2007 to 2010	2007	Yes
TERP	Post process calculation	2003	Yes

**Table 4-14: DFW RFP 2008 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	632.28	262.06
RFP On-Road Source Reduction	396.98	157.40
RFP Post-Control Emissions	235.30	104.67

Notes: 2008 NO<sub>x</sub> and VOC emissions and control reductions are given for the total nine-county DFW nonattainment area. See Appendix 1 for emissions separated between the four original and five additional counties of the DFW 1997 eight-hour ozone standard nonattainment area. Emissions credit is not taken for all post-control reductions for the RFP demonstration. Therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

**Table 4-15: DFW RFP 2011 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	707.87	293.76
RFP On-Road Source Reduction	510.82	204.22
RFP Post-Control Emissions	197.05	89.54

Notes: Emissions credit may not be taken for all post-control reductions for the RFP demonstration. Therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

**Table 4-16: DFW RFP 2012 On-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

Emissions	NO <sub>x</sub>	VOC
Uncontrolled Emissions	728.83	301.33
RFP On-Road Source Reduction	551.21	219.13
RFP Post-Control Emissions	177.63	82.20

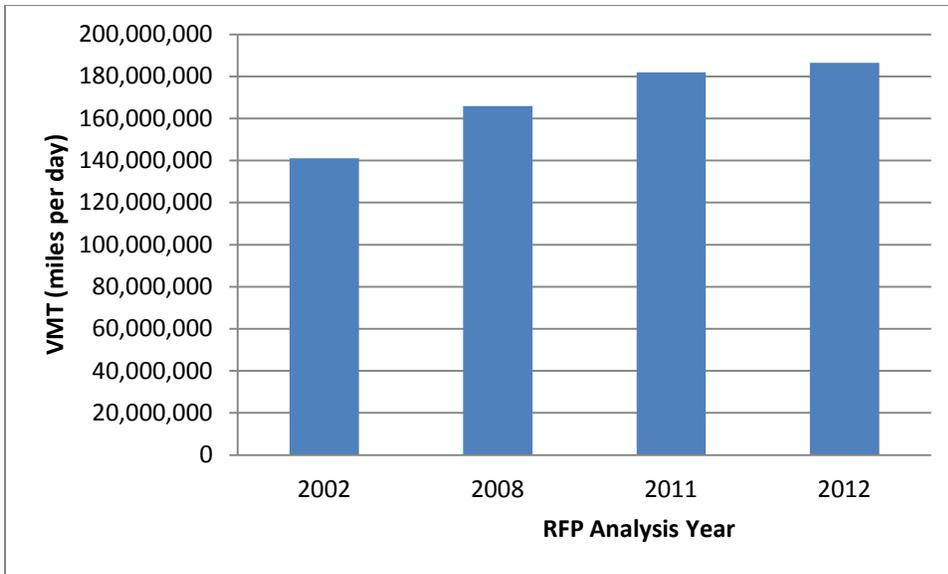
Notes: Emissions credit may not be taken for all post-control reductions for the RFP demonstration. Therefore, the RFP post-control emissions may not be equal to the projected post-control emissions inventory.

