

Source Apportionment Modeling Report

Prepared by the Capital Area Council of Governments

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Executive Summary

For this project, the Capital Area Council of Governments (CAPCOG) modeled the impact of a number of emission sources and source regions on ground-level ozone (O_3) levels at seven continuous air monitoring stations (CAMS) in the region in 2017 – CAMS 3, 38, 614, 690, 1603, 1675, and 6602. CAPCOG contracted with the Alamo Area Council of Governments (AACOG) to perform source apportionment modeling using the anthropogenic precursor culpability assessment (APCA) probing tool in Ramboll-ENVIRON's Comprehensive Air Quality Model with Extensions (CAMx)^{1,2}. AACOG used the June 2006³ and June 2012⁴ base case modeling platforms developed by the Texas Commission on Environmental Quality (TCEQ) with its 2017 emissions estimates used for attainment modeling for the Dallas-Fort Worth (DFW) and Houston-Galveston-Brazoria (HGB) 2008 Ozone National Ambient Air Quality Standard (NAAQS) nonattainment areas. For this project, CAPCOG and AACOG calculated source contributions based on the methods that the U.S. Environmental Protection Agency (EPA) used to calculate relative contribution factors (RCFs) in its source apportionment modeling for the Cross-State Air Pollution Rule (CSAPR) update for the 2008 Ozone NAAQS.⁵ In order to calculate the estimated impact of emissions sources in 2017, CAPCOG and AACOG also calculated projected 2017 O_3 design values (DVs) based on the EPA's December 2014 *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze*.⁶ Since 2017 O_3 design values will include both 2015 and 2016 ozone monitoring data, CAPCOG also calculated source contributions based on each monitoring station's 2015 and 2016 4th-highest maximum daily 8-hour ozone average (MDA8).

CAPCOG grouped contributions from:

- initial conditions (IC) and boundary conditions (BC) for the 2006 and 2012 modeling platforms;
- biogenic emissions domain-wide;
- fire emissions domain-wide;
- anthropogenic emissions from Canada, Mexico, and the Caribbean;
- offshore anthropogenic emissions;
- anthropogenic emissions from the CAPCOG region (Bastrop, Blanco, Burnet, Caldwell, Fayette, Hays, Lee, Llano, Travis, and Williamson Counties)
- anthropogenic emissions from the adjacent AACOG region (Atascosa, Bandera, Bexar, Comal, Gillespie, Guadalupe, Karnes, Kendall, Kerr, Medina, McMullen, and Wilson Counties);
- anthropogenic emissions from the adjacent Central Texas Council of Governments (CTCOG) region (Bell, Coryell, Hamilton, Lampasas, Milam, Mills, and San Saba Counties);

¹ <http://www.camx.com/>

² AACOG. APCA Runs for the 2006 and 2012 Photochemical Modeling Episodes Technical Report. Prepared for AACOG. April 4, 2017. Available online at <http://www.capcog.org/documents/airquality/reports/>.

³ <https://www.tceq.texas.gov/airquality/airmod/data/tx2006>

⁴ <https://www.tceq.texas.gov/airquality/airmod/data/tx2012>

⁵ EPA. Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Cross-State Air Pollution Rule Proposal. Office of Air Quality Planning and Standards, November 2015. Available online at:

https://www.epa.gov/sites/production/files/2015-11/documents/air_quality_modeling_tsd_proposed_rule.pdf.

