

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
**AGENDA ITEM REQUEST**  
for State Implementation Plan Revision Adoption

**AGENDA REQUESTED:** July 2, 2014

**DATE OF REQUEST:** June 13, 2014

**INDIVIDUAL TO CONTACT REGARDING CHANGES TO THIS REQUEST, IF NEEDED:** Joyce Spencer-Nelson, (512) 239-5017

**CAPTION: Docket No. 2013-1682-SIP.** Consideration of the adoption of the Emissions Inventory (EI) State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard (NAAQS) for the Houston-Galveston-Brazoria and Dallas-Fort Worth Areas.

The adopted SIP revision will satisfy the Federal Clean Air Act, §172(c)(3) and §182(a)(1) EI reporting requirements for the Houston-Galveston-Brazoria and Dallas-Fort Worth nonattainment areas under the 2008 eight-hour ozone NAAQS. States are required to submit a comprehensive, accurate, current EI from all relevant sources in ozone nonattainment areas within two years of the July 20, 2012 effective date of designations. (Brian Foster, Terry Salem) (Non-rule Project No. 2013-016-SIP-NR)

Steve Hagle, P.E.  
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**Copy to CCC Secretary? NO X YES**

# Texas Commission on Environmental Quality

## Interoffice Memorandum

**To:** Commissioners

**Date:** June 13, 2014

**Thru:** Bridget C. Bohac, Chief Clerk  
Richard A. Hyde, P.E., Executive Director

**From:** Steve Hagle, P.E., Deputy Director  
Office of Air

**Docket No.:** 2013-1682-SIP

**Subject:** Commission Approval for Adoption of the Emissions Inventory (EI) State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard (NAAQS) for the Houston-Galveston-Brazoria (HGB) and Dallas-Fort Worth (DFW) Areas Non-rule Project No. 2013-016-SIP-NR

### **Background and reason(s) for the SIP revision:**

The Federal Clean Air Act (FCAA) requires states to submit EI information for all relevant sources for each area designated nonattainment for a NAAQS. On March 12, 2008, the United States Environmental Protection Agency (EPA) lowered the eight-hour ozone NAAQS from 0.08 parts per million (ppm) to 0.075 ppm. Under the 0.075 ppm (75 parts per billion) standard, the EPA designated the HGB area, which includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, nonattainment with a marginal classification and the DFW area, which includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise Counties, nonattainment with a moderate classification, effective July 20, 2012. According to FCAA, §172(c)(3) and §182(a)(1), states are required to submit “a comprehensive, accurate, current inventory of actual emissions from all sources,” within two years of the effective date of nonattainment designations for the ozone NAAQS. Through the EPA’s *Implementation of the 2008 NAAQS for Ozone: State Implementation Plan Requirements; Proposed Rule* (proposed 2008 ozone standard SIP requirements rule), the EPA interprets these FCAA requirements to be due within two years of the July 20, 2012 effective date of designations for the 2008 eight-hour ozone NAAQS, which would be July 20, 2014 (78 FR 34178).

### **Scope of the SIP revision:**

#### **A.) Summary of what the SIP revision will do:**

This SIP revision satisfies the FCAA, §172 and §182 EI requirements for the HGB and DFW nonattainment areas under the 2008 eight-hour ozone NAAQS. As reinforced by the proposed 2008 ozone standard SIP requirements rule, the ozone nonattainment area base year EI submission is due no later than July 20, 2014 and then every three years thereafter (2017, 2020, etc.). The EPA’s proposed 2008 ozone standard SIP requirements rule recommends states use 2011 as the base year to fulfill the EI requirements. The year 2011 is also a year for a required EI submission under the existing Air Emissions Reporting Requirements (AERR) Rule. The 2011 AERR EI has been developed for many pollutants

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including ozone precursors, volatile organic compounds (VOC) and nitrogen oxides (NO<sub>x</sub>), from point, area, on-road mobile, and non-road mobile emissions source categories.

**B.) Scope required by federal regulations or state statutes:**

The FCAA requires that EIs be prepared for nonattainment areas generally, and provides for specific requirements that apply in ozone nonattainment areas. Because ozone is photochemically produced in the atmosphere when VOC mix with NO<sub>x</sub> in the presence of sunlight, the Texas Commission on Environmental Quality (TCEQ) must compile information on the important sources of these precursor pollutants. The EI identifies the source types present in an area, the amount of each pollutant emitted, and the types of processes and control devices employed at each plant or source category. The EIs provide data for a variety of air quality planning tasks including establishing baseline emission levels, calculating federally required emission reduction targets, emission inputs into air quality simulation models, and tracking emissions over time. The total inventory of emissions of VOC and NO<sub>x</sub> for an area is summarized from the estimates developed for four general categories of emissions sources: point, area, on-road mobile, and non-road mobile.

In accordance with the EPA's AERR, the National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air emissions of both criteria and hazardous air pollutants from all air emissions. As directed by the AERR, the NEI includes statewide coverage, including specific emissions data for the eight-hour ozone nonattainment areas in Texas. Annual and summer day emissions are reported on a three-year cycle for the AERR.

**C.) Additional staff recommendations that are not required by federal rule or state statute:**

None

**Statutory authority:**

The EI SIP revision is adopted under Texas Health and Safety Code, §382.002, Policy and Purpose; §382.011, General Powers and Duties; §382.012, State Air Control Plan; and §382.014, Emission Inventory. The EI SIP revision is also adopted under the commission's general authority under Texas Water Code, §5.102, General Powers and §5.105, General Policy.

**Effect on the:**

**A.) Regulated community:**

There will be no new effect on the regulated community. Regulated entities are already required to submit EI information to the TCEQ, which is used to develop EI data in accordance with federal requirements.

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**B.) Public:**

This SIP revision will have no new effect on the public.

**C.) Agency programs:**

This SIP revision will have no new effect on agency programs.

**Stakeholder meetings:**

No stakeholder meetings were held because there are no new rules proposed with this SIP revision.

**Public comment:**

The commission held public hearings on the proposed SIP revision in Houston on January 14, 2014 and in Arlington on January 16, 2014. Notice of public hearing was published in the *Texas Register* and the *Austin American-Statesman*, *Fort Worth Star-Telegram* and *Houston Chronicle* newspapers.

Oral comments were received at the Houston hearing from the Houston Regional Group of the Sierra Club (Sierra Club). Oral comments were received at the Arlington hearing from DFW Regional Concerned Citizens, Downwinders at Risk (Downwinders), the Lone Star Chapter of Sierra Club (Sierra Club), Public Citizen, and five citizens. The TCEQ received written comments from DFW Regional Concerned Citizens, the Sierra Club, and two citizens. A summary of the comments and the TCEQ response is provided as part of this SIP revision in the Response to Comments.

Generally, the comments concerned the development of the EI and questioned the accuracy of the EI data. The comments also focused on nonattainment designations and recommended that the EI SIP revision include the attainment areas that potentially may contribute to the air quality of the nonattainment areas.

There were also numerous comments concerning adverse health effects from oil and gas emissions and recommendations that the TCEQ implement additional monitoring operations and regulations regarding the oil and gas industry.

**Significant changes from proposal:**

As discussed in the proposal, the point source inventory data would be revised and were extracted again on April 1, 2014 in order to assure that the most up-to-date emissions were available for the adoption of this SIP revision. Site-level 2011 NO<sub>x</sub> and VOC emissions data were summarized and provided in a new Appendix K: *Point Source HGB and DFW Site Level Emissions*. This second extract accounts for revisions submitted on or before March 31, 2014 that have been reviewed, approved, and entered into the State of Texas Air Reporting System (STARS).

In response to comments received, the 2011 inventory was improved by updating the projected 2011 drilling activity data from the study *Development Of Texas Statewide*

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*Drilling Rigs Emission Inventories For The Years 1990, 1993, 1996, And 1999 Through 2040* with actual 2011 drilling activity data obtained from the Railroad Commission of Texas (RRC). The TCEQ recently reviewed the number of active oil and gas wells used to develop the 2011 inventory and made an adjustment to the emissions estimates based on this review. Originally, the TCEQ used the total number of active oil and gas wells as of the end of 2011 with the assumption that all of the wells were active for the entire year. For the revised emissions estimates, wells completed in 2011 were assumed to be active on average for half the year instead of the entire year. In addition, emissions estimates from gasoline bulk terminals and gas plants were revised based on the recently completed August 2013 ERG study, *Emission Inventory of Bulk Gasoline Terminals and Bulk Gasoline Plants*. Emissions estimates from oil and gas well heaters were revised based on the August 2013 ERG study, *Upstream Oil and Gas Heaters and Boilers*.

Based on these adjustments, the emissions in Table 2-3: *HGB 2011 NO<sub>x</sub> and VOC Emissions for Area Sources* and Table 2-4: *DFW 2011 NO<sub>x</sub> and VOC Emissions for Area Sources* of the EI SIP revision have been updated. For the HGB area, the 2011 annual NO<sub>x</sub> emissions estimate for area sources decreased from 8,617.31 tons per year (tpy) to 8,577.07 tpy, and the VOC emissions estimate decreased from 107,305.48 tpy to 104,943.91 tpy. For the DFW area, the 2011 annual NO<sub>x</sub> emissions estimate for area sources decreased from 16,639.03 tpy to 15,175.20 tpy, and the VOC emissions estimate decreased from 97,314.07 tpy to 96,604.76 tpy. The drilling rig emissions estimates in Table 2-5: *HGB 2011 NO<sub>x</sub> and VOC Emissions for Non-road Categories* and Table 2-6: *DFW 2011 NO<sub>x</sub> and VOC Emissions for Non-road Categories* of the EI SIP revision were updated using the 2011 drilling activity data obtained from the RRC. For the HGB area, the annual NO<sub>x</sub> emissions estimate for the non-road category decreased from 42,020.62 tpy to 41,946.29 tpy, and the VOC emissions estimate decreased from 18,822.77 tpy to 18,820.83 tpy. For the DFW area, the annual NO<sub>x</sub> emissions estimate for the non-road category increased from 37,539.51 tpy to 39,272.29 tpy, and the VOC emissions estimate increased from 16,914.67 tpy to 16,998.73 tpy.

**Potential controversial concerns and legislative interest:**

None

**Does this SIP revision affect any current policies or require development of new policies?**

No

**What are the consequences if this SIP revision does not go forward? Are there alternatives to SIP revision?**

The commission could choose not to comply with requirements to develop and submit this EI SIP revision to the EPA. If the EI SIP revision is not submitted within two years of the July 20, 2012 effective date of designations for the 2008 eight-hour ozone NAAQS deadline as specified in the FCAA, the FCAA requires the EPA to impose sanctions on the state and promulgate a federal implementation plan (FIP). Sanctions could include

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transportation funding restrictions, grant withholding, and increased emissions offsets requirements for new construction and major modification of stationary sources in the HGB and DFW ozone nonattainment areas. The EPA would be required to impose such sanctions and implement a FIP until a SIP revision is approved for the area. Additionally, failure to submit the required EI would jeopardize approval of future nonattainment plans for the HGB and DFW ozone nonattainment areas, which must be based on approved EIs.

The EPA's proposed 2008 ozone standard SIP requirements rule states that EI and reasonably available control technology SIP revisions are due by July 20, 2014. Other major SIP elements, including the attainment demonstration, reasonable further progress, and reasonably available control measures are due one year later. Alternatively, states could submit all elements together 30 months after designations by January 2015. However, the January 2015 deadline would not allow sufficient time to complete all SIP required elements.

**Key points in the adoption SIP revision schedule:**

**Anticipated Adoption Date:** July 2, 2014

**EPA Due Date:** July 20, 2014

**Agency contacts:**

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Terry Salem, Staff Attorney, (512) 239-0469, Environmental Law Division

**Attachments**

cc: Chief Clerk, 2 copies  
Executive Director's Office  
Marshall Coover  
Tucker Royall  
John Bentley  
Office of General Counsel  
Brian Foster

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

EMISSIONS INVENTORY FOR THE 2008 EIGHT-HOUR OZONE  
STANDARD NONATTAINMENT AREAS



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

**EMISSIONS INVENTORY STATE IMPLEMENTATION  
PLAN REVISION FOR THE 2008 EIGHT-HOUR OZONE  
NATIONAL AMBIENT AIR QUALITY STANDARD FOR THE  
HOUSTON-GALVESTON-BRAZORIA AND DALLAS-FORT  
WORTH AREAS**

Project Number 2013-016-SIP-NR

Adoption  
July 2, 2014

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## **EXECUTIVE SUMMARY**

The Federal Clean Air Act (FCAA) requires states to submit emissions inventory (EI) information for all relevant sources in areas that are designated nonattainment for the National Ambient Air Quality Standards (NAAQS). On March 12, 2008, the United States Environmental Protection Agency (EPA) lowered the eight-hour ozone NAAQS from 0.08 parts per million (ppm) to 0.075 ppm. Under the 0.075 ppm (75 parts per billion) standard, the EPA designated the Houston-Galveston-Brazoria (HGB) area nonattainment with a marginal classification and the Dallas-Fort Worth (DFW) area nonattainment with a moderate classification, effective July 20, 2012. The eight-county HGB area includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties. The ten-county DFW area includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise Counties. According to FCAA, §172(c)(3) and §182(a)(1), states are required to submit “a comprehensive, accurate, current inventory of actual emissions from all sources,” within two years of the effective date of nonattainment designations for the ozone NAAQS. This revision to the state implementation plan will satisfy the FCAA EI submittal requirements for the HGB and DFW nonattainment areas under the 2008 eight-hour ozone standard. As reinforced by the EPA’s proposed 2008 ozone standard SIP requirements rule, the nonattainment area base year EI submission is due no later than 24 months from the July 20, 2012 effective date of designations under the 2008 eight-hour ozone standard (July 20, 2014) and then updated every three years thereafter (2017, 2020, etc.). The EPA specified that states use 2011 as a base year in the proposed 2008 ozone standard SIP requirements rule for the 2008 eight-hour ozone NAAQS. An EI submission is also required under the existing Air Emissions Reporting Requirements (AERR) Rule. The 2011 AERR EI has been developed for many pollutants including ozone precursors (volatile organic compounds and nitrogen oxides) from point, area, on-road mobile, non-road mobile, and biogenic emissions source categories. This EI SIP revision is the baseline EI for the 2008 eight-hour ozone NAAQS and the AERR EI submittals every three years thereafter will satisfy the periodic EI requirements.