#### 4.6 VEHICLE MILES TRAVELED, ON-ROAD EMISSIONS, AND TRANSPORTATION CONTROL MEASURES

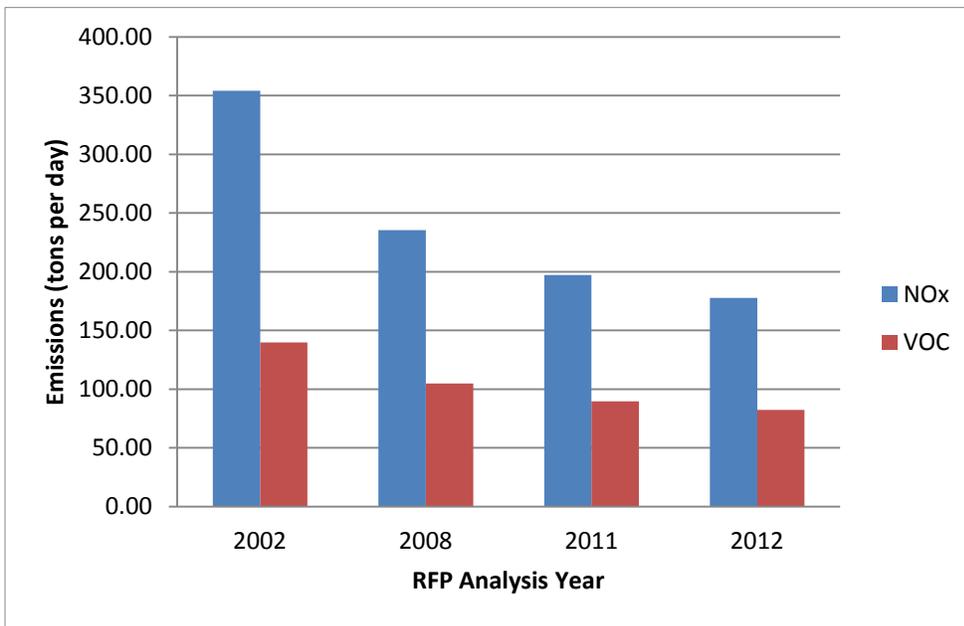
Transportation control measures (TCMs) are required to offset growth in vehicle miles traveled (VMT) that results in an increase in vehicle emissions for nonattainment areas classified as serious under the National Ambient Air Quality Standard for ozone. The TCMs are, therefore, part of the overall control strategy for the DFW nonattainment area and are documented in the DFW Attainment Demonstration SIP Revision for the 1997 Eight-Hour Ozone Standard (Project No. 2010-022-SIP-NR). There is growth in VMT for the DFW area for the years between the 2002 RFP base year and the 2012 attainment year, as illustrated in Figure 4-1: *RFP VMT Trends*; however, the growth in VMT for the area is more than offset by control measures that reduce the per mile emissions rates, resulting in a decrease in both NO<sub>x</sub> and VOC emissions for the same time period as shown in Figure 4-2: *RFP Post-Control On-Road NO<sub>x</sub> and VOC Emissions Trends*. The increase in VMT and decrease in vehicle emissions for the RFP time period are summarized in Table 4-17: *DFW RFP On-Road Mobile Post-Control NO<sub>x</sub> Emissions, VOC Emissions, and Vehicle Miles Traveled*. The values shown in Table 4-17 are documented in the emissions inventory development report and may be found in Exhibit 2-9 *Reasonable Further Progress Emissions Inventory, Dallas-Fort Worth Nonattainment Area, All Counties, Vehicle Miles Travel (thousands)* of Appendix 8. The control measures used to achieve the on-road mobile source RFP emissions reductions, and to demonstrate RFP requirements, do not include TCMs for this DFW RFP SIP revision. TCMs may be needed to meet RFP requirements for the area and are included as part of the control strategy for the DFW attainment demonstration SIP revision for the 1997 eight-hour ozone standard.

**Table 4-17: DFW RFP On-Road Mobile Post-Control NO<sub>x</sub> Emissions, VOC Emissions and Vehicle Miles Traveled**

RFP Milestone Year	NO <sub>x</sub> (tons per day)	VOC (tons per day)	VMT (miles per day)
2002	354.01	139.70	141,011,956
2008	235.30	104.67	165,898,504
2011	197.05	89.54	181,923,319
2012	177.63	82.20	186,387,869



**Figure 1 : RFP VMT Trends**



**Figure 2: RFP Post-Control On-Road NO<sub>x</sub> and VOC Emissions Trends**

#### 4.7 CONTINGENCY MEASURES

In the event of a milestone failure, contingency control measures estimated to reduce emissions by an additional 3% between each milestone year and the next calendar year are required. As with the 3% per year reduction requirement, the 3% contingency requirement is based on the adjusted base year (ABY) and may be met using VOC and/or NO<sub>x</sub> reductions. This SIP revision contains a milestone year RFP contingency demonstration and an attainment year RFP contingency demonstration. Table 4-18: *DFW RFP Contingency Demonstration for the 2011 Milestone Year (tons per day)* shows the milestone year 2011 contingency, for which the 3% contingency analysis is based on a 3% reduction in NO<sub>x</sub>, with no reductions coming from VOC, to be achieved between 2011 and 2012. Reductions needed for milestone year contingency were reserved from the 2012 milestone year target reductions. The milestone year contingency reductions are subtracted from creditable control reductions for milestone year 2012 to account for the contingency requirements for the 2011 milestone year. If the RFP milestone year requirement is met for 2011, the contingency reductions designated for the 2011 milestone year will be available to be used as contingency reductions for the attainment year RFP contingency demonstration.