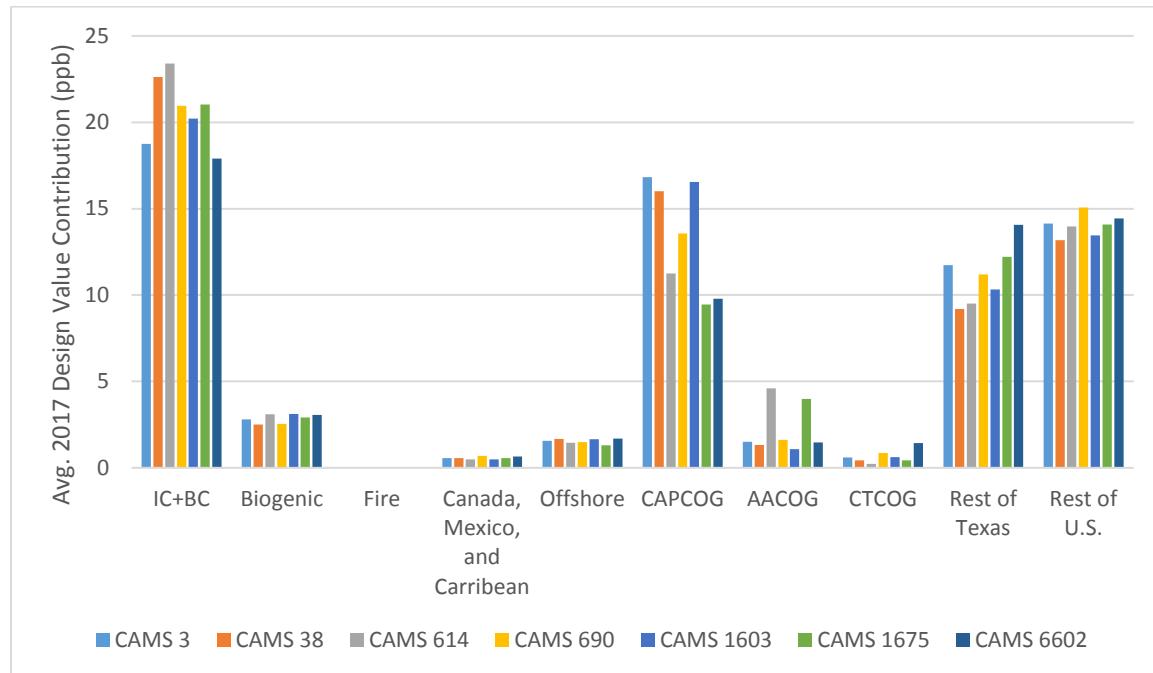
Accessed 2/15/2017.

⁶ EPA. *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze*. December 2014. Available online at: https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf. Last accessed 2/25/2017.

- anthropogenic emissions from the rest of Texas; and
- anthropogenic emissions from the rest of the U.S.

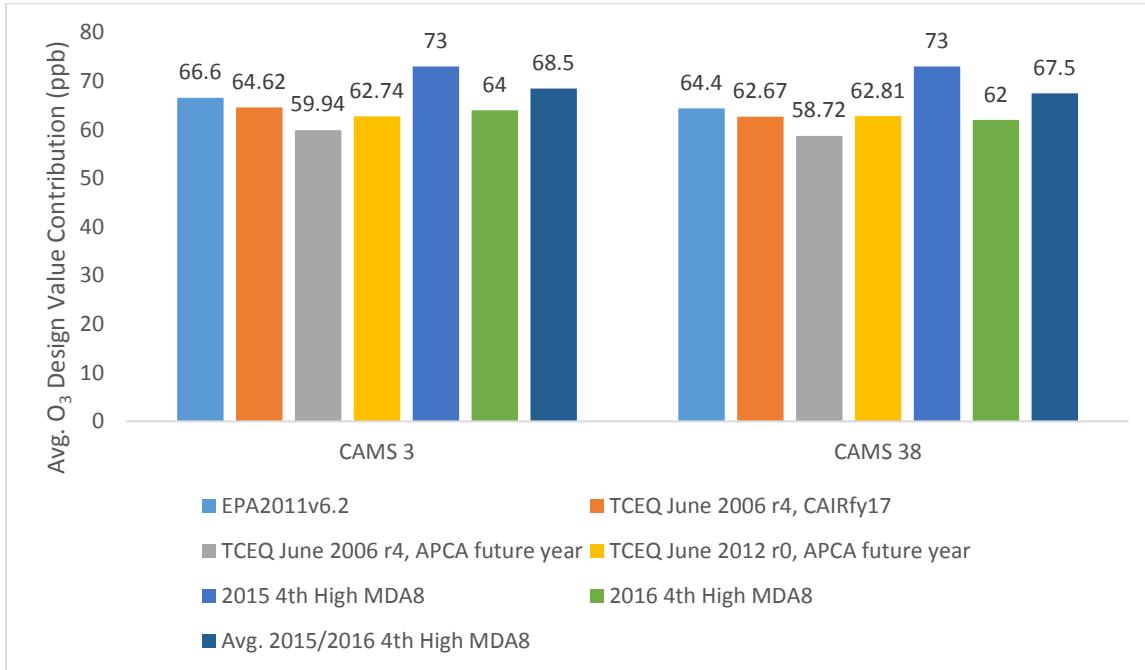
The following figure shows the estimated average contributions from each of these broad groupings, based on the average of each monitoring sites 4th-highest maximum daily 8-hour ozone average (MDA8) for 2015 and 2016, and the average RCF for each source modeled by AACOG using the 2006 and 2012 base cases.