## **SECTION V-A: 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 (NAAQS) 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, 2011, and 2013. 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 TCEQ. In 2009, the 81st Texas Legislature, during a special session, amended section 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 NAAQS; 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 and Safety Code, Chapter 382

September 1, 2013

Texas Water Code

September 1, 2013

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, 2012

Chapter 19: Electronic Reporting

November 11, 2010

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, §§39.402(a)(1) - (6), (8), and (10) - (12), 39.405(f)(3) and (g), (h)(1)(A) - (4), (6), (8) - (11), (i) and (j), 39.407, 39.409, 39.411(a), (e)(1) - (4)(A)(i) and (iii), (4)(B), (5)(A) and (B), and (6) - (10), (11)(A)(i) and (iii) and (iv), (11)(B) - (F), (13) and (15), and (f)(1) - (8), (g) and (h), 39.418(a), (b)(2)(A), (b)(3), and (c), 39.419(e), 39.420 (c)(1)(A) - (D)(i)(I) and (II), (D)(ii), (c)(2), (d) - (e), and (h), and 39.601 - 39.605	June 24, 2010
Chapter 55: Requests for Reconsideration and Contested Case Hearings; Public Comment, §§55.150, 55.152(a)(1), (2), (5), and (6) and (b), 55.154(a), (b), (c)(1) - (3), and (5), and (d) - (g), and 55.156(a), (b), (c)(1), (e), and (g)	June 24, 2010
Chapter 101: General Air Quality Rules	June 12, 2013
Chapter 106: Permits by Rule, Subchapter A	May 15, 2011
Chapter 111: Control of Air Pollution from Visible Emissions and Particulate Matter	February 6, 2014
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	March 6, 2014
Chapter 115: Control of Air Pollution from Volatile Organic Compounds	November 14, 2013
Chapter 116: Permits for New Construction or Modification	August 16, 2012
Chapter 117: Control of Air Pollution from Nitrogen Compounds	May 2, 2013
Chapter 118: Control of Air Pollution Episodes	March 5, 2000
Chapter 122: §122.122: Potential to Emit	December 11, 2002

## **SECTION VI: CONTROL STRATEGY**

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- 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)
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## **LIST OF ACRONYMS**

AEO	Annual Energy Outlook
AERR	Air Emissions Reporting Requirements
ASLRRRA	American Short Line and Regional Railroad Association
CenSARA	Central States Air Resources Agencies
CMV	commercial marine vessel
DFW	Dallas-Fort Worth
EDMS	Emissions and Dispersion Modeling System
EI	emissions inventory
EIQ	emissions inventory questionnaire
EPA	United States Environmental Protection Agency
ERG	Eastern Research Group
FCAA	Federal Clean Air Act
FMVCP	Federal Motor Vehicle Control Program
GIS	Geographic Information Systems
HARC	Houston Advanced Research Center
HGB	Houston-Galveston-Brazoria
HRVOC	highly reactive volatile organic compounds
I/M	inspection and maintenance
MOU	Memorandum of Understanding
MOVES	Motor Vehicle Emissions Simulator
NAAQS	National Ambient Air Quality Standard
NEI	National Emissions Inventory
NO <sub>x</sub>	nitrogen oxides
NESHAP	National Emission Standards for Hazardous Air Pollutants
NSPS	New Source Performance Standards
PEI	periodic emissions inventory
ppm	parts per million
RFG	reformulated gasoline
RFP	reasonable further progress
RRC	Railroad Commission of Texas
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)
TDM	travel demand model
TexN	Texas NONROAD Model
TNRCC	Texas Natural Resource Conservation Commission
tpd	tons per day
tpy	tons per year
TxLED	Texas Low Emission Diesel
VMT	vehicle miles traveled
VOC	volatile organic compounds



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Appendix K	Point Source HGB and DFW Site Level Emissions

## CHAPTER 1: GENERAL

### 1.1 BACKGROUND

“The History of the Texas State Implementation Plan (SIP),” a comprehensive overview of the SIP revisions submitted to the United States Environmental Protection Agency (EPA) by the State of Texas, is available on the [Introduction to the SIP](http://www.tceq.texas.gov/airquality/sip/sipintro.html#History) Web page (<http://www.tceq.texas.gov/airquality/sip/sipintro.html#History>) on the [Texas Commission on Environmental Quality's \(TCEQ\)](http://www.tceq.texas.gov) website (<http://www.tceq.texas.gov>).

### 1.2 INTRODUCTION

On March 12, 2008, the United States Environmental Protection Agency (EPA) lowered the eight-hour ozone standard from 0.08 parts per million (ppm) to 0.075 ppm. Under the 0.075 ppm (75 parts per billion) standard, the EPA designated the Houston-Galveston-Brazoria (HGB) area nonattainment with a marginal classification and the Dallas-Fort Worth (DFW) area nonattainment with a moderate classification, effective July 20, 2012. The eight-county HGB area includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties. The ten-county DFW area includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise Counties.

This SIP revision satisfies the Federal Clean Air Act (FCAA), §172 and §182 emissions inventory (EI) requirements for the nonattainment areas under the 2008 eight-hour ozone National Ambient Air Quality Standard (NAAQS). Through the *Implementation of the 2008 NAAQS for Ozone: State Implementation Plan Requirements; Proposed Rule* (proposed 2008 ozone standard SIP requirements rule), the EPA interprets the FCAA requirements that states submit a comprehensive, accurate, current EI from all sources, as described in FCAA, §172(c)(3) and §182(a)(1) to be due within two years of the July 20, 2012 effective date of designations for the 2008 eight-hour ozone NAAQS. The FCAA requires that EIs be prepared for nonattainment areas generally, and provides for specific requirements that apply in ozone nonattainment areas. Because ozone is photochemically produced in the atmosphere when volatile organic compounds (VOC) are mixed with nitrogen oxides (NO<sub>x</sub>) in the presence of sunlight, states are required to compile information on key sources of these precursor pollutants. The EIs provide data for a variety of air quality planning tasks including establishing baseline emission levels, calculating federally required emission reduction targets, emission inputs into air quality simulation models, and tracking emissions over time. The total EI of VOC, NO<sub>x</sub>, and other pollutants for an area are summarized from the estimates developed for five general categories of emissions sources: point, area, on-road mobile, non-road mobile, and biogenic.

The EPA specified in the proposed 2008 ozone standard SIP requirements rule that states use 2011 as a base year for EI SIPs to address the EI requirements. The year 2011 is also a year for a required EI submission under the existing Air Emissions Reporting Requirements (AERR) Rule. In accordance with the EPA's AERR, the National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air emissions of both criteria and hazardous air pollutants. As directed by the AERR, the NEI includes statewide coverage. Annual and summer day emissions are reported on a three-year cycle for the AERR. States can rely on these periodic AERR EI submittals to satisfy ongoing SIP EI submission requirements every three years. The periodic EI SIP revision submission requirements fall on the same years as the AERR submittals.

### **1.3 HEALTH EFFECTS**

In 2008, the EPA revised the primary ozone standard to 0.075 ppm. To support the 2008 eight-hour primary ozone standard, the EPA provided information that suggested that health effects may potentially occur at levels lower than the previous 0.080 ppm standard. Breathing relatively high levels of ground-level ozone can cause acute respiratory problems like cough and respiratory irritation and can aggravate the symptoms of asthma. Repeated exposures to high levels of ozone can potentially make people more susceptible to respiratory infection and lung inflammation and can potentially aggravate preexisting respiratory diseases, such as bronchitis and emphysema.

Children are at a relatively higher risk from exposure to ozone when compared to adults, since they breathe more air per pound of body weight than adults and because children's respiratory systems are still developing. Children also spend a considerable amount of time outdoors during summer and during the start of the school year (August through October) when high ozone levels are typically recorded. Adults most at risk from exposures to elevated ozone levels are people working or exercising outdoors and individuals with preexisting respiratory diseases.

### **1.4 PUBLIC HEARING AND COMMENT INFORMATION**

The commission held public hearings on this SIP revision on January 14, 2014 at 2:00 p.m. in Houston at the Houston-Galveston Area Council of Governments and on January 16, 2014 at 2:00 p.m. in Arlington at the Arlington City Hall Building. Notice of the public hearings for this SIP revision was published in the *Texas Register* and the *Austin American-Statesman*, the *Fort Worth Star-Telegram*, and *Houston Chronicle* newspapers.

The public comment period opened on December 13, 2013 and closed on January 27, 2014. Written comments were accepted via mail, fax, and through the [eComments](http://www5.tceq.state.tx.us/rules/ecomments) (<http://www5.tceq.state.tx.us/rules/ecomments>) system. Oral comments were received at the Houston hearing from the Houston Regional Group of the Sierra Club (Sierra Club). Oral comments were received at the Arlington hearing from DFW Regional Concerned Citizens, Downwinders at Risk (Downwinders), the Lone Star Chapter of Sierra Club (Sierra Club), Public Citizen, and five citizens. The TCEQ received written comments from DFW Regional Concerned Citizens, the Sierra Club, and two citizens. A summary of the comments and the TCEQ response is provided as part of this SIP revision in the Response to Comments.

An electronic version of this SIP revision and appendices can be found at the TCEQ's [Air Pollution from Ozone](http://www.tceq.texas.gov/airquality/sip/siplans.html) Web page (<http://www.tceq.texas.gov/airquality/sip/siplans.html>).

### **1.5 SOCIAL AND ECONOMIC CONSIDERATIONS**

Because this SIP revision does not create new obligations for sources to report EI information, there are no changes that would have an impact on society or the economy.

### **1.6 FISCAL AND MANPOWER RESOURCES**

The TCEQ 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 (EI)

### 2.1 INTRODUCTION

The Federal Clean Air Act (FCAA) requires that EIs be prepared for ozone nonattainment areas. Tropospheric, or ground-level, 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 a current EI 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 facility or source category. The EI provides data for a variety of air quality planning tasks, including establishing baseline emissions levels, calculating federally required emission reduction targets, developing emissions inputs for air quality models, and tracking emissions reductions over time. 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 federal Air Emissions Reporting Requirements (AERR) rule requires states to develop and submit periodic EIs to the United States Environmental Protection Agency (EPA) every three years. The 2011 inventory was the first periodic emissions inventory (PEI) submitted under the AERR. In accordance with the AERR, the 2011 PEI was reported to the EPA's National Emissions Inventory (NEI) as a comprehensive and detailed estimate of air emissions, including ozone precursors (NO<sub>x</sub> and VOC). As directed by the AERR, the Texas PEI includes annual emissions for the entire state and ozone season daily emissions for the 2008 eight-hour ozone nonattainment areas in Texas.

### 2.2 POINT SOURCES

#### 2.2.1 Point Source EI 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 sends emissions inventory questionnaire (EIQ) courtesy notification letters to all sites identified as meeting the reporting requirements of 30 TAC §101.10. Companies are required to report emissions data, including ozone season (defined in TCEQ point source guidance *2013 Emissions Inventory Guidelines* as May through September), and to provide samples of calculations used to determine reported emissions in accordance with detailed guidance. The guidance documents are available at the [TCEQ Point Source Emissions Inventory](http://www.tceq.texas.gov/airquality/point-source-ei/psei.html) Web page (<http://www.tceq.texas.gov/airquality/point-source-ei/psei.html>). Information characterizing the process equipment, the control devices, and the emissions points is also required. Data submitted to the TCEQ are reviewed for quality assurance purposes and then stored in the State of Texas Air Reporting System (STARS) database.

The 2011 base year point source EI data were extracted from STARS on April 1, 2014. The extracted data contain ozone season daily and annual NO<sub>x</sub> and VOC emissions from each site in the Houston-Galveston-Brazoria (HGB) and Dallas-Fort Worth (DFW) 2008 eight-hour ozone nonattainment areas that submitted a 2011 EIQ, including revisions reviewed, approved, and entered on or before the extract date. Site level 2011 NO<sub>x</sub> and VOC emissions data are summarized and provided in Appendix K: *Point Source HGB and DFW Site Level Emissions*. Further information, including 2011 unit-level NO<sub>x</sub> and VOC emissions data, is available upon request.

A summary of the 2011 point source EI data for the HGB and DFW 2008 eight-hour ozone nonattainment areas is presented in Table 2-1: *HGB 2011 NO<sub>x</sub> and VOC Emissions for Point Sources (tons per day and tons per year)*, and Table 2-2: *DFW 2011 NO<sub>x</sub> and VOC Emissions for Point Sources (tons per day and tons per year)*.

### 2.2.2 HGB Point Source EI

**Table 2-1: HGB 2011 NO<sub>x</sub> and VOC Emissions for Point Sources (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Brazoria	18.46	6,896.26	11.39	3,837.75
Chambers	7.93	2,344.79	5.66	1,970.04
Fort Bend	19.84	5,583.10	1.60	508.70
Galveston	13.18	3,602.04	15.40	3,613.96
Harris	47.32	16,076.28	55.78	18,801.24
Liberty	0.29	109.14	3.35	980.83
Montgomery	1.21	361.75	1.49	513.35
Waller	0.21	77.06	0.16	53.13
Total	108.44	35,050.42	94.83	30,279.00

### 2.2.3 DFW Point Source EI

**Table 2-2: DFW 2011 NO<sub>x</sub> and VOC Emissions for Point Sources (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Collin	0.66	173.98	0.80	234.73
Dallas	2.97	811.83	4.92	1,586.86
Denton	1.31	479.95	2.92	812.87
Ellis	12.15	4,122.43	5.12	1,681.72
Johnson	6.12	2,093.01	3.48	1,120.60
Kaufman	3.51	1,058.26	0.61	168.27
Parker	1.17	410.44	2.23	638.68
Rockwall	0.01	3.30	0.07	16.88
Tarrant	3.44	1,145.65	7.51	2,280.66
Wise	8.61	2,581.53	2.14	644.99
Total	39.95	12,880.38	29.80	9,186.26

## 2.3 AREA SOURCES

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 and recorded on the county-level. Area sources are divided according to emissions mechanism: hydrocarbon evaporative emissions or fuel combustion emissions. Examples of evaporative emissions sources include: 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: stationary source fossil fuel combustion, outdoor refuse burning, and structural fires. With some exceptions, area source emissions are calculated by multiplying an established emissions 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.

### **2.3.1 Area Source EI Development**

The 2011 area source EI was developed according to the AERR reporting requirements, using a combination of methodologies and data: EPA-generated EIs, TCEQ-contracted projects, TCEQ staff projects, and categories grown from the 2008 EI using factors derived from study data compiled by Eastern Research Group's (ERG) [Economy and Consumer Credit Analytics](http://www.economy.com/default.asp) website (<http://www.economy.com/default.asp>) and Annual Energy Outlook (AEO).

The EPA developed EIs for states to use for many source categories as part of the NEI. The states access these individual inventories through the [EPA's NEI](ftp://ftp.epa.gov/EmisInventory/2011nei/doc/) website (<ftp://ftp.epa.gov/EmisInventory/2011nei/doc/>). These source categories include but are not limited to industrial coatings; degreasing; residential, commercial/institutional, and industrial fuel use; commercial cooking; aviation fuel use; and consumer products. For some source categories, the TCEQ developed state-specific emissions estimates by acquiring current state specific activity data and applying appropriate emissions factors. These source categories include but are not limited to: storage tanks, structural fires, dry cleaners, automobile fires, and oil and gas.

In particular, significant resources were expended to improve the oil and gas area source inventory production categories for 2011. The improvements included the development and refinement of a state-specific oil and gas area source emissions calculator that uses county-level production and local equipment activity data with local emissions requirements to estimate emissions from individual production categories including compressors engines, condensate and oil storage tanks, loading operations, heaters, and dehydrators. The documentation for the development of the oil and gas emissions calculator can be found in Appendix A:

*Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions.* A significant improvement made to the oil and gas calculator for the 2011 inventory was the development of refined emission factors for VOC emissions from condensate storage tanks. The documentation for the refined emission factors can also be found in Appendix B: *Condensate Tank Oil and Gas Activities.*

### **2.3.2 HGB Area Source EI**

County-level totals from the 2011 area source EI for the HGB area are presented in Table 2-3: *HGB 2011 NO<sub>x</sub> and VOC Emissions for Area Sources (tons per day and tons per year).*

**Table 2-3: HGB 2011 NO<sub>x</sub> and VOC Emissions for Area Sources (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Brazoria	1.63	648.43	32.35	11,390.72
Chambers	0.29	108.11	7.96	2,843.21
Fort Bend	1.49	698.96	25.14	8,390.74
Galveston	0.79	370.19	16.92	5,649.96
Harris	13.88	5,515.16	175.35	58,858.77
Liberty	0.76	295.27	24.21	8,688.68
Montgomery	1.97	821.76	22.73	7,712.93
Waller	0.33	119.18	4.07	1,409.03
Total	21.14	8,577.06	308.73	104,944.04

### 2.3.3 DFW Area Source EI

County-level totals from the 2011 area source EI for the DFW area are presented in Table 2-4: *DFW 2011 NO<sub>x</sub> and VOC Emissions for Area Sources (tons per day and tons per year)*.

**Table 2-4: DFW 2011 NO<sub>x</sub> and VOC Emissions for Area Sources (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Collin	2.41	1,039.42	24.10	7,712.30
Dallas	11.70	4,144.41	84.25	26,613.80
Denton	2.26	975.32	34.54	11,644.710
Ellis	0.70	242.62	7.05	2,245.47
Johnson	2.06	758.48	17.98	6,253.20
Kaufman	0.42	152.32	5.35	1,716.17
Parker	0.67	253.47	12.85	4,422.75
Rockwall	0.16	77.18	3.01	965.71
Tarrant	10.12	3,656.01	74.18	24,270.94
Wise	12.14	4,435.29	29.18	10,454.74
Total	42.64	15,734.52	292.49	96,299.78

## 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 non-road source category is composed of a diverse collection of equipment, many of which are powered by diesel engines. Non-road emissions sources include, but are not limited to: agricultural equipment, construction and mining equipment, lawn and garden equipment, aircraft and airport equipment, locomotives, drilling rigs and commercial marine vessels (CMV). For the 2011 EI, emissions inventories for non-road



sources were developed as subcategories: NONROAD model categories; airports; CMVs; drilling rigs; and locomotives. The sections below describe the emissions calculation methods used for the non-road mobile source subcategories.