**Table 4-18: DFW RFP Contingency Demonstration for the 2011 Milestone Year (tons per day)**

Contingency Demonstration Description	NO <sub>x</sub>	VOC
2012 ABY emissions inventory	630.46	481.97
Percent for milestone year 2011 contingency calculation (total of 3%)	3.00	0.00
2011 to 2012 required contingency reductions (ABY emissions inventory x (contingency percent))	18.91	0.00
<b>Control reductions to meet contingency requirements</b>		
Reserved surplus reductions from 2011 RFP demonstration	18.91	0.00
Subtract 2011 motor vehicle emissions budget safety margin from surplus reductions from 2011 RFP demonstration	0.00	0.00
Unspecified control	0.00	0.00
Total contingency reductions	18.91	0.00
Contingency Surplus (+) or Shortfall (-)	0.00	0.00
<b>Are contingency reductions greater than required contingency reduction?</b>	<b>Yes</b>	<b>Yes</b>

The 3% attainment year RFP contingency analysis is based on a 3% reduction in NO<sub>x</sub>, with no emissions reductions coming from VOC, to be achieved between 2012 and 2013. Emissions inventory analyses were performed on the fleet turnover effects for the federal emissions certification programs for on-road and non-road vehicles. The emissions reductions for the year from 2012 to 2013 were estimated for those programs. Post-control emissions reductions not previously used in the 2012 milestone year demonstration may also be used to satisfy contingency requirements, so the surplus emissions reductions from the 2012 RFP demonstration are included in the contingency analysis. This RFP SIP revision provides for a 10% NO<sub>x</sub> motor vehicle emissions budget safety margin using some of the surplus emissions reductions from the 2012 RFP demonstration; those emissions are subtracted from the amount available to demonstrate RFP contingency for the 2012 attainment year. A summary of the 2012 attainment year RFP contingency analysis is provided in Table 4-19: *DFW RFP Contingency Demonstration for the 2012 Attainment Year (tons per day)*. The analysis demonstrates that

the attainment year RFP contingency reductions exceed the 3% reduction requirement; therefore, the RFP contingency requirement is fulfilled for the DFW area.

**Table 4-19: DFW RFP Contingency Demonstration for the 2012 Attainment Year (tons per day)**

Contingency Element Description	NO <sub>x</sub>	VOC
2012 ABY EI	630.46	481.97
Percent for contingency calculation (total of 3%)	3.00	0.00
2012 to 2013 required contingency reductions (ABY EI x (contingency percent))	18.91	0.00
<b>Control reductions to meet contingency requirements</b>		
Surplus reductions from 2012 RFP demonstration	21.92	0.05
Subtract 2012 RFP demonstration motor vehicle emissions budget safety margin from surplus reductions from 2012 RFP demonstration	-17.76	0.00
Federal Motor Vehicle Control Program (FMVCP), inspection and maintenance (I/M), reformulated gasoline (RFG)*, and on-road TxLED	33.22	10.01
Federal non-road mobile new vehicle certification standards	7.45	5.48
Non-road RFG	-0.01	0.08
Non-road TxLED	0.41	0.00
Federal locomotive standards	0.53	0.05
Total RFP demonstration contingency reductions	45.75	15.67
<b>Contingency Surplus (+) or Shortfall (-)</b>	<b>+26.84</b>	<b>+15.67</b>

\*This list of controls is the complete list for the nine DFW counties; however, RFG is required, and all control reductions are modeled with RFG, only in the four core counties.

## **CHAPTER 5: MOTOR VEHICLE EMISSIONS BUDGETS**

### **5.1 INTRODUCTION**

The Dallas-Fort Worth (DFW) reasonable further progress (RFP) state implementation plan (SIP) revision establishes motor vehicle emissions budgets (MVEBs), setting the allowable on-road mobile emissions that an area can produce while continuing to demonstrate RFP. The DFW RFP MVEBs are calculated by subtracting the on-road mobile source control strategies emissions reductions necessary to demonstrate RFP from the uncontrolled, projected on-road mobile source emissions for RFP milestone years. Local transportation planning organizations use the MVEBs to demonstrate that projected emissions from transportation plans, programs, and projects are equal to or less than the MVEBs, as required by the federal transportation conformity rule.