Figure E-1. Average 2017 Design Value Contributions by Source for June 2006 and June 2012 Modeling Platforms



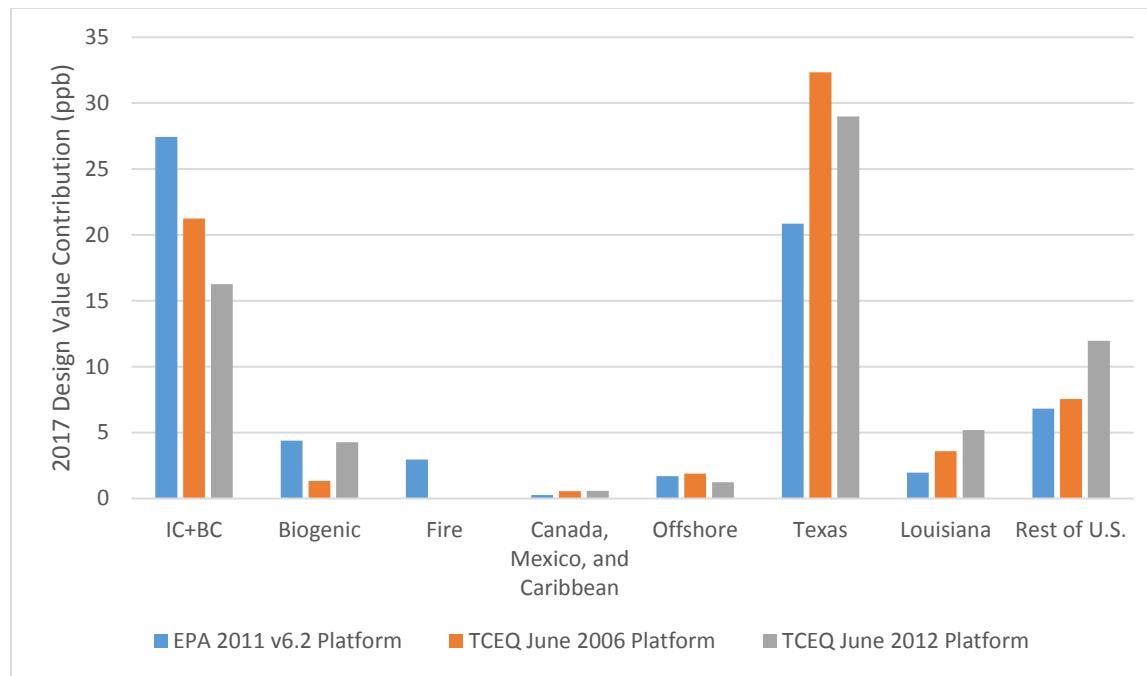
For CAMS 3 and CAMS 38, CAPCOG also compared projected 2017 design values calculated using TCEQ's June 2006 and June 2012 models to the design values developed by EPA using its May-September 2011v6.2 modeling platform. The figure shows two different projections using the June 2006 model – one based on the modeled O₃ levels using a simple 2017 future year run, and one using the APCA run. The figure also shows the 4th-highest MDA8 values measured in 2015 and 2016 at these stations, as well as the 2015-2016 average.

Figure E-2: Average 2017 O₃ Design Values for CAMS 3 and 38 Using EPA's 2011v6.2 Platform, TCEQ's June 2006 release 4 platform, TCEQ's June 2012 release 0 platform, and Avg. 4th High MDA8 for 2015/2016



CAPCOG also compared the modeling results for this project to EPA's interstate transport modeling for the CSAPR update for the 2008 Ozone NAAQS to assess the extent to which the region's O₃ design value would be expected to be influenced by emissions from within Texas, interstate O₃ transport, offshore emissions, international emissions within the modeling domain, biogenic emissions, and fire emissions. The following figure shows the aggregated relative contribution factors (RCF) from the three different modeling scenarios.

Figure E-3: 2017 O₃ CAMS 3 O₃ Contributions for the EPA 2011v6.2, TCEQ June 2006, and TCEQ June 2012 Modeling Platforms



Anthropogenic sources modeled accounted for less than half of the contributions to the 2017 design value using EPA's 2011v6.2 modeling, compared to about two-thirds of the contributions using the TCEQ's June 2006 and June 2012 modeling platforms. Neither the June 2006 or June 2012 platforms showed significant contributions from fire emissions, while the 2011 modeling platform includes quite significant fire emission contributions. Significant differences between TCEQ's June 2006 and June 2012 models include much more significant contributions from biogenic emissions and interstate transport in the June 2012 model compared to the June 2006 model, where over half of the contribution was modeled to come from anthropogenic emissions in Texas.

As part of this project, CAPCOG also conducted sensitivity analyses based on different methods used to calculate design values and relative contribution factors. These involved calculating different design values using the grid cell modeled versus the maximum value in the 3x3 grid array around the cell and calculating different RCFs based on the top 10 MDA8 days modeled, days with MDA8 values \geq 71 ppb, and days with MDA8 values \geq 60 ppb. CAPCOG also is including a comparison of the results of the last source apportionment modeling performed for the region in 2012 using the June 2006 base case to these results.