#### **2.4.1 Non-road EI Development**

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 airports, locomotives, CMVs, and drilling rigs. The TexN model allows TCEQ staff to replace the EPA NONROAD model's default data with more specific local survey data per EPA recommendations. Several equipment survey studies have been conducted which focused on various equipment categories operating in different areas in Texas. The resulting survey data are used as inputs to the TexN model to more accurately estimate non-road emissions for the state of Texas. The 2011 non-road category EI development used the same methodology found in the report *Development of 2008 Annual and Ozone Season Daily Emissions Inventories and Activity Data for Non-Road Sources within the Texas NONROAD Model (TexN)*. A copy of the ERG report and associated inputs and meteorological data are provided in Appendix C: *Development of 2008 Annual and Ozone Season Daily Emissions Inventories and Activity Data for Non-Road Sources within the Texas NONROAD Model (TexN)*.

The 2011 airport EI contains both annual and ozone season weekday emissions for airport sources related to aircraft operations. These emission sources include aircraft engines, auxiliary power units, and ground support equipment. The United States Federal Aviation Administration's Emissions and Dispersion Modeling System (EDMS) was used to calculate airport source emissions. To estimate the 2011 emissions from the airport sources, a survey collected updated information on aircraft activity, fleet mix, and other EDMS model input parameters. Model input data was compiled and reviewed, and any identified data gaps were filled using the most closely related data available. Documentation of methods and procedures used in developing HGB area 2011 airport EI can be found in Appendix D: *Development of Statewide Annual Emissions Inventory and Activity Data for Airports*. Documentation of methodology and procedures used to develop the DFW airport EIs can be found in Appendix E: *Development of Annual and Emissions Inventories and Activity Data for Airports in the 12-County Dallas-Fort Worth Area*.

The 2011 CMV inventory was developed based on multiple recent studies and datasets. The 2011 activity data were compiled using local port data and the United States Department of Transportation Maritime Administration. The EPA's updated 2011 emissions factors were used to account for vessel turnover and compliance with marine vessel air quality regulations. The emissions factors were applied to the 2011 activity values to calculate 2011 emissions. The emissions were spatially allocated to Geographic Information Systems (GIS) shape-files. Documentation of methodologies and procedures used in developing the CMV EIs can be found in Appendix F: *Development of 2011 Statewide Toxics and Actual Annual and Ozone Season Weekday Emissions Inventories for Commercial Marine Vessels*.

The 2011 EI for the drilling rig diesel engines was developed as part of a statewide EI improvement study. Well activity data were obtained through the acquisition of the "Drilling Permit Master and Trailer" database from the Railroad Commission of Texas (RRC) and through a survey of oil and gas exploration and production companies, which was used to develop improved drilling rig emissions characterization profiles. Documentation of methods and procedures used in developing the drilling rig diesel engine EIs can be found in Appendix G: *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993,*

1996, and 1999 through 2040. An improvement made for the 2011 inventory involved updating the projected 2011 drilling activity data from the study with actual 2011 drilling activity data obtained from the RRC.

The 2011 Texas locomotive EI includes Class I, II, and III locomotive activity and emissions by rail segment for all counties within Texas. Locomotive line haul and yard activity data were compiled from companies operating in Texas to create a county-level Class I line haul inventory. Data developed by the Eastern Regional Technical Advisory Committee in collaboration with the Federal Railroad Administration, the American Short Line and Regional Railroad Association (ASLRRA), and members of the Class II and III railroad communities used 2008 activity and emissions profiles for Class II and Class III railroads. To calculate annual gallons of fuel used by railroads, data compiled by ASLRRA from the Class II and III railroads, including total industry fuel use in 2008 for locomotives and total Class II/III route miles, were used. Based on the United States Energy Information Administration's latest AEO, 2008 fuel usage values were grown to estimate 2011 emissions. Documentation of methods and procedures used in developing the locomotive EIs can be found in Appendix H: *2011 Texas Railroad Emission Inventory Report*.

#### 2.4.2 HGB Non-Road Source EI

County-level 2011 non-road category source EI totals for the eight-county HGB 2008 eight-hour ozone nonattainment area are presented in Table 2-5: *HGB 2011 NO<sub>x</sub> and VOC Emissions for Non-Road Categories (tons per day and tons per year)*.

**Table 2-5: HGB 2011 NO<sub>x</sub> and VOC Emissions for Non-Road Categories (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Brazoria	8.94	3,165.17	3.38	1,306.36
Chambers	1.10	409.09	1.04	533.25
Fort Bend	6.60	2,262.79	2.54	872.54
Galveston	14.32	5,235.62	4.07	2,093.54
Harris	80.85	27,575.79	33.44	11,715.84
Liberty	3.60	1,289.23	0.71	260.74
Montgomery	4.76	1,668.65	4.32	1,876.34
Waller	0.94	339.95	0.43	162.22
Total	121.11	41,946.29	49.93	18,820.83

#### 2.4.3 DFW Non-Road Source EI

County-level 2011 non-road category source EI totals for the ten-county DFW 2008 eight-hour ozone nonattainment area are presented in Table 2-6: *DFW 2011 NO<sub>x</sub> and VOC Emissions for Non-Road Categories (tons per day and tons per year)*.

**Table 2-6: DFW 2011 NO<sub>x</sub> and VOC Emissions for Non-Road Categories (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Collin	8.41	2,499.54	6.00	1,823.14
Dallas	30.89	9,622.11	21.73	6,569.42
Denton	11.43	3,895.51	4.85	1,542.32
Ellis	3.76	1,138.51	1.59	480.65
Johnson	7.56	2,509.24	1.15	352.16
Kaufman	3.34	958.56	1.07	314.98
Parker	3.77	1,169.07	1.19	363.23
Rockwall	0.95	284.14	1.22	416.69
Tarrant	43.65	14,912.53	14.95	4,728.63
Wise	6.85	2,283.08	1.25	407.51
Total	120.61	39,272.29	55.00	16,998.73

## 2.5 ON-ROAD MOBILE SOURCES

On-road mobile emission 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 (emissions factors) and the number of units of activity must be determined. The emissions factors for on-road mobile sources are determined using models developed and approved by the EPA. The models allow for input of local conditions and vehicle characteristics. The activity information corresponding to the emissions factors is obtained using local travel demand models, the output from the highway performance monitoring system, and speed models.

### 2.5.1 On-Road Mobile Source EI Development

The 2011 on-road mobile source inventory was developed using the latest available data, current emissions factors and models, and the most current planning assumptions. Changes in the inventories can be expected when a SIP is revised if there have been changes in any of the underlying tools or data used in the inventory development. On-road mobile source category EIs presented in this SIP revision used emissions factors developed from the EPA's Motor Vehicle Emissions Simulator (MOVES) model and methods consistent with both the EPA SIP inventory development guidance and with the requirements of transportation conformity.

In March 2010, the EPA replaced the MOBILE6.2 model with MOVES as the official emissions factor model for developing on-road mobile source category EIs. 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 remains. The primary approach to developing an on-road inventory is the same with either MOVES or MOBILE6.2. With both models, emission rates are produced for subsets of the on-road fleet, and the emission rates are multiplied by the activity level of each vehicle type or source use type.

During the development phase of the 2011 AERR inventories, the EPA released multiple versions of the MOVES model. The EPA prefers that states use the latest version of MOVES that is available. According to the EPA's guidance, if states have completed significant work on an inventory for periodic reporting or for a SIP revision when a new version of MOVES is released, such work can be completed and submitted to EPA using the previous version of the model. The EPA released MOVES2010a in August of 2010 and MOVES2010b in April 2012. The EPA originally released MOVES2010b in April 2012 to allow MOVES users to benefit from several improvements to general model performance relative to MOVES2010a. The difference in the models is related solely to model performance and does not affect the final emissions estimates. In October 2012, a database update to MOVES2010b was released, which corrected an error that affects emissions estimates for years after 2020; however, this version was not used for the 2011 AERR inventories due to schedule constraints.

The 2011 AERR emissions estimates for all pollutants, precursors, or toxics were not affected by which version of the MOVES model was used. The inventories for reporting under the AERR for which significant work had been completed by April 2012 were developed using MOVES2010a. The AERR inventories developed after April 2012 used MOVES2010b (April 2012). The AERR inventory development schedule for HGB required the use of MOVES2010a. The AERR inventory development schedule for DFW allowed the use of MOVES2010b (April 2012).

The MOVES 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 a particular area. Because modifications to the inputs significantly influence the emissions factors calculated by the MOVES model, input parameters reflecting local conditions were used instead of relying on national default values for the development of the 2011 on-road inventory. The localized inputs used for the DFW and HGB on-road mobile source 2011 EI 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, emissions rates calculated by the MOVES model must be multiplied by the level of vehicle activity. On-road mobile source emissions factors are expressed in units of grams per mile; therefore, the activity information that is required to complete the inventory calculation is vehicle miles traveled (VMT) in units of miles per day. The level of vehicle travel activity is developed using a travel demand model (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 and reporting inventories, VMT estimates are calibrated against outputs from the federal highway performance monitoring system, 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 EI. Roadway speeds, required inputs for the MOVES model, are calculated by using the activity volumes from the TDM and a post-processor speed model.

A summary of the annual and daily DFW and HGB 2011 on-road mobile source NO<sub>x</sub> and VOC emissions levels is presented in Sections 2.5.2: *HGB On-road Mobile Source EI* and 2.5.3: *DFW On-road Mobile Source EI*. The inventory development methods, MOVES inputs, and the results are documented in Appendix I: *Development of 2011 On-Road Mobile Source Actual Annual and Summer Weekday Emissions Inventories for All Texas Counties (Except for 12*

*Counties in the Dallas-Fort Worth Area), and Winter Weekday Emissions Inventories for El Paso: Houston-Galveston-Brazoria Area and Appendix J: Development of 2011 On-Road Mobile Source Actual Annual and Summer Season Weekday Emissions Inventories for 12 Counties in the Dallas-Fort Worth Metropolitan Statistical Area - Amendment.*

### **2.5.2 HGB On-Road Mobile Source EI**

The 2011 HGB 2008 eight-hour ozone nonattainment area EI for on-road mobile sources was developed using emissions factors calculated using the MOVES2010a version of the MOVES model. All control strategies implemented by 2011 were included in the input to the EI development for the 2011 on-road mobile source base year EI. Those controls include the effects of the federal motor vehicle control program (FMVCP), reformulated gasoline (RFG), the HGB vehicle I/M program, and the Texas Low Emission Diesel (TxLED) program.

The VMT was developed using the latest activity estimates from the HGB TDM 2011 network. The activity levels used to calculate the EI reflect the 2011 roadway network with 2011 VMT and speeds. A summary of the EI is presented in Table 2-7: *HGB 2011 NO<sub>x</sub> and VOC Emissions for On-road Mobile Sources (tons per day and tons per year)*. Complete documentation of the development of the EI and details on MOVES model inputs are provided in Appendix I.

**Table 2-7: HGB 2011 NO<sub>x</sub> and VOC Emissions for On-Road Mobile Sources (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Brazoria	8.44	3,155.45	4.20	1,436.68
Chambers	6.84	2,501.74	1.07	357.56
Fort Bend	12.54	4,720.44	6.20	2,143.22
Galveston	7.37	2,746.59	3.86	1,319.75
Harris	137.01	50,782.06	58.18	19,955.62
Liberty	4.92	1,772.54	1.66	547.55
Montgomery	15.22	5,727.18	6.30	2,161.07
Waller	3.87	1,470.91	1.15	391.48
Total	196.21	72,876.91	82.62	28,312.93

### **2.5.3 DFW On-Road Mobile Source EI**

The 2011 DFW 2008 eight-hour ozone nonattainment area EI for on-road mobile sources was developed using emissions factors calculated using the MOVES2010b version of the MOVES model. All control strategies implemented by 2011 were included in the input to the EI development for the 2011 on-road mobile source base year EI. Those controls include the effects of the FMVCP; RFG, the DFW vehicle I/M program, and the TxLED program.

The VMT was developed using the latest activity estimates from the DFW TDM 2011 network. The activity levels used to calculate the EI reflect the 2011 roadway network with 2011 VMT and speeds. A summary of the EI is presented in Table 2-8: *DFW 2011 NO<sub>x</sub> and VOC Emissions for On-Road Mobile Sources (tons per day and tons per year)*. Complete documentation of the development of the EI and details on MOVES model inputs are provided in Appendix J.

**Table 2-8: DFW 2011 NO<sub>x</sub> and VOC Emissions for On-Road Mobile Sources (tons per day and tons per year)**

County	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Collin	22.76	7,827.63	10.28	3,050.34
Dallas	89.86	31,244.48	37.98	11,301.26
Denton	20.99	7,349.39	8.68	2,582.00
Ellis	11.39	4,195.26	3.31	1,003.77
Johnson	8.81	3,197.03	3.21	972.89
Kaufman	9.40	3,323.77	2.33	799.21
Parker	8.68	3,238.67	2.43	738.60
Rockwall	3.29	1,181.82	1.22	360.17
Tarrant	57.48	20,088.88	27.12	8,039.88
Wise	6.21	2,270.95	1.80	556.29
Total	238.87	83,917.88	98.36	29,404.41

## 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 emissions such as isoprene, monoterpene, and alpha-pinene. Biogenic emissions are estimated by the EPA using its biogenic emissions inventory tool.

## 2.7 EMISSIONS SUMMARY

The 2011 NO<sub>x</sub> and VOC emissions in the HGB and DFW 2008 eight-hour ozone nonattainment areas for each source category are summarized in Table 2-9: *Summary of HGB 2011 NO<sub>x</sub> and VOC Emissions (tons per day and tons per year)* and Table 2-10: *Summary of DFW 2011 NO<sub>x</sub> and VOC Emissions (tons per day and tons per year)*.

**Table 2-9: Summary of HGB 2011 NO<sub>x</sub> and VOC Emissions (tons per day and tons per year)**

Category	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Point	108.44	35,050.42	94.83	30,279.00
Area	21.14	8,577.06	308.73	104,944.04
Non-Road Mobile	121.11	41,946.29	49.93	18,820.83
On-Road Mobile	196.21	72,876.91	82.62	28,312.93
Total	446.90	158,450.68	536.12	182,356.80

**Table 2-10: Summary of DFW 2011 NO<sub>x</sub> and VOC Emissions (tons per day and tons per year)**

Category	Ozone Season Weekday NO <sub>x</sub> (tpd)	Annual NO <sub>x</sub> (tpy)	Ozone Season Weekday VOC (tpd)	Annual VOC (tpy)
Point	39.95	12,880.38	29.80	9,186.26
Area	42.64	15,734.52	292.49	96,299.78
Non-Road Mobile	120.61	39,272.29	55.00	16,998.73
On-Road Mobile	238.87	83,917.88	98.36	29,404.41
Total	442.08	151,805.07	475.65	151,889.18

**RESPONSE TO COMMENTS RECEIVED REGARDING  
THE EMISSIONS INVENTORY (EI) STATE  
IMPLEMENTATION PLAN (SIP) REVISION FOR THE  
2008 EIGHT-HOUR OZONE NATIONAL AMBIENT AIR  
QUALITY STANDARD (NAAQS) FOR THE HOUSTON-  
GALVESTON-BRAZORIA (HGB) AND DALLAS-FORT  
WORTH (DFW) AREAS**

The Texas Commission on Environmental Quality (TCEQ or commission) offered public hearings for this SIP revision on January 14, 2014 at 2:00 p.m. in Houston at the Houston-Galveston Area Council of Governments and on January 16, 2014 at 2:00 p.m. in Arlington at the Arlington City Hall Building. Oral comments were received at the Houston hearing from the Houston Regional Group of the Sierra Club (Sierra Club). Oral comments were received at the Arlington hearing from DFW Regional Concerned Citizens, Downwinders at Risk (Downwinders), the Lone Star Chapter of Sierra Club (Sierra Club), Public Citizen, and five citizens.

The comment period opened December 13, 2013 and closed January 27, 2014. The TCEQ received written comments from DFW Regional Concerned Citizens, the Sierra Club, and two citizens.

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**GENERAL COMMENTS**

**Air Quality Concerns**

Downwinders commented that the TCEQ relies on people buying new cars during the worst economic recession to reduce ozone levels. Downwinders linked the inaccurate EI to causing negative effects to the results and eventual failure of the DFW 1997 Eight-Hour Ozone Attainment Demonstration (AD) SIP revision. Downwinders also commented that the ozone design value has increased due to the Barnett Shale oil and gas growth.



Downwinders, Public Citizen, and the Sierra Club commented that emissions from large sources outside the DFW nonattainment areas contribute to the area's nonattainment. Public Citizen recommended the state develop an EI SIP to include counties with large coal-fired power plants that contribute to the DFW air quality. DFW Regional Concerned Citizens stated that the cumulative emissions from areas outside the DFW 2008 eight-hour ozone nonattainment area, weather, and traffic patterns should all be included in this EI SIP revision, and that emissions from one area should not be allowed to influence the air quality of another area.