### **5.2 OVERVIEW OF METHODOLOGIES AND ASSUMPTIONS**

The TCEQ developed updated on-road mobile source emissions inventories and control strategies reductions estimates using the latest planning assumptions and the newest version of the EPA's emission factor model, MOVES2010a. Updated emissions inventory development included development of a 2002 base year emissions inventory, adjusted base-year emissions inventories for 2008, 2011, and 2012, uncontrolled milestone year emissions inventories for 2011 and 2012, post-control milestone year emissions inventories for 2011 and 2012, and control strategies reduction estimates for 2008, 2011, 2012, and 2013. The TCEQ contracted the North Central Texas Council of Governments (NCTCOG) to develop the RFP emissions inventories and control strategies reductions. Detailed documentation of the on-road mobile emissions inventory development is provided in the NCTCOG contractor report in Appendix 8: *Development of Reasonable Further Progress On-Road Mobile Source Emissions Inventories for the Dallas-Fort Worth Nonattainment Area*.

### **5.3 MOTOR VEHICLE EMISSIONS BUDGETS FOR RFP MILESTONE YEARS**

The RFP MVEBs reflect the on-road mobile source emissions inventories for RFP milestone years, the on-road mobile source reductions strategies used to demonstrate RFP, and a transportation conformity safety margin, where one is used. A transportation conformity safety margin is allowed when there is a surplus of emissions reductions beyond those required to demonstrate RFP for a milestone year. The amount of the safety margin must be less than the total in surplus emissions reductions for nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC); therefore, even if the safety margin is used for a transportation conformity determination, the DFW nonattainment area will meet the 1997 eight-hour ozone standard RFP requirements for all milestone years. Summaries for MVEB calculations for each RFP milestone year are presented in Tables 5-1: *2011 RFP Motor Vehicle Emissions Budgets for the DFW Ozone Nonattainment Area (tons per day)* and 5-2: *2012 RFP Motor Vehicle Emissions Budgets for the DFW Ozone Nonattainment Area (tons per day)*. Details for MVEB calculations are documented in Appendix 1: *Dallas-Fort Worth Nonattainment Area Reasonable Further Progress Demonstration Calculations Spreadsheet*.

The RFP control strategy produces more than the required NO<sub>x</sub> emissions reductions for each milestone year; therefore, 10% of the 2012 surplus NO<sub>x</sub> emissions reductions are used to provide a budget safety margin. The safety margin is set to zero in the VOC and NO<sub>x</sub> calculations for the 2011 MVEB and in the VOC calculations for the 2012 MVEB.

**Table 5-1: 2011 RFP Motor Vehicle Emissions Budgets for the DFW Ozone Nonattainment Area (tons per day)**

Control Strategy Description	NO <sub>x</sub>	VOC
2011 on-road emissions projection without post-1990 FCAA controls	707.87	293.76
<b>2011 On-Road Mobile RFP Controls</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>
Tier 1 FMVCP; RFG; I/M Program; Tier 2 FMVCP; 2007 heavy duty diesel FMVCP; On-road TxLED	510.82	204.22
2011 on-road emissions projection with post-1990 FCAA controls (uncontrolled emissions inventory minus control reductions)	197.05	89.54
Add transportation conformity safety margin	0.00	0.00
2011 RFP MVEBs	197.05	89.54

Note: Although the 2011 RFP reductions exceed the required emission reductions, no surplus emissions are used to provide a safety margin for 2011. The safety margin is set to zero.

**Table 5-2: 2012 RFP Motor Vehicle Emissions Budgets for the DFW Ozone Nonattainment Area (tons per day)**

Control Strategy Description	NO <sub>x</sub>	VOC
2012 on-road emissions projection without post-1990 FCAA controls	728.83	301.33
<b>2012 On-Road Mobile RFP Controls</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>
Tier 1 FMVCP; RFG; I/M Program; Tier 2 FMVCP; 2007 heavy duty diesel FMVCP; On-road TxLED	551.21	219.13
2012 on-road emissions projection with post-1990 FCAA controls (uncontrolled inventory minus control reductions)	177.63	82.20
Add transportation conformity safety margin	17.76	0.00
2012 RFP MVEBs	195.39	82.20

Note: The 2012 RFP reductions exceed the required NO<sub>x</sub> emission reductions; therefore, 10% of the surplus emissions are used to provide a NO<sub>x</sub> safety margin for 2012. The safety margin for VOC is set to zero.

## REFERENCES FOR GUIDANCE DOCUMENTS

EPA, 1992. "Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources." EPA420-R-92-009, December 1992, U.S. Environmental Protection Agency, Emission Planning and Strategies Division, Office of Mobile Sources and Technical Support Division, Office of Air Quality Planning and Standards.

EPA, 1993. "NO<sub>x</sub> Substitution Guidance." December 1993, US Environmental Protection Agency, Office of Air Quality and Planning Standards, Research Triangle Park, NC 27711.