In its Quality Assurance Project Plan (QAPP) for this project, CAPCOG indicated that it also planned to calculate the average contribution per ton per day of emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs). CAPCOG's analysis of the modeling results showed that 99% of the impact from anthropogenic emissions is attributable to NO_x emissions, and as a result, CAPCOG only performed for this analysis for NO_x emissions, not VOC emissions.

Table of Contents

Executive Summary.....	2
Table of Contents.....	6
1 Introduction	9
1.1 Prior Source Apportionment Studies for the CAPCOG Region	9
1.2 New Source Apportionment Modeling Using June 2006 and June 2012 Modeling Platforms Projected to 2017.....	10
1.3 Modeling Domain.....	10
1.4 Receptors	12
1.5 Sources.....	13
1.6 Relative Contribution Factors	18
1.7 Projected 2017 Ozone Levels.....	19
1.8 Organization of Report.....	21
2 Domain-Scale Source Apportionment	22
2.1 NO _x and VOC Contributions	22
2.2 Impacts from Initial Conditions, Boundary Conditions, Biogenic Emissions, Fire Emissions, and Anthropogenic Emissions.....	24
2.3 Continental U.S., Offshore, and International Contributions	25
2.4 Interstate Transport Contributions.....	27
3 Texas Source Apportionment	31
3.1 Impacts by COG Region.....	31
3.2 Impacts from Counties in the CAPCOG, AACOG, and CTCOG Regions	35
3.3 Analysis of "AirSheds" for Each of the Seven Monitors.....	38
4 Analysis of Ozone Contribution-NO _x Emissions Ratios.....	39
4.1 CAPCOG, AACOG, and CTCOG Regions	40
4.2 Regions within Texas.....	41
4.3 Interstate Transport and Offshore Sources	42
5 Conclusions and Recommendations for Future Research.....	43
Appendix A: Coding for APCA Spreadsheets.....	45
Appendix B: Sensitivity Analysis: Alternative RCF Calculations	48
2006 Episode.....	48
2012 Episode.....	63
Appendix C: Alternative 2017 Design Value Projections	78
2017 Design Value Projections Using EPA Recommendations for Modeled Attainment Test.....	78
Alternative 2017 Design Value Projections Using Modeling Data.....	80
Appendix D: Analysis of Potential Impacts Newly Permitted EGUs in Guadalupe County on 2017 Modeled Contributions	81
Appendix E: QA Report	84
CAPCOG checks of AACOG deliverables.....	84
Internal checks of CAPCOG-developed spreadsheets for calculating RCFs	84
Check of Data Analysis Spreadsheet.....	85
Appendix F: Run Log.....	87
Table 1-1. Receptors Analyzed.....	13
Table 1-2. Avg. Peak 2017 MDA8 O ₃ Values Modeled for top 5 Days by Monitoring Station and Modeling Platform	19
Table 2-1. NO _x Contribution by Source Category and Monitoring Station, June 2006 Model	23