**The purpose of this EI SIP revision is to satisfy the Federal Clean Air Act (FCAA), §172 and §182 EI requirements for the HGB and DFW nonattainment areas under the 2008 eight-hour ozone NAAQS. According to FCAA, §172(c)(3) and §182(a)(1), states are required to submit a comprehensive, accurate, and current EI for nonattainment areas within two years of the effective date of nonattainment designations for the ozone NAAQS. This SIP revision is intended to meet those requirements and is not intended to demonstrate attainment of the 2008 ozone NAAQS. This SIP revision includes emissions from the 10-county DFW and the eight-county HGB 2008 eight-hour ozone nonattainment areas only, as required by the FCAA and United States Environmental Protection Agency (EPA) guidance.**

**The TCEQ is currently developing an AD SIP revision for the DFW 2008 eight-hour ozone nonattainment area. Separate EIs have been developed for the 2006 base case modeling, and 2018 future case inventories for the 2018 future case attainment demonstration modeling. In developing the AD SIP revision modeling emissions, the TCEQ is using the most current EI data and growth assumptions for all categories, including oil and gas. Comments applicable to the AD inventories, ozone modeling, and control strategies should be made during the public comment period for the AD SIP revision. Comments concerning classification and AD results are outside the scope of this EI SIP revision. No changes were made as a result of these comments.**

Sierra Club commented that the classifications for DFW and HGB 2008 eight-hour ozone nonattainment areas are incorrect. Sierra Club also stated that the Beaumont-Port Arthur, Tyler-Longview and San Antonio metropolitan areas have all violated the existing 75 parts per billion (ppb) standard and should be designated nonattainment under the 2008 eight-hour ozone standard. Public Citizen commented that counties with coal or gas and drilling activities should be added to ozone nonattainment areas.

Public Citizen, Sierra Club, and one individual suggested that the TCEQ should have included EI data from ozone attainment areas in this SIP revision.

Sierra Club, DFW Regional Concerned Citizens, and two individuals commented that the TCEQ has never over-controlled because areas have been out of attainment for a long period of time and the ozone standard has never been attained. Downwinders commented that the TCEQ is not interested in reducing air pollution for the public. One individual favored strong protection for keeping the air clean.

**The purpose of this SIP revision is to fulfill the FCAA, §172 and §182 EI requirements for the HGB and DFW nonattainment areas under the 2008 eight-hour ozone standard. The FCAA requires states to submit EI information for all relevant sources within each area designated by the EPA as nonattainment for a**

**NAAQS, so no EI data was included from attainment areas. Similarly, no change was made to address attainment designation status as such an action is outside the scope of this SIP revision.**

DFW Regional Concerned Citizens commented that political pressure should not deter the development of a comprehensive inventory that will be used in granting future permits, and that the TCEQ will not be overreaching their authority by enforcing the FCAA.

**The purpose of this SIP revision is to satisfy the FCAA, §172 and §182 EI requirements for the HGB and DFW 2008 eight-hour ozone nonattainment areas under the 2008 eight-hour ozone NAAQS. The TCEQ takes its duties to Texas citizens very seriously and believes that this SIP revision meets FCAA requirements and guidance included in the EPA's *Implementation of the 2008 NAAQS for Ozone: State Implementation Plan Requirements; Proposed Rule* (proposed 2008 ozone standard SIP requirements rule) to submit a comprehensive, accurate, and current EI for ozone nonattainment areas. Comments regarding the permitting process are outside the scope of this EI SIP revision. No changes were made as a result of these comments.**

One individual commented that that ozone concentrations over 75 ppb averaged 34 days a year from 2012 and 2013 and ozone concentrations over 84 ppb averaged 11 days a year from 2012 and 2013, which equals 45 days out of the year. The individual also commented that that summer air conditions are worsening, as evidenced by an ozone day that occurred in September 2013.

**The purpose of this SIP revision is to satisfy the FCAA, §172 and §182 EI requirements for the HGB and DFW nonattainment areas under the 2008 eight-hour ozone NAAQS. While these comments are outside the scope of this SIP revision, the TCEQ does not agree that the commenter's analysis is the appropriate way to investigate or compare the air in an area to the standards set by the EPA. For example, days when eight-hour average ozone is greater than or equal to 84 ppb would also count as days above 75 ppb. In other words, days above 84 ppb cannot be totaled with days above 75 ppb because that would result in the double counting of days.**

**Trend analysis of high ozone days is a more effective way to assess whether the quality of the air in an area is improving or deteriorating over a long period of time. High ozone day yearly trends in the DFW area show that days with eight-hour ozone greater than 75 ppb decreased by 49%, from 2000 (63 days) to 2013 (32 days). Similarly, days with ozone greater than 84 ppb decreased by 75%, from 2000 (36 days) to 2013 (9 days). Please note data from 2013 in this response and following responses is preliminary and subject to change.**

**Additionally, another means to examine the air quality is to consider how an area's air pollution concentrations compare to the NAAQS. The current NAAQS for 2008 eight-hour ozone is set at 75 ppb. The design value is used to compare the air in an area to the NAAQS. For ozone, the design value is calculated by taking the three-year average of the fourth-highest eight-hour ozone concentration at each monitor in the area. This calculation removes the year-to-year variability from factors such as meteorology and number of monitors and provides an effective means for evaluating ozone trends. Although the 2013 design value in the DFW area is above**

**the NAAQS at 87 ppb, it has decreased by 15% from 2000, when the design value was 102 ppb. Furthermore, the percentage of monitors with valid design values which measured above the NAAQS has decreased by 20% from 2000 through 2013.**

**Also, the ozone forecast season in the DFW area runs from March through October, and high ozone days occurring in September are not uncommon, and therefore are not indicative of worsening ozone pollution. The ozone forecast seasons do not necessarily correspond to the "ozone seasons" defined for regulatory purposes by the EPA. No changes were made as a result of these comments.**

The Sierra Club commented that while overall air quality has improved, Texas has not attained the ozone standard. One individual stated that the DFW area had been designated as an ozone nonattainment area for many years and has not yet attained the ozone standard. Public Citizen and one individual commented that ozone concentrations have been increasing in the DFW ozone nonattainment area.

**The DFW area has made considerable improvement in air quality. For example, between 2000 and 2013, the 1997 eight-hour ozone design value has trended downward 15 ppb from 102 ppb to 87 ppb. The number of DFW eight-hour ozone exceedance days has also decreased from 36 to nine from 2000 to 2013.**

**The TCEQ appreciates the acknowledgement of improving air quality, but disagrees that Texas has failed to ever attain the ozone standard. Despite the challenges of growing population, the TCEQ's air quality planning efforts have resulted in significant air quality improvements, including attainment of the ozone standard in several areas of the state. In 2008, the EPA issued a determination that the DFW four-county one-hour ozone nonattainment area had attained the one-hour NAAQS based on verified 2004 through 2006 monitoring data and supported by 2007 through 2008 monitoring data.**

**The EPA has redesignated the Beaumont-Port Arthur ozone nonattainment area to attainment for the 1997 eight-hour ozone standard, and the area is currently monitoring attainment of the 2008 eight-hour ozone standard. The EPA has redesignated both the El Paso County and Victoria County one-hour ozone nonattainment areas to attainment for both the 1997 and 2008 eight-hour ozone standards. El Paso County has monitored attainment of the one-hour ozone standard since 1998, and the EPA redesignated Victoria County as attainment of the one-hour ozone standard on May 8, 1995. The HGB area is currently monitoring attainment of the one-hour ozone standard.**

**Overall 1997 eight-hour ozone design values have been trending downward since 2000 for both the DFW and HGB ozone nonattainment areas, and the state has seen a 24% decrease in the three-year average of the statewide maximum fourth highest eight-hour ozone concentrations from 2000 through 2013. No changes were made as a result of these comments.**

One individual expressed concern about poor air quality in the DFW nonattainment area. DFW Regional Concerned Citizens commented that the TCEQ is not doing its job to protect clean air. Public Citizen commented that more stringent air quality standards than the EPA has set should

be applied in order to improve air quality. Two individuals expressed consideration of moving from the DFW area if air quality does not improve.

One individual expressed concern that the TCEQ does not work in a timely manner to protect public health and the environment. DFW Regional Concerned Citizens and one individual commented that the TCEQ should do more to protect the environment and not allow itself to be influenced by politics.

**The TCEQ strives to protect the state's human and natural resources consistent with sustainable economic development. The purpose of this SIP revision is to satisfy the FCAA, §172 and §182 EI requirements for the HGB and DFW nonattainment areas under the 2008 eight-hour ozone NAAQS. The DFW area has made considerable improvement in air quality. For example, between 2000 through 2013 the eight-hour ozone design value has trended downward 15 ppb. The number of days in DFW where the daily eight-hour ozone peak exceedanced 84 ppb has also decreased from 36 to nine over the same period. The percentage of monitors in the DFW 2008 eight-hour ozone nonattainment area measuring nonattainment has decreased by 20% from 2000 through 2013. No changes were made in response to this comment.**

DFW Regional Concerned Citizens commented that the public hearing information for this SIP revision was not published adequately for the public's knowledge.

**Notice of the public hearings for this SIP revision was provided in the same manner as all SIP revision notices, as required by state and federal law. The notice was published in the *Texas Register* as well as the *Austin American-Statesman*, the *Fort Worth Star-Telegram*, and the *Houston Chronicle* newspapers.**

**The EI SIP revision and appendices were also made available to the public through the TCEQ's [SIP Hot Topics Web page](http://www.tceq.texas.gov/airquality/sip/Hottop.html) (<http://www.tceq.texas.gov/airquality/sip/Hottop.html>) and the TCEQ's [Air Pollution from Ozone Web page](http://www.tceq.texas.gov/airquality/sip/criteria-pollutants/sip-ozone) (<http://www.tceq.texas.gov/airquality/sip/criteria-pollutants/sip-ozone>). All interested persons can subscribe to receive e-mail when new information is updated on SIP revision and SIP-related news items on the SIP Hot Topics Web page. No changes were made in response to this comment.**

One individual recommended the TCEQ work with other government agencies, elected officials, and the regulated community to create new, clean industries.

**The TCEQ's authority in SIP development is limited to air quality control. Creating new clean industries is beyond the scope of this EI SIP revision. No changes were made in response to this comment.**

One individual commented that identification and enforcement were needed to ensure companies follow best practices.

**The TCEQ agrees with this comment and vigorously pursues compliance with the applicable environmental requirements. The TCEQ also pursues enforcement against any person or business that is in non-compliance and whose violations meet the criteria for referral to enforcement as laid out in the TCEQ's Enforcement**

**Initiation Criteria. All penalties assessed are done so in accordance with the TCEQ's Penalty Policy. As indicated previously, this EI SIP revision is solely to address the EI requirements in the FCAA. No changes were made in response to this comment.**

The Sierra Club and Public Citizen commented that that the ozone season was not clearly defined.

**To clarify the definition of "ozone season" for emissions inventory purposes, the TCEQ has included additional information in section 2.2.1 of the EI SIP. Point source ozone season emissions are reported by sites for individual units in accordance with TCEQ *Emissions Inventory Guidelines* and cannot be calculated in aggregate from the annual emissions. In the *Emissions Inventory Guidelines*, the Emissions Assessment Section uses the definition of ozone season found in 40 CFR §51.50 as the 153 day period running from May 1 through September 30.**

**Please note the ozone forecast seasons referenced in earlier responses to comments do not necessarily correspond to the "ozone seasons" defined for regulatory purposes by the EPA. Ozone forecast seasons for different areas of the state can be found at:**

**<https://www.tceq.texas.gov/airquality/monops/ozonefacts.html>**

### **Air Permitting**

DFW Regional Concerned Citizens stated that it had requested permitted emissions on a part per thousand basis from the TCEQ, but had not received it.

**The TCEQ authorizes emissions on a mass basis, generally in pounds per hour and/or tons per year (tpy). Typically, authorizations do not contain concentration-based limits, such as parts per thousand, so this information would not be available. Site-specific air permitting information can be viewed online at <https://webmail.tceq.state.tx.us/gw/webpub> or by contacting the Air Permits Division at [airperm@tceq.texas.gov](mailto:airperm@tceq.texas.gov). Comments regarding permits are outside the scope of this EI SIP revision. No changes were made as a result of these comments.**

DFW Regional Concerned Citizens and one individual stated that current permits authorized emissions that have had an adverse health impact on local citizens. DFW Regional Concerned Citizens and one individual further stated that while the community must have jobs, it also must remain healthy to actively participate in community life.

**Comments regarding permits are outside the scope of this EI SIP revision, which is to document emissions within the HGB and DFW 2008 eight-hour ozone nonattainment areas. No changes were made as a result of these comments.**

DFW Regional Concerned Citizens and two individuals stated that the TCEQ could not adequately assess the impact of permitting new sources on DFW air quality without an accurate EI of all source categories.

**The TCEQ agrees that an accurate EI is useful for air quality planning purposes. The TCEQ uses the best available information at the time of inventory development and continues to perform EI improvement research. The EI reflects two decades of**

**continuous improvement. The TCEQ has performed state-of-the-science studies to identify and quantify potentially under-reported emissions sources. These studies result in refined emissions factors, activity data, or emissions determination methods that are incorporated directly into the development of the appropriate inventory source category. These efforts ensure the best possible inventory is used for control strategy and SIP development.**

**The use of the EI for permitting purposes is outside of the scope of this EI SIP revision. However, the TCEQ provides the following information to clarify how EI data is used in permitting. When permitting expansions of existing major stationary sources (sites), baseline actual emissions (BAE) are established for sites using historical emissions data. The BAE is compared to the projected actual emissions after the expansion to determine the impact of the proposed project(s). Point source EI data may not always be available to establish BAE. If point source EI data are used to establish BAE, these data should be the most accurate data available for that time period since sites are required to use the best available method to determine emissions, such as continuous emissions monitoring data.**

**Area (nonpoint) and mobile source inventory data are not typically used in the air permitting process, and the FCAA does not require the TCEQ to assess all inventory source categories to issue air permits. For certain types of permitting actions, an air quality analysis can be performed that demonstrates that authorized emissions from a proposed major stationary source will not contribute to a violation of the NAAQS. Background ambient concentration data, which encompasses air emissions from all sources, may be evaluated during this analysis. No changes were made in response to this comment.**

### **EI Accuracy**

The Sierra Club supports the use of industry-reported data to develop the point source EI.

### **The TCEQ appreciates the support.**

DFW Regional Concerned Citizens and one individual stated that the EI needed to be accurate, comprehensive, updated, and publicly available. The individual further stated that the TCEQ must work with the EPA to establish a reliable inventory.

The Sierra Club and Public Citizen commented that that the TCEQ has failed to develop an accurate inventory for 40 years. The Sierra Club and Public Citizen stated the current inventory is too inaccurate to be used for SIP development, especially when considering widespread and escalating oil and gas production. Downwinders commented that the lack of accurate inventory for oil and gas sources prevents the DFW area from attaining the ozone standard.

The Sierra Club cited the September 9, 2013 issue of the *Federal Register* (78 FR 55037), which discussed the TCEQ under-estimating highly reactive volatile organic compound (HRVOC) emissions, and expressed concern that this inventory similarly underestimates emissions.

Public Citizen stated that the TCEQ has implemented inadequate control measures in DFW to ensure the region attains the ozone standard. The Sierra Club commented that the success of

future control measures depends upon an accurate EI, and further stated that inaccurate inventories will jeopardize future control measures and attainment of the ozone standard.