EPA, 1994. "Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration," Corrected Version as of February 18, 1994. U.S. Environmental Protection Agency, Ozone/Carbon Monoxide Programs Branch, Office of Air Quality Planning and Standards. Research Triangle Park, NC 27711.

EPA, 1997. "Emission Factors for Locomotives." U.S. Environmental Protection Agency, Office of Transportation and Air Quality. EPA-420-F97-051, December 1997.

EPA. "Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans." U.S. Environmental Protection Agency, Ozone/Carbon Monoxide Programs Branch, Office of Air Quality Planning and Standards. Research Triangle Park, NC 27711.

EPA, 2002. "Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation." U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Transportation and Air Quality, January, 2002.

EPA, 2003. "User Guide for MOBILE6.1 and MOBILE6.2." Assessment and Standards Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, EPA420-R-03-001, August 2003.

EPA, 2005. "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations." EPA-454/R-05-001, Issued By: Emissions Inventory Group, Emissions, Monitoring and Analysis Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency. Research Triangle Park, NC 27711, August 2005.

EPA, 2005. "Geographic Allocation of Nonroad Engine Population Data to the State and County Level." EPA420-R-05-021 December 2005 NR-014d.  
<http://www.epa.gov/OMS/models/nonrdmdl/nonrdmdl2005/420r05021.pdf>.

EPA, 2005. "User's Guide for the Final NONROAD2005 Model." EPA420-R-05-013, December 2005. <http://www.epa.gov/otaq/nonrdmdl.htm>

EPA, 2009. "Draft Motor Vehicle Emission Simulator (MOVES) 2009, Software Design and Reference Manual." Assessment and Standards Division Office of Transportation and Air Quality U.S. Environmental Protection Agency, EPA420-B-09-007 March 2009.

EPA, 2009. "Frequently Asked Questions About NONROAD2008." EPA-420-F-09-021, April 2009. <http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2008/420f09021.pdf>

EPA, 2009. "Emission Factors for Locomotives." U.S. Environmental Protection Agency, Office of Transportation and Air Quality. EPA-420-F09-025, April 2009.

EPA, 2009. "EPA NONROAD Model Updates of 2008 "NONROAD2008". April 2009 International Emission Inventory Conference. EPA-420-F-09-020, April 2009.  
<http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2008/420f09020.pdf>

EPA, 2010. "Motor Vehicle Emissions Simulator (MOVES), User Guide for MOVES2010a." Assessment and Standards Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, EPA420-B-10-036, August 2010.

EPA, 2010. "Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity." Transportation and Regional Programs Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, EPA420-B-10-023, April 2010.

Federal Aviation Administration, 2009. Technical Guidance on the Use of Emissions and Dispersion Modeling System (EDMS) 5.1.2 for Emission Inventory modeling, Federal Aviation Administration (FAA), November 06, 2009.

Federal Register, Monday, June 2, 2003, Part II, Environmental Protection Agency, 40 CFR Part 51, Proposed Rule To Implement the Eight-Hour Ozone National Ambient Air Quality Standard; Proposed Rule.

Federal Register, Friday, April 30, 2004, Part II, Environmental Protection Agency, 40 CFR Parts 50, 51 and 81, [OAR 2003-0079, FRL-7651-7], RIN 2060-AJ99, Final Rule To Implement the 8-Hour Ozone National Ambient Air, Quality Standard-Phase 1.

Federal Register, Tuesday, November 29, 2005, Part II, Environmental Protection Agency, 40 CFR Parts 51, 52, and 80 Final Rule To Implement the 8-Hour Ozone National Ambient Air Quality Standard; Final Rule.

2008 National Emissions Inventory Data and Documentation, Nonpoint Sector:  
<http://www.epa.gov/ttn/chief/net/2008inventory.html#inventorydata>."

2008 Nonpoint Emissions Estimates, E. H. Pechan and Associates:  
<http://projects.pechan.com/EPA/Non-PointEmissionEstimates/index.html#SolventUsageSurfaceCoatings>

U.S. Department of Transportation, 2009. Federal Aviation Administration, *APO Terminal Area Forecast Detail Report*, [www.apo.data.faa.gov/wtaf](http://www.apo.data.faa.gov/wtaf), 2009.

*Appendices Available Upon Request*

Jamie Zech

[jamie.zech@tceq.texas.gov](mailto:jamie.zech@tceq.texas.gov)

512.237.3935