Table 2-2. VOC Contribution by Source Category and Monitoring Station, June 2006 Model	23
Table 2-3. NO _x Contribution by Source Category and Monitoring Station, June 2012 Model	23
Table 2-4. VOC Contribution by Source Category and Monitoring Station, June 2012 Model	23
Table 2-5. Comparison of CAMS 3 APCA Contributions Results for 2017 by Base Case Used.....	28
Table 2-6. Comparison of CAMS 38 APCA Contributions Results for 2017 by Base Case Used (ppb).....	29
Table 3-1. Councils of Governments in Texas	32
Table 3-2. Minimum and Maximum Contributions of COG Regions and Rest of Texas on CAPCOG Receptors	34
Table 3-3. Modeled Impacts from Individual Counties - June 2006 Base Case, 2017 Future Year (ppb)...	35
Table 3-4. Modeled Impacts from Individual Counties - June 2012 Base Case, 2017 Future Year (ppb)...36	36
Table 3-5. Modeled Impacts from Counties in the CAPCOG, AACOG, and CTCOG Region - June 2006 Base Case, 2017 Future Year (ppb).....	37
Table 3-6. Airsheds for each monitor based on a county contributing at least 1.0 ppb or 0.5 ppb in at least one platform.....	38
Table 3-7. Airsheds for each monitor based on a county contributing at least 1.0 ppb or 0.5 ppb in both platforms.....	39
Table 4-1. Average Peak O ₃ Contribution per tpd of NO _x emissions for CAPCOG, AACOG, and CTCOG Regions.....	40
Table 4-2. Average Peak O ₃ Contribution per tpd NO _x emissions for Texas by COG Region.....	41
Table 4-3. Interstate and Offshore Ozone Contribution to NO _x Emissions Ratios by State (excluding Texas)	42
Table 4-4. Ozone Contribution to NO _x Emission Ratios by Census Region/Division	43
Table B-1. Avg. Peak 2017 MDA8 O ₃ Values Modeled and Number of Days Used in Alternative RCF Calculations, June 2006 Platform.....	48
Table B-2. Avg. Peak 2017 MDA8 O ₃ Values Modeled and Number of Days Used in Alternative RCF Calculations, June 2012 Platform.....	48
Table B-3. CAMS 3 RCFs for June 2006 Episode.....	49
Table B-4. CAMS 38 RCFs for June 2006 Episode.....	51
Table B-5. CAMS 614 RCFs for June 2006 Episode.....	53
Table B-6. CAMS 690 RCFs for June 2006 Episode.....	55
Table B-7. CAMS 1603 RCFs for June 2006 Episode.....	57
Table B-8. CAMS 1675 RCFs for June 2006 Episode.....	59
Table B-9. CAMS 6602 RCFs for June 2006 Episode.....	61
Table B-10. CAMS 3 RCFs for June 2012 Episode.....	63
Table B-11. CAMS 38 RCFs for June 2012 Episode.....	65
Table B-12. CAMS 614 RCFs for June 2012 Episode.....	67
Table B-13. CAMS 690 RCFs for June 2012 Episode.....	69
Table B-14. CAMS 1603 RCFs for June 2012 Episode.....	71
Table B-15. CAMS 1675 RCFs for June 2012 Episode.....	73
Table B-16. CAMS 6602 RCFs for June 2012 Episode.....	75
Table C-1. Design Value Projection Using EPA's Modeled Attainment Test and June 2006 Modeling Platform	79
Table C-2. Design Value Projection Using EPA's Modeled Attainment Test and June 2012 Modeling Platform	79

Table C-3. Range of RRF Values for 2006 and 2012 Episodes Using Alternative Calculation Methods.....	80
Table D-1. NO _x Emissions and Ozone Impacts of Counties Near Guadalupe County on CAMS 614	81
Table D-2. Guadalupe County 2016 OSD EGU NO _x Emissions (tpd)	82
Table D-3. EPA 2011 and 2017 Emissions Modeled for Guadalupe County OSD EGU NO _x Emissions (tpd)	82
Table D-4. EPA 2017 Ozone Season Day NO _x Estimate for Guadalupe County (tpd)	83
Table F-1. Modeling Run Log.....	88
Figure E-1. Average 2017 Design Value Contributions by Source for June 2006 and June 2012 Modeling Platforms.....	3
Figure E-2: Average 2017 O ₃ Design Values for CAMS 3 and 38 Using EPA's 2011v6.2 Platform, TCEQ's June 2006 release 4 platform, TCEQ's June 2012 release 0 platform, and Avg. 4 th High MDA8 for 2015/2016.....	4
Figure E-3: 2017 O ₃ CAMS 3 O ₃ Contributions for the EPA 2011v6.2, TCEQ June 2006, and TCEQ June 2012 Modeling Platforms	5
Figure 1-1. TCEQ Modeling Domain for June 2006 and June 2012 Models (36 km = black, 12 km = blue, 4 km = green).....	11
Figure 1-2. EPA 12 km Modeling Domain for CSAPR Update for 2008 Ozone NAAQS	12
Figure 1-3. Map of U.S. Census Regions and Divisions	15
Figure 1-4. Source Regions Modeled	16
Figure 1-5. Texas Source Regions.....	17
Figure 1-6. 2015 and 2016 4th Highest MDA8 Values at CAMS 3, 38, 614, 690, 1603, 1675, and 6602 (ppb).....	20
Figure 2-1. Domain-Wide NO _x and VOC Design Value Contributions in the June 2006 and June 2012 Platforms.....	22
Figure 2-2. Average Contributions of Initial Conditions, Boundary Conditions, Biogenic Emissions, Fire Emissions, and Anthropogenic Emissions to Peak MDA8 O ₃ , June 2006 Platform (ppb)	24
Figure 2-3. Average Contributions of Initial Conditions, Boundary Conditions, Biogenic Emissions, Fire Emissions, and Anthropogenic Emissions to Peak MDA8 O ₃ , June 2012 Platform.....	25
Figure 2-4. Contributions of Anthropogenic Emissions from Continental U.S., Offshore, Mexico, Canada, and Caribbean to Peak O ₃ Concentrations in the CAPCOG Region, June 2006 Model (ppb)	26
Figure 2-5. Contributions of Anthropogenic Emissions from Continental U.S., Offshore, Mexico, Canada, and Caribbean to Peak O ₃ Concentrations in the CAPCOG Region, June 2006 Model (ppb)	26
Figure 2-6. Interstate Anthropogenic Emissions Contributions by Monitoring Station (ppb).....	27
Figure 3-1. Texas Anthropogenic Emissions Contributions by Monitoring Station (ppb)	31
Figure 3-2. Map of Regional Councils of Government in the State of Texas	32
Figure 3-3. Contributions from Anthropogenic Emissions in East Texas COGs and Rest of Texas, June 2006 Platform	33
Figure 3-4. Contributions from Anthropogenic Emissions in East Texas COGs and Rest of Texas, June 2012 Platform	34
Figure C-1. Projected Maximum Design Value Using Modeled Attainment Test Projections (ppb)	80