**The TCEQ develops the EI in accordance with EPA reporting requirements and works closely with the EPA to ensure the inventory is accurate, updated, and comprehensive.**

**The EI reflects two decades of continuous improvement. The TCEQ has performed state-of-the-science studies to identify and quantify potentially under-reported emissions sources. These studies result in refined emissions factors, activity data, or emissions determination methods that are incorporated directly into the development of the appropriate inventory source category. As one example, a recent study refined upstream oil and gas industry storage tank emissions factors for the state. More information on these studies can be found at: <http://www.tceq.texas.gov/airquality/airmod/project/pj.html>.**

**The TCEQ disagrees that the inventory is too inaccurate for future SIP and control strategy development. For the point source EI, industrial sites subject to the TCEQ's reporting requirements submit emissions data using the best available method, such as monitoring or measurement data. The TCEQ's reporting requirements for ozone nonattainment areas require sites that emit either 10 tpy of volatile organic compounds (VOC) emissions or 25 tpy of nitrogen oxides (NO<sub>x</sub>) emissions to submit an annual point source EI. Since these emissions thresholds are either lower than or equivalent to major stationary source thresholds, the TCEQ ensures that a detailed inventory of stationary sources in ozone nonattainment areas is collected for ozone photochemical modeling purposes. As this SIP revision is not intended to demonstrate attainment, commenting on control strategies is outside the scope of this SIP revision.**

**Area (nonpoint) and mobile source EI estimates are developed using the best available data and emissions determination methods or models available at the time. For example, the area source oil and gas inventory uses the current production data and well statistics from the Railroad Commission of Texas (RRC) to develop specific county-level estimates. As noted above, the TCEQ has invested significant resources in advancing area source inventory development methods. The methods TCEQ uses to develop its area source oil and gas inventory serve as a model for other agencies.**

**The TCEQ disagrees with the statement concerning the inaccuracy of the EI due to widespread and escalating oil and gas production. RRC data indicate that Barnett Shale gas production declined by approximately 8% from 2012 to 2013 and approximately 6% from 2011 to 2013. Drilling permits in the Barnett Shale area have experienced more significant declines, decreasing approximately 20% from 2012 to 2013, and more than 77% from 2008, the peak year of issued permits. These trends indicate that Barnett Shale oil and gas production has most likely peaked and is now declining.**

**Similarly, RRC production data for the HGB 2008 eight-hour ozone nonattainment area indicate an overall decline in oil and gas production from 2003 to 2012 (decreases of 11% in oil production, 28% in casinghead gas production, 64% in**

natural gas production, and 63% in condensate production). RRC production data for 2013 are preliminary at the drafting of this SIP revision, but overall decreases from 2003 to 2013 are still reflected, with the exception of oil production; for which preliminary data indicate a modest 3% increase from 2003 values.

Major stationary (point) sources are the largest emitters of HRVOC emissions. The TCEQ annually updates and publishes a regulatory guidance document, *Emissions Inventory Guidelines*, to ensure accurate determination of emissions, including HRVOC emissions, reported by point sources. For several HRVOC emissions sources in the HGB 2008 eight-hour ozone nonattainment area, Chapter 115, Subchapter H, Divisions 1 through 3, requires monitoring or measurement of HRVOC emissions or process streams; these data are required to be used to determine and report emissions for the point source EI. For other HRVOC emissions sources, if monitoring or measurement data are not available, emissions estimates are based upon the most recent available accepted method, as noted in the September 9, 2013 issue of the *Federal Register* (78 FR 55040).

If these best available emissions determination methods still result in a discrepancy between the point source EI and ambient monitoring data, the difference will be reconciled using the methods such as that commended by the EPA in the September 9, 2013 issue of the *Federal Register* (78 FR 55040) and used by the TCEQ in the 2010 HGB attainment demonstration SIP revision. The commission will also continue to work with all interested stakeholders to improve emissions inventory estimation methods.

In the HGB area, applicable sites in Harris County are required to participate in an annual HRVOC market-based cap and trade program.

The purpose of this SIP revision is to establish the baseline year inventory for the 2008 eight-hour ozone standard, not to demonstrate attainment of that standard. The TCEQ uses the best available information at the time of inventory development and continues to perform EI improvement research. These efforts ensure the best possible inventory is used for control strategy and SIP development. No changes were made as a result of these comments.

### **Health Effects**

Two individuals commented about the increased sensitivity of some members of the population to the effects of ozone. DFW Regional Concerned Citizens and one individual expressed concern for children who will develop asthma and other chronic illnesses and another individual commented about the cost of asthma medication. DFW Regional Concerned Citizens and one individual commented about children not being able to enjoy outdoor activities because of their respiratory problems. DFW Regional Concerned Citizens and two individuals commented that an increase in ozone precursors is causing an increase in asthma and chronic obstructive pulmonary disease.

The TCEQ appreciates the comments related to health effects of ozone and economic welfare and is committed to working with area stakeholders to attain the 2008 eight-hour ozone standard, which is a health-based standard. The primary NAAQS are those that the EPA determines are necessary to protect public health,



**including sensitive members of the population such as children, the elderly, and those with pre-existing conditions. Breathing relatively high levels of ground-level ozone may cause acute respiratory problems like cough and respiratory irritation, and may aggravate the symptoms of asthma. Health effects from ozone generally can resolve quickly once an individual is no longer exposed to high levels.**

**The commenters express the concern that concentrations of ozone precursors (and presumably ozone itself) have increased, leading to an increase in asthma and chronic obstructive pulmonary disease (COPD). Between 2000 and 2013, the 1997 eight-hour ozone design value in the DFW area has trended downward 15 ppb. This reduction in ozone design value has coincided with significant reductions in ozone precursor emissions. Between 2005 and 2011 (the most recent periodic emissions inventory year available), VOC emissions have been reduced 16% across all source categories (approximately 29,000 tons), and NO<sub>x</sub> emissions have been reduced 34% across all source categories (approximately 79,000 tons).**

**However, although levels of both precursors and ozone have decreased over time, diagnosis of asthma continues to increase (see below). As a result, it is not clear that there is a definite link between ozone levels and asthma development. Regarding COPD, the most recent analysis from EPA indicates that hospitalizations for respiratory diseases, including COPD, would not be significantly affected by concentrations of ozone lower than the current NAAQS.**

**It is important to emphasize that although the causes of asthma are not fully understood, there are many factors that influence the development and exacerbation of asthma. According to the World Health Organization, one of the strongest risk factors for developing asthma is genetic predisposition. In addition, indoor allergens (dust mites, pet dander, and presence of pests such as rodents or cockroaches) together with outdoor allergens (pollen and mold), tobacco smoke, or other triggers such as cold air, extreme emotions (anger or fear) and physical exercise can all provoke symptoms in those with asthma. The Centers for Disease Control and Prevention estimates that asthma prevalence has increased over recent years. The reason for this increase is unknown, but some scientists have suggested changes in exposure to microorganisms (hygiene hypothesis) or the rise in sedentary lifestyle (affecting lung health) and obesity (which results in inflammation) may be to blame. For additional information on asthma, please contact the Texas Department of State Health Services at 512-458-7111. No changes were made as a result of these comments.**

### **Upstream Oil and Gas Industry and EI Trends**

**One individual commented that ozone precursor emissions have been increasing in the DFW ozone nonattainment area. Downwinders stated that all source categories have reduced air pollution in the DFW area except for the oil and gas industry.**

**The TCEQ disagrees with these comments. As detailed in the DFW Reasonable Further Progress (RFP) SIP Revision for the 1997 Eight-Hour Ozone Standard (2010-023-SIP-NR), the overall controlled NO<sub>x</sub> and VOC EI for the DFW area decreased 19% from 2002 to 2012. While VOC emissions did increase 6% during this timeframe, NO<sub>x</sub> emissions significantly declined by 39% during this same**

**period. Significant reductions in ozone concentrations have occurred in the DFW area.**

**Like most of the U.S., the DFW area is NO<sub>x</sub>-limited with respect to ozone formation, which means that NO<sub>x</sub> emission reductions are far more effective than VOC emission reductions at lowering ozone levels. This is particularly true in areas such as DFW and most of eastern Texas, which have high amounts of naturally occurring VOC from biogenic sources. Most notably, isoprene is emitted by oak trees and is highly reactive in the presence of NO<sub>x</sub> for forming ozone.**

**Each VOC type has a maximum incremental reactivity (MIR) value, which is the highest amount of ozone that can be formed per unit of VOC if a sufficient quantity of NO<sub>x</sub> is present and the full reaction is allowed to go to completion (i.e., not halted by loss of sunlight or absence of NO<sub>x</sub>). Additionally, the hydroxyl radical (OH) is critical to ozone formation and each VOC type has a reaction rate constant (K<sub>OH</sub>), which is the rate at which the reaction occurs. Provided below is a table of these VOC-specific values.**

**Natural gas is composed primarily of methane, with the bulk of the remainder made up of ethane, propane, and butane. As shown in the table, 1 gram of methane will yield 0.0144 grams of ozone, but 1 gram of isoprene will yield 10.61 grams of ozone, which is 738 times more ozone created than with methane. Furthermore, the reaction rate at which isoprene will make ozone is over 15,000 times faster than that for methane. The MIR and K<sub>OH</sub> reaction rate values for ethane, propane, and butane also show how much more reactive isoprene and other compounds are at forming ozone.**

**In a hypothetical environment without vegetation where no other VOC existed besides methane, ethane, propane, and butane, then these lower reactive compounds could have an increased relative effect on ozone formation, but it would be small. Research done by the University of California at Riverside in this area can be obtained from the saprc07.xls spreadsheet available at <http://www.cert.ucr.edu/~carter/SAPRC/>.**

Compound Name	MIR		K <sub>OH</sub> Reaction Rate	
	(grams O <sub>3</sub> /VOC)	Ratio to Methane	(cm <sup>3</sup> molec <sup>-1</sup> s <sup>-1</sup> )	Indexed to Isoprene
1,3-Butadiene	12.61	877	6.59E-11	1.5
Propene (Propylene)	11.66	811	2.60E-11	3.8
Isoprene	10.61	738	9.96E-11	1
1-Butene	9.73	676	3.11E-11	3.2
Ethene (Ethylene)	9.00	626	8.15E-12	12.2
Alpha-Pinene	4.51	313	5.18E-11	1.9
Beta-Pinene	3.52	245	7.35E-11	1.4
Isopentane	1.45	101	3.60E-12	27.7
n-Pentane	1.31	91	3.84E-12	25.9
Isobutane	1.23	86	2.14E-12	46.6
n-Butane	1.15	80	2.38E-12	41.8
Benzene	0.72	50	1.22E-12	81.4
Propane	0.49	34	1.11E-12	89.4
Ethane	0.28	20	2.54E-13	392.3
Methane	0.0144	1	6.62E-15	15,056.50

**The 6% increase in the VOC EI cannot be attributed entirely to upstream oil and gas emissions. As detailed in the DFW RFP SIP revision and the DFW AD SIP Revision for the 1997 Eight-Hour Ozone Standard (2010-022-SIP-NR), the area source category excluding oil and gas emissions increased overall from 2002 (RFP) and 2006 (AD) to 2012. The area source inventory includes specific area source categories that are population-dependent and increase with population increases. Examples include residential fuel combustion, landfills, and vehicle refueling.**

**The TCEQ has implemented rules to reduce emissions from sources located at upstream oil and gas sites. The East Texas combustion rule, 30 Texas Administrative Code (TAC) Chapter 117, Subchapter E, Divisions 2 and 4, limits NO<sub>x</sub> emissions from stationary gas-fired reciprocating engines. Upstream oil and gas storage tank emissions in DFW and other areas are controlled by 30 TAC Chapter 115, Subchapter B, Division 1.**

**Additionally, new permits by rule or standard permit application procedures that require notification and a registration are applicable for all oil and gas projects in the Barnett Shale that start construction after April 1, 2011. Therefore, it is incorrect to state that all source categories have reduced emissions except the oil and gas category. No changes were made in response to these comments.**

Downwinders stated that oil and gas industry VOC emissions were larger than VOC emissions generated by mobile sources in the DFW nonattainment area.

**The TCEQ disagrees with this comment. Based upon the most current 2011 EI for the DFW 10-county 2008 eight-hour ozone nonattainment area, oil and gas sources emit approximately 16,928 tpy of NO<sub>x</sub> emissions and 26,142 tpy of VOC emissions, whereas mobile source emissions total more than seven times the amount of NO<sub>x</sub> emissions, 123,190 tpy, and nearly twice the amount of VOC emissions, 46,403 tpy. No changes were made in response to this comment.**

Downwinders stated that oil and gas emissions were hidden and not easily calculated from the data in this EI SIP revision.

**The TCEQ reports EI data to the EPA in accordance with the requirements of the Air Emissions Reporting Rule (AERR) (40 Code of Federal Regulations (CFR) Part 51, Subpart A). The AERR specifically requires states to report point, area (nonpoint), and mobile source emissions and/or activity data at specified time intervals. Different portions of the oil and gas industry are reported in these three source categories. The point source EI typically contains gas processing plants and some upstream oil and gas sites in nonattainment areas, whereas the area source inventory contains the majority of upstream oil and gas sites in the state, and the mobile source inventory includes drilling rigs. More detailed information about sources and emissions rates included in each category is available upon request from the TCEQ Emissions Assessment Section. No changes were made in response to this comment.**

#### **POINT SOURCES**

The Sierra Club stated that the TCEQ needs to track oil and gas sites that meet point source EI reporting requirements one year but not subsequent years to avoid inaccurate point source emissions projections.

**The TCEQ does track which sites report to the point source EI on an annual basis. Upstream oil and gas emissions that are not reported in the point source EI are accounted for in the area source EI.**

**Both point and area source emissions projections account for industry activity and/or emissions trends. Therefore, the cumulative point source and area source emissions projections for the upstream oil and gas industry are accurate estimates despite the fluctuation in the population of upstream oil and gas sites that report to the point source EI. No changes were made in response to this comment.**

Downwinders asked if blowdown emissions from compressor engines are in the inventory.

**Point source annual emissions include emissions from blowdown activities in accordance with the TCEQ's *Emissions Inventory Guidelines* document.**

One individual commented that hydraulic fracturing produces earthquakes which could potentially generate ozone.

**Comments related to hydraulic fracturing causing earthquakes are beyond the scope of this SIP revision. However, the TCEQ is aware of a relatively recent study from the University of Virginia that indicates that in laboratory settings,**

**earthquakes may directly generate ozone. Further research is required to determine whether this phenomenon actually occurs, i.e., can be observed and measured, and the extent to which this phenomenon contributes to increases in ground-level ozone.**

**Criteria pollutant (or precursor) emissions from earthquakes would be classified as biogenic emissions. The federal AERR no longer requires states to develop and submit biogenic EIs, so these emissions would be outside the scope of this EI SIP revision.**

### **Flares**

Based on a 2012 Houston Advanced Research Center (HARC) study, Downwinders commented that flares generate ozone and are not control devices. The Sierra Club commented that flares do not control emissions at the presumed 98% destruction and removal efficiency (DRE) and questioned why the EI continued to assume 98% DRE.

**The HARC study referred to in the comment (Eduardo P. Olaguer, *The Potential Near-Source Ozone Impacts of Upstream Oil and Gas Industry Emissions*, Journal of the Air and Waste Management Association, August 2012) concluded that flares could significantly contribute to ozone formation. However, the TCEQ does not believe that the assumptions made in this study reflect actual conditions or impacts. The modeled flare, described as receiving natural gas in the abstract, was modeled as receiving a significant amount of propylene (an HRVOC that can increase ozone production efficiency). No evidence or citation was presented to substantiate the addition of propylene to the modeled flare's input stream at a natural gas facility. Based on TCEQ analyses, the majority of VOC emissions at upstream oil and natural gas facilities are flash gas emissions, which occur when oil or condensed natural gas hydrocarbon liquids are reduced to atmospheric pressure after extraction. Flash gas emissions have been sampled from storage tanks located at natural gas and oil wells at approximately 70 sites statewide. None of the lab analyses for these sites reported detectable quantities of HRVOCs, such as propylene. Similarly, the EPA SPECIATE software's emissions profile for oil and gas production activities does not contain these compounds (EPA, 2012). The author's addition of propylene to an oil and gas service flare appears highly unrealistic, even for an emissions event. The paper does not attribute the modeled ozone production from these flare emissions to the addition of propylene in the results and/or conclusions.**

**The TCEQ disagrees that flares are not control devices. Flares are first and foremost safety devices. Flares protect industrial sites and the adjacent communities by safely burning waste gas. Flares help to reduce the amount of pollution released into the environment by burning and destroying waste gas instead of allowing it to vent directly to the atmosphere.**

**The EPA sets New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) for sources. The EPA has specifically determined that flares operating in accordance with the specifications found in the NSPS (40 CFR 60.18) and the NESHAPS (40 CFR 63.11) destroy VOC or volatile hazardous air pollutants (HAP) with a destruction efficiency of 98% or**

greater (reference: *Basis and Purpose Document on Specifications For Hydrogen-Fueled Flares*, Emission Standards Division, U.S. Environmental Protection Agency, Office of Air Radiation, Office of Air Quality Planning Standards, Research Triangle Park, North Carolina 27711, p.1, March 1998; available at: [http://www.tceq.state.tx.us/assets/public/implementation/air/rules/Flare/Resource\\_5.pdf](http://www.tceq.state.tx.us/assets/public/implementation/air/rules/Flare/Resource_5.pdf)).

The TCEQ's 2010 Flare Study, conducted in conjunction with the University of Texas at Austin, indicated that dual-service flares (flares in both emergency and routine service) can achieve 98% or greater DRE, even during low flow conditions. However, providing too much steam or air assist to the flare can potentially decrease flare DRE.

To ensure that the TCEQ's study results were readily available to both the regulated community and public, the TCEQ partnered with the University of Texas at Austin to create supplemental flare operations training (available free of charge at: [sfot.ceer.utexas.edu](http://sfot.ceer.utexas.edu)). The primary objective of this training is to enhance operators' understanding of industrial flare operations and to provide practical information about variables affecting flare performance.

One of the major goals of the training is to increase operators' understanding of efficient flare operations, which will lead to maximizing flare DRE at or above 98% when using existing on-site resources.

No changes were made in response to these comments.

### **Greenhouse Gases**

One individual stated that the ozone standard must be strict to protect the environment from global warming and carbon dioxide (CO<sub>2</sub>) emissions.

The FCAA requires the EPA to set NAAQS for widespread pollutants that are harmful to public health and the environment, one of which is ozone. The EPA has not promulgated a NAAQS for any greenhouse gas, including CO<sub>2</sub>, and the reduction of greenhouse gas emissions is outside the scope of this EI SIP revision. No changes were made in response to this comment.

### **AREA SOURCES**

The Sierra Club noted that the TCEQ was unable to procure a full year of 2008 active wells for each county and should have a Memorandum of Understanding (MOU) with the RRC to obtain this data.

The TCEQ appreciates the need to share data between agencies and does have an MOU with the RRC to share data. Although Eastern Research Group (ERG) was not able to obtain the total number of active wells by county for 2008 for the report *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions* due to timing of the data availability, the TCEQ did obtain this information from the RRC and was able to adjust the EI appropriately. The TCEQ receives oil and gas data which is used to estimate emissions from many oil and gas sources. For counts of active wells, the

**TCEQ typically uses well count information from the following RRC Web page (<http://www.rrc.state.tx.us/data/wells/wellcount/index.php>) because it offers regularly updated data for active wells by county. No changes were made in response to this comment.**

The Sierra Club and Public Citizen noted that having an accurate area source inventory is of paramount importance and the 2011 inventory is inaccurate and undervalued given the widespread development of natural gas and oil through hydraulic fracturing development throughout Texas. Public Citizen also commented that the methodology for area sources for the 2011 EI was inadequate. The Sierra Club also noted that as a result of an inadequate 2011 inventory, the emission control strategies like the EPA's NSPS for new storage tanks will not be recognized as a valid control strategy.

**The TCEQ agrees with the Sierra Club on the importance of the area source EI. The area source inventory is developed in accordance with an EPA-approved quality assurance project plan and in accordance with the requirements of 40 CFR Part 51, Subpart A, AERR. The TCEQ expends significant resources to develop an accurate area source inventory. To this end, for the oil and gas sector, improvements made by the TCEQ include the development and refinement of a state-specific oil and gas emissions calculator. This oil and gas area source emissions calculator uses county-level production and local equipment activity data with local emissions requirements to estimate emissions from individual production categories including compressor engines, condensate and oil storage tanks, loading operations, heaters, and dehydrators. A significant improvement made to the oil and gas emissions calculator for the 2011 inventory is the development of refined emission factors for VOC emissions from condensate storage tanks.**

**The TCEQ disagrees that the inventory is too inaccurate for future SIP and control strategy development. Area (nonpoint) and mobile source EI estimates are developed using the best available data and emissions determination methods or models available at the time. For example, the area source oil and gas inventory uses the current production data and well statistics from the RRC to develop specific county-level estimates. As noted above, the TCEQ has invested significant resources in advancing area source inventory development methods. The methods TCEQ uses to develop its area source oil and gas inventory serves as a model for other agencies. As this SIP revision is not intended to demonstrate attainment, commenting on control strategies is outside the scope of this EI SIP. No changes were made in response to these comments.**

Public Citizen stated that in 2013 there were 304,900 active oil and gas wells in Texas, while the EI SIP revision uses 90,000 gas wells and 150,000 oil wells (or a total of 240,000 wells). Public Citizen indicated that the large difference in the number of oil and gas wells is exponential and is inadequate to begin to address local air quality problems.

Downwinders indicated that the number of wells used in the 2011 EI was not correct, and that the TCEQ used about 240,000 oil and gas wells, while the RRC had 55,000 or 60,000 more oil and gas wells. The Sierra Club also noted that the numerous oil and gas wells drilled since 2008 were not included in Appendix A: *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions*.

The 2011 oil and gas emissions estimates contained in this SIP revision were developed using the number of oil and gas wells in 2011. It would not be appropriate to use the number of oil and gas wells in 2013 to develop the 2011 EI. In addition, it appears that the 304,900 active wells referenced by the two groups include all active wells, including service wells, injection/disposal wells, and storage wells. The TCEQ only used the number of active oil and gas wells to develop the oil and gas EI.

The 2011 area source EI was developed using a total of 261,476 oil and gas wells. Information taken on February 14, 2014 from the RRC indicates that for 2011, there were 263,402 oil and gas wells. This slight increase is a difference of less than 1%. The difference is due to the RRC updating the well counts since the development of the EI. The RRC oil well information is available at: <http://www.rrc.state.tx.us/data/production/oilwellcounts.php> and the gas well information is available at <http://www.rrc.state.tx.us/data/production/gaswellcounts.php>.

The Sierra Club is correct that the report does not account for drilling since 2008. However, the TCEQ obtained 2011 oil and gas well counts from the RRC and used these counts to develop oil and gas emissions estimates for 2011 including drilling emissions estimates.

The TCEQ recently reviewed the number of active oil and gas wells used to develop the 2011 inventory, and made an adjustment to the emissions estimates based on this review. Originally, the TCEQ used the total number of active oil and gas wells as of the end of 2011 with the assumption that all of the wells were active for the entire year. For the revised emissions estimates, wells completed in 2011 were assumed to be active on average for half the year instead of the entire year. In addition, emissions estimates from gasoline bulk terminals and gas plants were revised based on a recently completed August 2013 Eastern Research Group (ERG) study, *Emission Inventory of Bulk Gasoline Terminals and Bulk Gasoline Plants*; emission estimates from oil and gas well heaters were revised based on the August 2013 ERG study, *Upstream Oil and Gas Heaters and Boilers*; and emissions estimates from compressor engines in the DFW 2008 eight-hour ozone nonattainment counties were revised based on data obtained from the Barnett Shale Special Inventory

Based on these adjustments, the emissions in Table 2-3: *HGB 2011 NO<sub>x</sub> and VOC Emissions for Area Sources* and Table 2-4: *DFW 2011 NO<sub>x</sub> and VOC Emissions for Area Sources* of the EI SIP revision have been updated. For the HGB area, the 2011 annual NO<sub>x</sub> emissions estimate for area sources decreased from 8,617.31 tpy to 8,577.06 tpy, and the VOC emissions estimate decreased from 107,305.48 tpy to 104,944.04 tpy. For the DFW area, the 2011 annual NO<sub>x</sub> emissions estimate for area sources decreased from 16,639.03 tpy to 15,734.52 tpy, and the VOC emissions estimate decreased from 97,314.07 tpy to 96,299.78 tpy.

The Sierra Club questioned the accuracy of the 2008 EI and the 2011 EI since the report stated, "Total active wells by county for the full 2008 year are not readily available from the RRC ."



**Although ERG was not able to obtain the total number of active wells by county for 2008 for the report *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions* due to timing of the data availability, the TCEQ did obtain the information from the RRC and was able to adjust the EI appropriately. The 2008 EI is developed using the total number of active wells by county for the full 2008 year. The 2011 EI is developed using the total number of active wells by county for the full 2011 year. No changes were made in response to this comment.**

One individual stated that the assumption that the boom in the Barnett Shale has peaked is not accurate, and thus, the emissions are not going to stabilize at 2012 levels. The commenter further stated that as the price of natural gas increases there will be more drilling activity in the DFW area.

**The oil and gas EI is based primarily on the actual number of oil and gas wells and the amount of Texas oil and gas production in 2011. These data are obtained from the RRC. Data on changes in future activity will be available for use by the TCEQ to develop future inventories and to validate past inventory accuracy. The TCEQ uses the most current data available at the time of SIP development. No changes were made in response to this comment.**

The Sierra Club requested that the appendices document the area source emissions by category. Downwinders stated that the TCEQ does not break down emissions from the oil and gas exploration and production from the area source portion of the EI. The Sierra Club and Downwinders stated that there was no way to know how much of the 10,535 tons of VOC listed in Table 2-4 for Wise County was from condensate storage tanks. The Sierra Club further stated that one should be able to determine the amount and source of any emissions in the EI.

**The TCEQ agrees that the 2011 emissions associated with oil and gas exploration and production are not detailed within the narrative of the 2011 EI SIP revision. The appendices contain information on methods used to develop certain oil and gas categories contained within the 2011 EI but do not contain 2011 emissions. The 2011 EI SIP revision focuses on all 2011 ozone precursor emission estimates for the DFW and HGB nonattainment areas; not just oil and gas production and exploration emissions. As a result, ozone precursors are summarized by county and emissions sector (e.g., point source). Emission estimates of ozone precursors from oil and gas exploration and production sources are included within the reported tons of emissions supplied in the 2011 EI SIP revision. Area source oil and gas emissions by source classification code are available by accessing the EI titled “2011 Area Source V3” within the Texas Air Emissions Repository located at <http://texaer.tceq.state.tx.us/texaer/index.cfm>. Querying the 2011 data for Wise County on this website shows that 4,031 tons of the 10,455 tons of VOC for Wise County were assigned to condensate storage tanks. No changes were made in response to these comments.**

The Sierra Club and Downwinders commented that the source of the compressor engine emissions factors is unclear.

**Point source emission rates for compressor engines are based on the best available data, including stack test data, at the unit level in accordance with the TCEQ’s**

***Emissions Inventory Guidelines* document. Area source compressor engine emissions estimates for the HGB 2008 eight-hour ozone nonattainment counties are based on average emissions rates per type of compressor engine as detailed in the ERG report found in Appendix A: *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions*. Area source compressor engine emissions estimates for the DFW 2008 eight-hour ozone nonattainment counties including Wise County are based on updated engine profile distributions and emission factors obtained from the Barnett Shale Phase II Special Inventory.**

**Compressor engine data obtained from the Barnett Shale Phase II Special Inventory and 2011 point source EI compressor engine emissions data were used to validate the data used in the ERG report. As a result of this analysis, the TCEQ concludes the emission factors developed in the ERG report are the best available for developing the 2011 EI SIP revision for the HGB area. The Barnett Shale Phase II Special Inventory data was used to update the engine profile distributions and emission factors for the DFW 2008 eight-hour ozone nonattainment counties.**

The Sierra Club and Public Citizen commented that the compressor engine emissions in the 2011 EI were not accurate because six-year-old compressor engine data was used to develop the emissions factors. The Sierra Club added that specifics about the type of engine for 20% of the compressor engine population in the ERG report *Characterization of Oil and Gas Production Equipment and Develop a Methodology* were not known and that this negatively impacted the accuracy of the EI. The Sierra Club, Downwinders, and one individual added that new compressor engines installed since the ERG report was completed were not being included properly in the 2011 EI. The Sierra Club noted that removing 61 compressor engines from the population of engines used to develop the emissions factors in the ERG report could also affect the accuracy of the EI.

One individual urged the TCEQ to update the compressor engine emissions factors using stack test data. This individual further indicated that the sources should be tested the way they are actually operated and maintained in order to correctly account for control device efficiencies. Downwinders stated that the ERG report *to Estimate Statewide Emissions* is based on voluntary industry surveys and not on real world emissions or stack testing.

**Compressor engine data obtained from the Barnett Shale Phase II Special Inventory and 2011 point source EI were used to validate the data used in the ERG report. As a result of this analysis, the TCEQ concludes the emission factors developed in the ERG report are the best available for developing the 2011 EI SIP revision for the HGB area. The Barnett Shale Phase II Special Inventory data was used to update the engine profile distributions and emission factors for the DFW 2008 eight-hour ozone nonattainment counties.**

**The ERG report states, “ERG combined data from the two 2007 TCEQ engine surveys with the HARC survey data and determined the distribution or fraction of compression load by engine type for the most reported engines (comprising 80% of the population) for each of the three categories used in the HARC report.” ERG did know the types of engines for the entire compressor engine data referenced in the report, but used the specific compressor engine make and model numbers for the top 80% of the engines reported. This was done to make the number of specific**

**compressor engine make and model numbers listed in Tables 4-3: *Emission Factor Data for Texas Attainment Areas*, 4-4: *Emission Factor Data for Dallas Nonattainment Areas*, and 4-5: *Emission Factor Data for Houston Nonattainment Areas* more manageable. Because the compressor engine emissions estimates are based on natural gas production, as the production increases, the number of compressor engines required increases and are accounted for in the EI.**

**While 61 compressor engines were removed (57 due to missing engine characteristic information), a population of 2,880 compressor engines was used to develop the emissions factors. The removal of 61 compressor engines amounts to only 2% of the total compressor engines. This fraction is not statistically significant and would not have significantly affected emission estimates. Where available and applicable, the ERG report *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions* used data based on stack testing. When stack test data are used to develop the emissions estimate, the TCEQ requires that the stack test data reflect current operations and processes including any control equipment. No changes were made in response to these comments.**

The Sierra Club and one individual stated that the TCEQ should not apply a 90% reduction to the carbon monoxide and VOC emission factors for compressor engines equipped with non-selective catalytic reduction. They stated that instead an 85% reduction should have been applied to be more conservative.

**While the TCEQ appreciates the comment, the 90% reduction is an accepted industry standard from the EPA's AP-42, *Compilation of Air Pollutant Emission Factors*, Section 3.2, and is applicable for determining area source compressor engine emissions. No changes were made in response to these comments.**

The Sierra Club asked whether the 2011 EI included the additional artificial lift engines from the oil wells drilled between 2008 and 2011.

**Artificial lift engine emissions estimates in the 2011 EI are based on the number of active oil wells in 2011. Statewide, 5,263 additional oil wells were used to develop the 2011 EI as compared to the 2008 EI. The 2011 EI does include the emissions estimates from the additional artificial lift engines located at these additional 5,263 oil wells. No changes were made in response to this comment.**

The Sierra Club indicated that the TCEQ's assumption that 70% of artificial lift engines are electrically operated was not conservative and instead assuming 50% of artificial lift engines are electrically operated would be conservative. Downwinders indicated that assuming that 70% of artificial lift engines are electrified is a severe overestimation, and that there are no data or studies to confirm the 70% estimate.

**The ERG report states that between 50% and 90% of artificial lift engines are electrically operated. This information came from four companies that specialize in artificial lift engines. The TCEQ used the mean of this range, 70%, as an estimate for the percentage of artificial lift engines electrically operated. No changes were made in response to these comments.**

The Sierra Club questioned whether the assumption made in the ERG report about no artificial lift engines being manufactured after July 1, 2008 would be valid for the 2011 EI.

**The 2011 EI uses updated artificial lift engine emission factors taken from a 2011 Central States Air Resource Agencies (CenSARA) study, and the EPA's Oil and Gas Emissions Estimation Tool that is currently under development. These updated factors take into account artificial lift engines manufactured after July 1, 2008. No changes were made in response to this comment.**

Downwinders indicated that the number of artificial lift engines in the 2011 EI did not reflect the number of new artificial lift engines in use since the ERG report was completed in November 2010.

**The artificial lift engine emissions estimates in the 2011 EI were developed using the number of oil wells in 2011 and does include the number of new wells and artificial lift engines at those wells since the report was completed. No changes were made in response to this comment.**

The Sierra Club stated that they support the TCEQ conducting additional work and surveys that were recommended in the ERG report for pump-jacks and dehydrators.

**The TCEQ appreciates the Sierra Club's support.**

The Sierra Club assumed that the information for oil and condensate storage tanks contained in the ERG report in Appendix A have been superseded by the newer ERG report in Appendix B: *Condensate Tank Oil and Gas Activities*.

**For the 2011 EI, condensate storage tank emissions estimates were calculated using the updated factors from the ERG report located in Appendix B: *Condensate Tank Oil and Gas Activities*. Oil storage tank emissions estimates are calculated using the factors contained in the original ERG report contained in Appendix A: *Characterization of Oil and Gas Production Equipment and Develop a Methodology*, because the *Condensate Tank Oil and Gas Activities* report did not research oil storage tanks. No changes were made in response to this comment.**

The Sierra Club questioned whether any companies use splash loading for loading and unloading operations, and if any do, that the TCEQ should outlaw its use.