1 Introduction

Source apportionment air quality modeling provides a powerful tool for air quality planning in that it provides data on the contribution of different sources of emissions on ambient air pollution levels and can help identify the highest-priority emissions to control in order to improve air quality in a region.

1.1 Prior Source Apportionment Studies for the CAPCOG Region

Prior to this project, the most recent O₃ source apportionment modeling data available for the CAPCOG region was EPA's 2017 source apportionment modeling data completed in 2016 using its 2011v6.2 modeling platform. This modeling provided data on the contribution of anthropogenic emissions from each of the lower 48 states in the U.S., the District of Columbia (D.C.), tribal lands, offshore, and the portions of Mexico and Canada that were within the modeling domain, as well as the contributions from biogenic sources, fires, and initial and boundary modeling conditions.⁷

Another recent set of source apportionment modeling data is 2017 source apportionment modeling data TCEQ completed using its June 2006/August-September 2006 modeling platform in conjunction with its proposed attainment demonstration State Implementation Plan (SIP) for the Dallas-Fort Worth (DFW) 2008 Ozone NAAQS nonattainment area.⁸ TCEQ made these data available to CAPCOG in early 2016, and CAPCOG used the data for Continuous Air Monitoring Station (CAMS) 3 in our 2016 Ozone Conceptual Model.⁹ CAPCOG also has the data that was made available for CAMS 38, 601, 613, 614, 674, 675, and 684. These data provided details on the contribution of sources in the DFW nonattainment area, the rest of Texas, and the rest of the country, on O₃ levels. Sources modeled included:

- Biogenic emissions
- Point sources – electric generating units (EGUs)
- Point sources – cement plants
- Point sources – other
- Area sources
- On-road sources
- Non-road sources

⁷ EPA. *Final Cross-State Air Pollution Rule Update*. "Data File with Ozone Design Values and Ozone Contributions." 9/7/2016. Available online at:

https://www3.epa.gov/airmarkets/CSAPRU/Final%20CSAPR%20Update_Ozone%20Design%20Values%20&%20Contributions_All%20Sites.xlsx. Last accessed 3/5/2017.

⁸ This data was obtained from TCEQ on April 1, 2016, and was based on data for CAMS 3. Files used for this section included sa.20060531-

20060702.camx620APCA_cb6r2.tx.fy17_06jun.c0j.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.AN
WC.8h_cellvalu.csv.gz and sa.20060813-

20060915.camx620APCA_cb6r2.tx.fy17_06aqs1.c0j.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.A
NWC.8h_cellvalu.csv.gz. These data are no longer available on TCEQ's FTP site. In order to obtain these files, please contact TCEQ at amda@tceq.texas.gov.

⁹ CAPCOG. CAPCOG Ozone Conceptual Model 2016. 9/23/2016. Available online at:

http://www.capcog.org/documents/airquality/reports/2016/Deliverable_3.2-CAPCOG_Ozone_Conceptual_Model_2016.pdf. Accessed 3/5/2017.

- Off-road sources
- Oil and gas sources from the Barnett Shale
- Oil and gas sources from elsewhere
- Low-level point sources

Prior to the early 2016 source apportionment modeling data TCEQ made available to CAPCOG, the previous major source apportionment study available for the region (not counting the earlier versions of the CSAPR update modeling) was a 2012 study conducted by the University of Texas at Austin using the June 2006 base case model.¹⁰ This study modeled the impact of the Austin-Round Rock Metropolitan Statistical Area (MSA), five adjacent counties, major metropolitan areas in Eastern Texas, rural areas of Eastern Texas, large coal-fired power plants to the Northeast of Austin, the rest of Texas, Louisiana, and areas outside of Texas and Louisiana. Receptors included CAMS 3, CAMS 38, and Travis County.