**The 2011 EI emissions estimates from loading and unloading operations are estimated using the dedicated vapor balance service emission factors from AP-42, *Compilation of Air Pollutant Emission Factors*, Section 5.2. The factors are the same for both submerged loading and splash loading. Regardless of whether companies use splash loading or submerged loading, the emissions in the 2011 EI would remain unchanged. Rulemaking regarding the use of splash loading is outside the scope of the EI SIP revision. No changes were made in response to this comment.**

The Sierra Club indicated that information from studies and surveys done after the ERG report was developed should be incorporated into the 2011 EI for pneumatic devices. The Sierra Club

also stated it was unclear how emissions from some sources would be updated in the future; in particular, that emissions from pneumatic devices were undercounted.

**The TCEQ continues to work to improve the EI, but due to the SIP revision process timing requirements for public hearing and comment, cannot always include recently available data. Improvements to emission estimates are subsequently incorporated into future EIs. The data in the report represents the best data that was available when the 2011 inventory was developed. For the 2011 EI, pneumatic device emissions estimates are based on updated emission factors and activity data (including the average number of pneumatic devices per well) developed from two surveys conducted by the TCEQ. The first survey was conducted in 2011 and focused on the 23-county Barnett Shale area. The second survey was conducted in 2012 and focused on the remainder of the state. In addition, revised bleed rate information from the EPA's Oil and Gas Emission Estimation Tool was used in the development of the emission factors used for the 2011 inventory. No changes were made in response to these comments.**

The Sierra Club indicated that the RRC has information about the amount of gas vented during well completions, and that this data should be used in the 2011 EI. The Sierra Club added that the TCEQ should obtain and use actual blowdown data from the RRC in 2011 for the 2011 EI. The Sierra Club added that it was not necessary for the TCEQ to estimate the number of well completions that are oil wells versus gas wells, because that information is available from the RRC.

**While the RRC does have information about the amount of gas vented after wells are put into production, it does not have information about the amount of gas vented during well completions. Therefore, the 2011 EI was developed using the methodology from the ERG report.**

**As noted in the ERG report, the majority of well completions (64% in 2008) are designated as "oil/gas wells" by the RRC and not separately as only oil wells or gas wells. Therefore, because the emissions factors differ, the TCEQ estimated how many of these "oil/gas well completions" were oil wells and how many were gas wells to provide a more accurate inventory using the method indicated in the ERG report. No changes were made in response to these comments.**

The Sierra Club was concerned that the Eagle Ford Shale was not included in the Central Regional Air Planning Association (CENRAP) studies on which equipment leak fugitive emissions are based.

**While the Eagle Ford Shale was not separately detailed in the CENRAP studies referenced in the ERG report, the Eagle Ford Shale is part of the Western Gulf Basin. The Western Gulf Basin was included in the CENRAP studies, so equipment leak fugitive emissions from the Eagle Ford Shale were accounted for in the 2011 EI. No changes were made in response to this comment.**

Public Citizen questioned if the TCEQ should state whether there are any flares used at oil and gas well sites, and those emission sources should be included the SIP revision.

**The 2011 EI does include flare emissions estimates from oil and gas sites in the point source EI and flare emissions from oil and gas wellhead sites in the area source EI. No changes were made in response to this comment.**

The Sierra Club, Downwinders, Public Citizen and one individual noted that Appendix A contains a 2010 report based on emissions primarily from 2008 and 2009, and questioned whether this report was relevant to the 2011 EI. The Sierra Club, Public Citizen, and one individual also commented that the 2011 EI should be based on actual 2011 emissions data and not estimates based on old calculations. The Sierra Club, Public Citizen and one individual further questioned whether the increased development of oil and gas sources since 2008 was reflected in the 2011 EI. One individual commented that the total numbers and types of equipment could be underestimated since parts of the ERG report are based on studies that go back to 2005 and used pre-2005 data.

**While the report contained in Appendix A was used to develop the 2008 EI and contained some pre-2005 data, the calculation methodologies and emissions factors contained in the report still remain valid for developing emissions estimates for many source types. To develop the 2011 EI, the emission factors from the report were combined with 2011 activity data to estimate 2011 emissions. Oil and gas activity data from 2008 was not used to develop the 2011 EI, and the 2011 oil and gas area source EI was not grown or projected from the 2008 EI. The 2011 EI for these categories was based on actual oil and gas activity occurring in Texas in 2011. No changes were made in response to these comments.**

The Sierra Club questioned why the NO<sub>x</sub> and VOC emissions for the DFW 2008 eight-hour ozone nonattainment counties listed in Table 5-2: *State-wide Emissions Inventory for 2008 by County* of the ERG report were lower than those reported in Chapter 2, *Emissions Inventories*, of the EI SIP revision.

**Table 5-2 of the ERG report lists 2008 area source oil and gas emissions, while the emissions reported in Chapter 2 of the EI SIP revision are 2011 total area source emissions. NO<sub>x</sub> emission estimates for 2011 are lower than the 2008 estimates primarily due to the effect of 30 TAC Section 117 NO<sub>x</sub> rules that require NO<sub>x</sub> controls on many of the compressor engines in the DFW nonattainment counties. The compliance date for these rules was after 2008 and before 2011. VOC emissions estimates for 2011 are lower than the 2008 estimates primarily due to the updated condensate storage tank emission factors developed in the 2012 ERG study *Condensate Tank Oil and Gas Activities*. No changes were made in response to this comment.**

Public Citizen questioned the Tarrant County NO<sub>x</sub> emissions reductions from 3,500 tons in 2008 to less than 1,000 tons in 2011.

**The decrease in NO<sub>x</sub> emissions estimates is due almost entirely to the implementation of 30 TAC Chapter 117 emission specifications for compressor engines during that period. These extensive specifications required controls on compressor engines larger than 50 horsepower (hp) in size in Tarrant County, and resulted in a significant decrease in emissions. These requirements went into effect after the 2008 EI was developed, and the compliance deadlines to meet these**

**emissions specifications were required before January 1, 2011. No changes were made in response to this comment.**

The Sierra Club and one individual questioned the area source VOC emissions in Wise County since Table E-2: *State-wide Emissions Inventory for 2008 by County* in Appendix A lists 24,000 tons of VOC from oil and gas sources in 2008, while the 2011 EI indicates 10,535 tons of VOC from all area sources.

**The TCEQ updated the emissions factors for several oil and gas sources for the 2011 EI. In particular, updated condensate storage tank emissions factors were developed in the 2012 ERG study *Condensate Tank Oil and Gas Activities*. Pneumatic device emissions factors were revised and activity data were developed from 2011 and 2012 TCEQ surveys. As a result of these improved emissions factors, the oil and gas emissions estimates for the 2011 EI were significantly lower than the emissions estimates for the 2008 EI. No changes were made in response to these comments.**

The Sierra Club suggested several revisions to the ERG report included in Appendix A, such as: 1) Indicating whether there are any flares used at well sites on pages 1-1 and 1-2 and Table 1-1: *Upstream Oil and Gas Production Source Types*; 2) Correcting the name of the HARC on page 4-1; 3) Updating Table 4-1: *Fraction of Wells >1 Year Old* to include wells completed in 2011; 4) Listing all of the shale zones which are subject to hydraulic fracturing along with their emissions estimates on page 4-2; 5) Defining “minor gap-filing” and explaining how this alters estimates for air emissions on page 4-4; 6) Stating how much manufacturer’s data vary and how much it alters that data by averaging across all performance data for a specific engine on page 4-5; and 7) Verifying that a 100 hp engine burns an equal amount of fuel as two 50 hp engines on page 4-10.

**While the TCEQ appreciates the comments, the report included in Appendix A is from a project completed in 2010. Changing a third-party final report after acceptance is not a routine practice. The requested changes will be noted for future work efforts, however, no updates will be made to the existing report at this time, since the changes would not impact the 2011 emissions listed in the EI SIP.**

The Sierra Club indicated that the term “green completion method” needed to be defined. The Sierra Club further stated that since the new EPA NSPS requires green completions for new gas wells beginning this year, it should be listed as a control device for the EI SIP revision.

**The purpose of the EI SIP revision is to submit a comprehensive, accurate, current EI for nonattainment areas and is not intended to identify control strategies or demonstrate attainment of the 2008 ozone NAAQS. Comments applicable to control strategies should be made during the public comment period for the AD SIP revision. No changes were made a result of these comments.**

**The TCEQ agrees that the term “green completion method” should have been defined. Changing a third-party final report after acceptance is not a routine practice. The requested changes will be noted for future work efforts and no updates will be made to the existing report at this time, since the changes would not impact the 2011 emissions listed in the EI SIP.**

The Sierra Club agreed with the ERG report recommendations of incorporating further efforts to better assess emissions from well completions and well blowdowns, pneumatic devices, fugitive emissions, and heaters and boilers.

**The TCEQ thanks the Sierra Club for the comment.**

The Sierra Club indicated that flares used at oil and gas well production sites should be investigated and questioned whether the TCEQ requires companies to use stack tests to determine if flare destruction efficiencies are what they are purported to be.

**To obtain the most complete EI possible, effort is prioritized for survey work for the categories that are expected to have the most significant impact on the EI and on any modeling or control strategy work. Flare activity at well production sites will be considered in this prioritization. At this time, the TCEQ is unaware of any practical way to perform a conventional stack test on a flare. The 2011 EI is developed with the assumption that flares operate with a 98% VOC destruction efficiency as listed in the EPA's AP-42, *Compilation of Air Pollutant Emission Factors*. No changes were made in response to this comment.**

The Sierra Club questioned what made the CENRAP data accurate enough that ERG could make a comparison of the emissions developed in the report to the CENRAP emissions as a quality assurance check.

**At the time the ERG study was done, the CENRAP data included basin-specific factors developed from survey data for Texas. ERG concluded that comparing emissions developed in their report to the CENRAP data was appropriate. The TCEQ agrees with this approach because at the time of the report, the CENRAP study contained the most recent and relevant information available. No changes were made in response to this comment.**

The Sierra Club noted that in Appendix A of the ERG report, ERG repeats many times throughout the memorandum associated with the work plan for this report that it will attempt to obtain data. The Sierra Club noted that an attempt was not good enough, and that ERG must do more than just attempt to obtain data, otherwise public money is wasted.

**The TCEQ appreciates the comment, but notes that ERG wrote this memorandum before the project was completed. This memo detailed how the Work Order effort would be performed for this project. The main report details what data ERG was able to obtain and whether there were any problems with obtaining the data. It is also important to note that a contractor is paid according to the elements of the contract that are completed, and the level of effort expended. If a contractor is unable to complete any portions of a contract, then the amount paid to the contractor is adjusted accordingly. No changes were made in response to these comments.**

The Sierra Club indicated that CO<sub>2</sub> and methane greenhouse gas emissions should be reported from well blowdown events.

**Estimating greenhouse gas emissions is outside the scope of the EI SIP revision. No changes were made as a result of these comments.**



One individual stated that blowdown emissions can account for more compressor engine emissions than what comes out of the stack, and questioned why these emissions are not included in the EI.

**Point source annual emissions include emissions from blowdown activities in accordance with TCEQ's *Emissions Inventory Guidelines* document. Information on compressor engine blowdown emissions was not available to accurately estimate these emissions for the 2011 area source EI. This category has been identified as a potential area for further research for upcoming fiscal years. No changes were made in response to this comment.**

The Sierra Club questioned whether information from oil tanks was included in the emission factors developed by the ERG report *Condensate Tank Oil and Gas Activities* included in Appendix B. The Sierra Club further questioned how emissions from oil tanks were determined.

**The ERG study focused only on condensate storage tanks and did not include oil storage tank data. For the 2011 EI, oil storage tank emissions estimates were developed using the factors contained in the ERG report *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions* contained in Appendix A. These factors were based on stack test data. No changes were made in response to these comments.**

The Sierra Club and one individual noted that there was a wide range of emission factors for condensate storage tanks, and mentioned the Waggoner Crystelle tank from Table 2-5: *Condensate Tank Emission Factors from the TCEQ 2010 Study* from Appendix B in particular. The individual further stated that it is difficult to derive an average emission factor when there is such a wide range of factors. The Sierra Club added that where individual source data were available, condensate tank emissions should be based on those data and the regional emissions factors should only be used where individual source data were not available. The Sierra Club also requested that emissions factors be developed for condensate and oil tanks separately and their emissions estimates be reported separately in the EI.

**The TCEQ agrees that estimating condensate tank emissions is a complex issue. The TCEQ does have separate emissions factors for condensate storage tanks and oil storage tanks. These emissions are reported separately in the EI.**

**The updated condensate tank emission factors developed in this ERG report and used for the 2011 area source EI are based on numerous data points from a variety of condensate storage tanks with a range of emission factors. These updated factors were used because they are an improvement over the previous factors due to the larger data set, production-weighting of the factors, and weighting the factors based on the emissions estimation method, with test data weighted more heavily than other methods. The regional emission factors contained in this ERG report were used to develop area source emissions at the county-level because individual source data for every individual source were not available. No changes were made in response to these comments.**

The Sierra Club was supportive of ERG and the TCEQ being conservative with the control efficiencies developed by this study, since they believe controls required by the new permit by rule and NSPS regulations that went into effect after 2011.

**The TCEQ thanks the Sierra Club for their support.**

The Sierra Club supported ERG's recommendation that future surveys on oil and gas producers be handled through mandatory requirements.

**The TCEQ appreciates the suggestion and will consider mandatory survey participation as needed for future research.**

The Sierra Club requested that a consistent definition of condensate based on American Petroleum Institute (API) gravity be developed.

**For EI purposes, condensate is defined as a liquid hydrocarbon with an API gravity greater than 40° at 60°F (and a specific gravity less than 0.8251). The EI defines condensate in this manner due to the definition of black oil found in the Oil and Natural Gas Production and Natural Gas Transmission and Storage NESHAP, 40 CFR Part 63, Subpart HH.**

**NON-ROAD SOURCES**

The Sierra Club indicated that emissions reductions from new engine and fuel standards for drilling rigs for 2009 and 2010 in Appendix G: *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993, 1996, and 1999 through 2040* may be overly optimistic.

**Without stating specific reasons why the Sierra Club believes the reductions may be overly optimistic, the TCEQ is unable to specifically address the comment. The drilling rig emission factors in the ERG report *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993, 1996, and 1999 through 2040* were developed using EPA's NONROAD2008a model. The TCEQ also notes that the drilling rig emissions estimates in 2009 and 2010 were lower than 2008 due in large part to the decreased drilling activity during those years and not solely due to engine and fuel standards. No changes were made in response to this comment.**

The Sierra Club questioned if the drilling emission numbers included the impacts of hydraulic fracturing. The Sierra Club also indicated that the differences in operations from wells that are hydraulically fractured and/or drilled horizontally versus wells drilled vertically should be taken into account. The Sierra Club further noted that the hydraulic fracturing processes merit their own study.

**Hydraulic fracturing pump engine emissions are included in the 2011 EI separately from the drilling rig emissions as an area source and are based on the EPA's Oil and Gas Emissions Estimation Tool. The EPA developed these emissions using the actual number of horizontal spuds drilled in each Texas county in 2011 combined with activity data and emission factors taken from a 2012 CenSARA study.**

**The differences in drilling rig operations (vertical versus horizontal) are taken into account in the 2011 EI. The ERG report *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993, 1996, and 1999 through 2040* developed three different drilling rig profiles: rigs used for vertical wells less than**

**or equal to 7,000 feet, rigs used for vertical wells greater than 7000 feet, and rigs used for horizontal/directional wells. Activity data were developed for each of the three rig profiles and included the number of engines by rig type, engine age, engine horse-power size, engine operational time, and average load percentage. For the 2011 EI, emissions estimates for each of the three rig profiles are calculated separately and then summed and reported as total drilling rig emissions.**

**The TCEQ agrees that hydraulic fracturing processes are complex and will continue to research EI improvements for all source categories, not just oil and gas, as funding allows. No changes were made in response to these comments.**

The Sierra Club questioned if the large reduction in NO<sub>x</sub> emissions from drilling rigs in Tarrant County and similar counties between 2008 and 2011 actually occurred.