Finally, U.T. conducted two sets of source apportionment modeling of 12 major point sources in the region in 2009. Reports for these data were never developed, but CAPCOG provided analysis of the data in a 2015 report available online.¹¹

1.2 New Source Apportionment Modeling Using June 2006 and June 2012 Modeling Platforms Projected to 2017

CAPCOG was interested in conducting new source apportionment modeling data using the most recent versions of EPA's 2006 and 2012 modeling platforms projected to 2017 in order to gain a better understanding of impacts of the relative impacts of emissions of nitrogen oxides (NO_x) versus volatile organic compound (VOC) emissions, anthropogenic versus non-anthropogenic sources, and local sources versus O₃ transport. CAPCOG was particularly interested in being able to model the impacts of individual counties within the CAPCOG region and the adjacent Alamo Area Council of Governments (AACOG) and Central Texas Council of Governments (CTCOG) region in order to better understand the relative importance of emissions from each county in these regions on ambient O₃ concentrations. CAPCOG decided to use both the June 2006 and June 2012 modeling platforms in order to evaluate how estimated contributions can change depending on the meteorology being used.

1.3 Modeling Domain

The following map shows the CAMx modeling domains used by TCEQ for its June 2006 and June 2012 modeling. The coarsest domain – the 36 km Regional Planning Organization (RPO) grid covers all of the continental U.S., the lower tier of Canada, and most of Mexico. This grid is compatible and consistent with the modeling domain EPA uses for its modeling. The narrower 12 km grid system covers all of Texas and Louisiana, and includes most of the other states in EPA Region 6 – Arkansas, New Mexico, and

¹⁰ The University of Texas at Austin. *Analysis of the Impact of Regional Transport on Ozone Concentrations in the Austin Area using the Anthropogenic Precursor Culpability Assessment (APCA) Tool with the Rider 8 Photochemical Modeling Episode for May 31-July 2, 2006*. July 2013. Available online at:

http://www.capcog.org/documents/airquality/reports/2013/Task_8.3-APCA_Analysis_Final.pdf. Accessed 3/5/2017.

¹¹ CAPCOG. *Photochemical Modeling Analysis Report*. 9/4/2015. Available online at:
http://www.capcog.org/documents/airquality/reports/2015/Photochemical_Modeling_Analysis_Report_2015-09-04_Final_Combined.pdf. Accessed 3/5/2017.

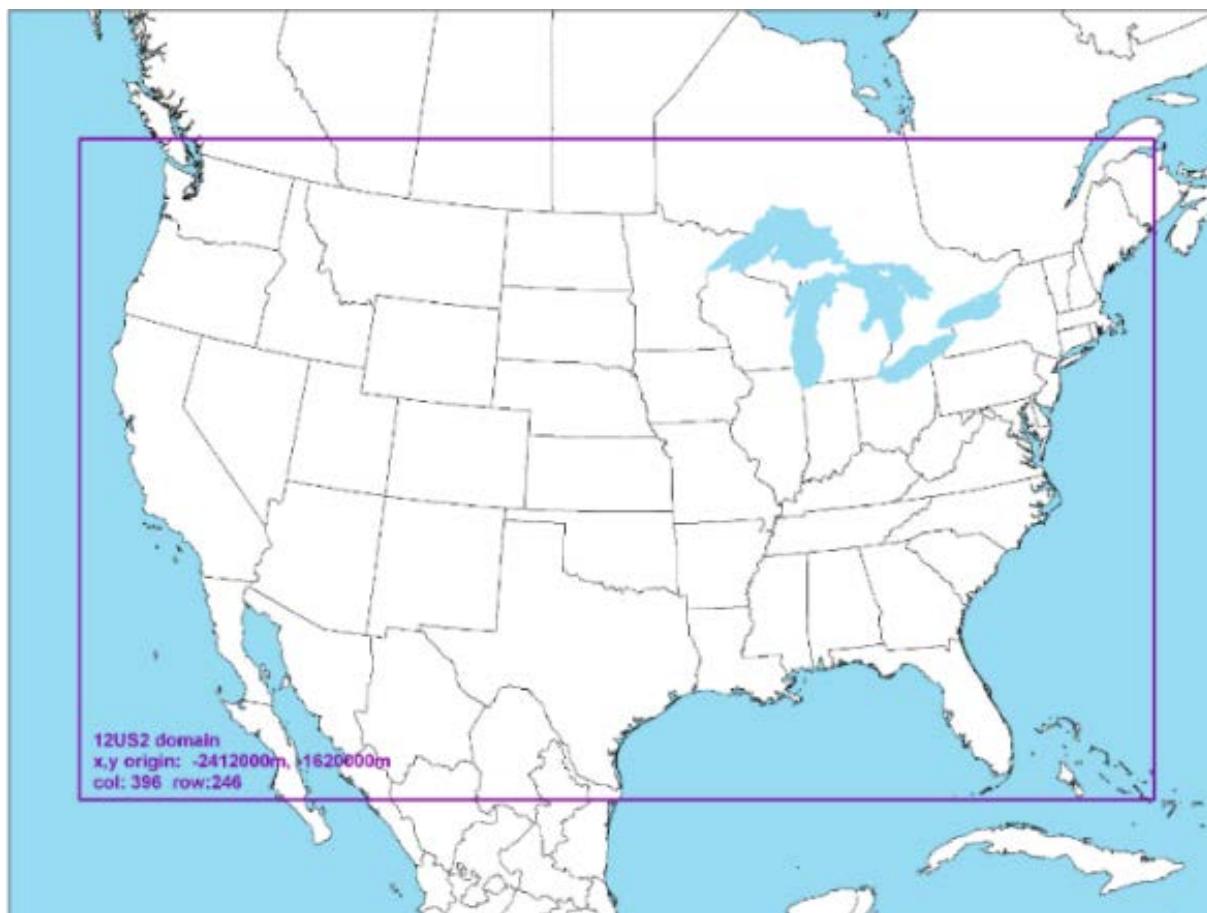
Oklahoma, as well as almost all of Mississippi, much of the western portion of the Gulf of Mexico, and parts of Mexico, Kansas, Kentucky, and Missouri. The finest-scale 4 km grid system covers the Eastern part of Texas and includes parts of Oklahoma, Arkansas, Louisiana, and parts of the Gulf of Mexico. The Austin area is within the 4 km system.