**The large decrease in NO<sub>x</sub> emissions estimates is due primarily to two factors. First, NO<sub>x</sub> reductions occurred with the introduction of the Tier 3 and Tier 4 diesel emission standards. The Tier 3 standards were fully implemented by the end of 2008, and the Tier 4 standards began phasing-in starting in 2008 (with a tentative final implementation date of 2015). Second, there is a reduced amount of drilling activity in 2011 as compared to 2008. In Tarrant County for example, there were 454 gas wells completed in 2011 compared to 665 gas wells completed in 2008. No changes were made in response to this comment.**

The Sierra Club questioned the assumption in the report that the number of thousands of feet of drilling will stay static from 2010 to 2040 when 2011 and 2012 saw increased activity due to the expansion of the Eagle Ford Shale and Permian Basins.

**Based on historical drilling activity, there was a significant decrease in drilling activity during 2009 and 2010 state-wide. Future drilling activity was then projected using United States Energy Information Administration projections of oil and gas production which was the best information available at the time of the project development.**

**After the initial EI SIP revision proposal, the TCEQ completed a review of 2011 drilling activity data to determine if the drilling activity data projected in the ERG report *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993, 1996, and 1999 through 2040* aligned with the actual 2011 drilling activity data. Based on this review of the data, the TCEQ has updated the drilling rig emissions estimates in Table 2-5: *HGB 2011 NO<sub>x</sub> and VOC Emissions for Non-road Categories* and Table 2-6: *DFW 2011 NO<sub>x</sub> and VOC Emissions for Non-road Categories* of this EI SIP revision using the 2011 drilling activity data obtained from the RRC. For the HGB area, the annual NO<sub>x</sub> emissions estimate for the non-road category decreased from 42,020.62 tpy to 41,946.29 tpy, and the VOC emissions estimate decreased from 18,822.77 tpy to 18,820.83 tpy. For the DFW area, the annual NO<sub>x</sub> emissions estimate for the non-road category increased from 37,539.51 tpy to 39,272.29 tpy, and the VOC emissions estimate increased from 16,914.67 tpy to 16,998.73 tpy.**

The Sierra Club indicated that 2009 drilling information is available from the RRC, and this would improve the accuracy of the 2011 EI.

**The ERG report *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993, 1996, and 1999 through 2040* used 2009 drilling data that were obtained from the RRC. The TCEQ used 2011 drilling activity data obtained from the RRC to develop the 2011 EI. No changes were made in response to this comment.**

The Sierra Club indicated that all the emissions from drilling to completion need to be assessed and included in the EI.

**The 2011 EI does include emissions estimates for drilling rigs, mud degassing, well completions, well blowdowns, and hydraulic fracturing engines along with many other oil and gas related source types. The TCEQ included emissions from all oil and gas activities for which adequate information was available at the time the EI was developed. No changes were made in response to this comment.**

The Sierra Club stated that horizontal hydraulic fracturing and horizontal drilling could result in increased NO<sub>x</sub> and VOC emissions as compared to the more conventional vertical or slant drilling.

**The TCEQ acknowledges that there may be differences in the amount of emissions from drilling horizontal wells as compared to vertical wells which also includes factors such as the depth of drilling involved. The TCEQ contracted with ERG to perform a study on drilling rigs and examine hydraulic fracturing in Texas shale plays. In the ERG report *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993, 1996, and 1999 through 2040*, different emissions profiles for horizontal drilling and vertical drilling rigs were identified. Each profile had specific, associated emissions, and horizontal drilling emissions were larger. In addition, extensive research was conducted using data from the RRC permit records database to improve well activity data and a survey was employed to obtain detailed drilling rig engine data. The results of this report were incorporated into the 2011 EI. The TCEQ used the hydraulic fracturing default emissions from the EPA's Oil and Gas Emissions Estimation Tool for the 2011 EI. The TCEQ may consider additional research on this topic in the future. No changes were made in response to this comment.**

The Sierra Club and one individual commented that Appendix F: *Development of 2011 Statewide Toxics and Actual Annual and Ozone Season Weekday Emissions Inventories for Commercial Marine Vessels* refers to the EI for locomotives although there is no information about locomotives in the appendix.

**The locomotive and commercial marine vessel (CMV) EI was developed under a single project. The contractor, ERG, provided two separate reports: one report for CVM emissions, which is contained in Appendix F; and one report for locomotive emissions, which is found in Appendix H: *2011 Texas Railroad Emissions Inventory Report*. No changes were made in response to these comments.**

The Sierra Club supported the TCEQ's description of the Houston-Galveston, Texas City, and Freeport areas as a "hotspot of activity" and suggested that this area should be a "hotspot of emission reductions" in the upcoming and future SIP revisions.

**The HGB area is currently classified as marginal nonattainment for the 2008 eight-hour ozone standard, and no attainment demonstration or control strategy analysis is required for the area based on this classification from the EPA. Any potential future control strategies would be based on photochemical modeling results and other technical analyses used to determine controls that would be the most effective to attain the standard at that time. No changes were made in response to this comment.**

The Sierra Club and one individual noted that Appendix F states the *2011 Statewide Toxics and Actual Annual and Ozone Season Weekday Emissions Inventory for Commercial Marine Vessels* study was conducted On August 31, 2010 and requested clarification on this statement.

**The *2011 Statewide Toxics and Actual Annual and Ozone Season Weekday Emissions Inventory for Commercial Marine Vessels* study was completed on August 17, 2012 for TCEQ under a contract with ERG. This report was developed based on a variety of recent studies and activity data from prior years projected to 2011. One of the studies used by ERG to support the EI development was *Implement Port of Houston's Current Inventory and Harmonize the Remaining 8-County Shipping Inventory*, which was completed by Environ International on August 31, 2010.**

The Sierra Club noted that the Automatic Identification System (AIS) data, compiled by contractor ERG to quantify traffic patterns in the Gulf of Mexico, was not used to estimate emissions for the 2011 CMV EI due to project time constraints. The Sierra Club requested an explanation for how this issue will be corrected with revisions applied to the 2011 CMV EI.

**As noted on page 3-6 in Appendix F, “to match individual vessels to their characteristics is a very time consuming process and the project budget and schedule limited the use of AIS data to general spatial allocations of vessel traffic.” Although the AIS data was not directly used to develop individual vessel emissions due to project budget and schedule limitations, these data were used for comparison purposes to verify general spatial allocations of vessel traffic. The TCEQ notes that EI improvement research and related efforts are ongoing and the AIS data cited above may be used in the future for further inventory refinement and development. No changes were made in response to these comments.**

The Sierra Club noted the TCEQ's use of EPA-defined Source Classification Codes (SCC) as a means to attribute calculated emissions to the various marine vessel types and questioned if this resulted in any missing vessels or vessel activity.

**These SCCs are used to accommodate EPA reporting and estimation requirements for grouping of CMVs under specific SCCs and does not result in any missing vessels or vessel activities. For more information refer to Table 2-1: *Example SCC Assignments by Vessel Types* in Appendix F. No changes were made in response to this comment.**

The Sierra Club requested that the TCEQ further evaluate the EPA's latest guidance for estimating emissions from marine vessels for weaknesses and provide suggestions on how these methodologies can be corrected for improved accuracy.

**The TCEQ continues to evaluate the best methodologies for estimating emissions from CMVs. However, evaluation of the EPA's methodologies for future inventory work is outside the scope of this SIP revision. No changes were made as a result of these comments.**

The Sierra Club requested clarification on the use of the terms "slight" and "consistent" as used in the ERG report *Development of 2011 Statewide Toxics and Actual Annual and Ozone Season Weekday Emissions Inventories for Commercial Marine Vessels* listed in Appendix F to describe monthly variation in different marine vessel activity for 2011.

**The analysis was performed only to determine if there were any significant differences in monthly variation to warrant additional resources in keeping the inventory disaggregated at a monthly level. Data used to assess monthly variance were derived from the AIS data, which shows actual locations of individual vessels operating in Texas state waters at monthly and annual level maps (these data can be provided upon request). Based on these AIS data maps of vessel traffic, there is very little difference in marine vessel activity from month to month. No changes were made in response to this comment.**

The Sierra Club questioned the accuracy of the 2007 Port of Houston EI which was used as part of the basis for the development of the 2011 EI for CMV.

**The 2007 Port of Houston EI is well documented and represents a highly detailed inventory based on actual operational data of vessels and land-based equipment characteristics and activities to the extent such information was available. Local activity parameters are used to extend emission estimates to those portions not directly inventoried. Actual operational data were obtained from interviews with vessel operators, crew, pilots, and the United States Coast Guard's (USCG) vessel traffic system, which tracks oceangoing commercial marine vessels from points of origin and destination. No changes were made in response to this comment.**

The Sierra Club and one individual questioned the TCEQ's use of linear projection to grow the data from the 2007 Port of Houston inventory for the 2011 CMV EI. Specifically, the Sierra Club noted that using this linear growth did not account for impacts due to the economic recession period of 2007 to 2010 and requested clarification on how the 2007 Port of Houston inventory activity data were adjusted to 2011 activity levels.

**The TCEQ continues to work to improve the EI. The data from the 2007 Port of Houston inventory represents the best data available when the 2011 inventory was developed. CMV activity data from 2011 was not available for inclusion in the inventory within the time frame required to complete submittal of the inventory to the EPA by December 31, 2012. Therefore, activity data from prior years was developed and projected for 2011. No changes were made in response to these comments.**

The Sierra Club and one individual questioned the assumptions and validity of the load factors used in the EI development of vessels in port.

**Quantifying operating loads while a vessel is in port is one of the most challenging aspects of port EI projects, as noted in the EPA's April 2009 guidance, *Current***

***Methodologies in Preparing Mobile Source Port-Related Emission Inventories.*** The load factor methodology used is approved by the EPA and represents an approximate estimate for overall activity reflecting typical engine loads during normal equipment operation. No changes were made in response to these comments.

The Sierra Club requested verification on ERG's assumptions that navy vessel activities in Texas state waters were minimal since no active naval bases were located in Texas after 2006 and that most military vessel exercises occur in federal waters.

**Because of homeland security issues, obtaining timely information on military vessel activity was not possible in the project timeframe. Therefore, ERG made assumptions based on the data available at the time for the development of the 2011 EI. Since there were no active naval bases in Texas after 2006, the assumption that navy vessel activity was minimal is reasonable. No changes were made in response to this comment.**

The Sierra Club requested that a statement in Appendix F, indicating that certain Coast Guard craft tend to be used at coastal rescue stations where hours of operation may be relatively small with minimal impact on coastal air quality, be verified.

**The TCEQ notes that this statement in the report is specific to new fleet (65-foot special purpose craft, SPC-LE 33) that the USCG indicated it had taken delivery of (as of 2011) when providing data to ERG. The report notes that "ERG was not able to get any indication from the USCG on how many of these vessels were sent to Texas USCG stations. These boats tend to be used at coastal rescue stations, so actual hours of operation may be relatively small and their impact on coastal air quality will be limited." ERG used available data to make these assumptions and the TCEQ had no data to indicate otherwise. No changes were made in response to this comment.**

The Sierra Club noted that Appendix F contains an error which incorrectly refers to "San Padre Island."

**The TCEQ agrees that the wording referring to "San Padre Island" is incorrect and should indicate "South Padre Island" in Appendix F. Changing a third-party final report after acceptance is not a routine practice. The requested changes will be noted for future work efforts, however, no updates will be made to the existing report at this time, since the changes would not impact the 2011 emissions listed in the EI SIP.**

The Sierra Club suggested that marine vessel activity in federal water ways should be included in the EI and modeled for the SIP.

**The EI in this SIP revision includes an estimate of the emissions from marine vessels in state waters. Emissions estimates and modeling for the federal waters are outside the scope of this SIP revision. No changes were made in response to this comment.**

The Sierra Club commented that there was no indication that the TCEQ used the age of dredge engines to determine the air emissions. The Sierra Club requested that assumptions related to dredging activity data be verified by contacting dredge companies to obtain more accurate information.

**The equation used in calculating dredging emissions does not require a direct input of the age of the engine. However, dredge engine emissions were estimated using applicable EPA emissions factors that take fleet age into account.**

**Dredging assumptions were based on the *Diesel Inventory of Marine Vessels Phase II - Final Report* developed previously for the TCEQ (see the list of references included in Appendix F). The TCEQ recognizes that the EI improvement process is on-going and will take this suggestion under consideration for future EI development research. No changes were made in response to these comments.**

The Sierra Club and one individual noted that Appendix F indicates an error in the departure date listed on Page 3-17 in the calculation example.

**The TCEQ agrees that the indicated date of “January 11, 2007” is incorrect and Appendix F should indicate “January 11, 2011.” Changing a third-party final report after acceptance is not a routine practice. The requested changes will be noted for future work efforts, however, no updates will be made to the existing report at this time, since the changes would not impact the 2011 emissions listed in the EI SIP.**

## **ON-ROAD SOURCES**

One individual commented that the emissions results for trucks transporting waste water from oil production wells, as represented in the report *Development of Oil and Gas Mobile Source Inventory in the Barnett Shale in the 12-County Dallas-Fort Worth Area, Final Report, August 2012, North Central Texas Council of Governments*, are a concern because most of the emissions produced by the trucks are due to long-term idling that could easily be mitigated if controls were implemented and enforced.

**The TCEQ appreciates the commenter’s interest in reducing emissions due to long-term truck idling; however, as discussed previously, this SIP revision is not intended to demonstrate attainment of the 2008 eight-hour ozone standard or include additional control strategy analysis. Comments regarding control strategies in the DFW area should be made during the public comment period for the DFW AD SIP revision, which is currently scheduled to begin in December 2014. This comment is beyond the scope of this SIP revision. No changes were made as a result of this comment.**

One individual thought the 2018 extrapolated vehicle miles traveled (VMT) in the report *Development of Oil and Gas Mobile Source Inventory in the Barnett Shale in the 12-County Dallas-Fort Worth Area, Final Report, August 2012, North Central Texas Council of Governments* for trucks transporting waste water from oil production wells during production phase was too low based upon VMT presented in the report for 2006 and 2012.

**The VMT values for inventories that will be used in a SIP are developed using standardized methodologies approved by the EPA. The VMT values used in the EI**



**SIP revision are based upon the DFW and HGB travel demand models that are calibrated using actual ground counts and are adjusted as needed to be consistent with VMT estimates based upon the Highway Performance Monitoring System (HPMS). The HPMS is another VMT estimation system that is also calibrated to actual ground counts. The DFW and HGB travel demand models are subjected to extensive review processes in order to be validated for use in VMT development of a SIP revision. The VMT used in this EI SIP revision are documented in Appendices I and J.**

**The emissions and VMT values documented in the report *Development of Oil and Gas Mobile Source Inventory in the Barnett Shale in the 12-County Dallas-Fort Worth Area* were developed using the best information that could be obtained using the available resources for the subject vehicles, which is a very small subset of the vehicles operating the DFW metropolitan planning area. As intended, the study provides preliminary information concerning on-road vehicles operating at oil and gas sites. The TCEQ is assessing how to use the activity information and assessing next steps. However, because the on-road SIP emissions inventories set motor vehicle emissions budgets for transportation conformity, the information is not yet comprehensive enough to incorporate into the on-road SIP emissions inventory process. No changes were made in response to this comment.**

One individual commented that the CO<sub>2</sub> emissions from trucks transporting waste water from oil production wells, as represented in the report *Development of Oil and Gas Mobile Source Inventory in the Barnett Shale in the 12-County Dallas-Fort Worth Area, Final Report, August 2012, North Central Texas Council of Governments* reaches a level of 200,000 pounds a day.

**The CO<sub>2</sub> emissions are not a required element for this SIP revision. This SIP revision provides a basis for the DFW and HGB nonattainment areas for the 2008 eight-hour ozone standard. Inventory values for NO<sub>x</sub> and VOC are included in the EI SIP revision as required by FCAA, §182 and EPA's *Implementation of the 2008 National Ambient Air Quality Standard for Ozone: State Implementation Plan Requirements*. No changes were made in response to this comment.**

The Sierra Club and one individual commented that the TCEQ did not use the October 2012 MOVES database when developing the 2011 on-road mobile source EI. The October 2012 MOVES database corrected an error that only affects emissions 2020 and beyond. Sierra Club stated that future year inventories will be less accurate because the TCEQ did not use the October 2012 database when developing the 2011 on-road inventory.

**The TCEQ is required to use the latest available on-road emissions estimation model when developing EIs for SIP revisions. The October 2012 Motor Vehicle Emission Simulator (MOVES) database was not available at the time the 2011 on-road EI was developed. However, the MOVES October 2012 database only affects emissions for analysis years 2020 and beyond. Therefore, use of the October 2012 database would have no effect on the 2011 EIs presented in the EI SIP revision. No changes were made in response to these comments.**