Figure 1-1. TCEQ Modeling Domain for June 2006 and June 2012 Models (36 km = black, 12 km = blue, 4 km = green)



TCEQ's grid system covers a larger geographic area than the grid system EPA used for the source apportionment modeling it performed for the CSAPR Update for the 2008 Ozone NAAQS. However, the extent of TCEQ's 12 km grid system is considerably more limited than EPA's grid system, which relied exclusively on a 12 km x 12 km grid for the entire continental U.S. TCEQ's 4 km x 4 km grid system over eastern Texas provides 9 times the resolution for this part of the state than EPA's grid system provides (seen in the figure below.).

Figure 1-2. EPA 12 km Modeling Domain for CSAPR Update for 2008 Ozone NAAQS



1.4 Receptors

CAPCOG selected seven receptors to analyze for this project. These seven receptors are the seven CAMS in the Austin-Round Rock MSA that had 4th-highest MDA8 O₃ levels of at least 70 ppb in 2015. Since compliance with the 2015 Ozone NAAQS is based on a location's 3-year average of its 4th-highest MDA8 O₃ levels staying at or below 70 ppb, CAPCOG felt that it was most appropriate to analyze these seven stations. CAMS 601 has a 4th-highest MDA8 value of 70 ppb, but since it is outside of the MSA, CAPCOG chose not to include it in this analysis.

CAMS 3 and 38 are “regulatory” monitoring stations operated by TCEQ in accordance with federal regulations and are used as the basis for determining the Austin-Round Rock MSA’s compliance with the 2015 Ozone NAAQS. CAMS 614, 690, 1603, 1675, and 6602 are research monitors operated by CAPCOG under a TCEQ-approved quality assurance project plan (QAPP) with precision and accuracy performance comparable to TCEQ’s CAMS 3 and 38, but are not configured to meet federal regulatory requirements and are therefore not used to determine compliance with the NAAQS. The table below provides details on each of the stations that were analyzed for this project.

Table 1-1. Receptors Analyzed

Monitoring Station	Name	Owner	City	County
CAMS 3	Austin Northwest	TCEQ	Austin	Travis
CAMS 38	Austin Audubon Society	TCEQ	Austin	Travis
CAMS 614	Dripping Springs	CAPCOG	Dripping Springs	Hays
CAMS 690	Lake Georgetown	CAPCOG	Georgetown	Williamson
CAMS 1603	Gorzycki Middle School	CAPCOG	Austin	Travis
CAMS 1675	San Marcos Staple Road	CAPCOG	San Marco	Hays
CAMS 6602	Hutto	CAPCOG	Hutto	Williamson

Note that in this project, although the term “design value” is used for regulatory purposes to refer only to a measurement used to assess formal compliance with the NAAQS, CAPCOG uses the term to refer to the 3-year average of the 4th highest MDA8 O₃ levels at CAPCOG’s research monitors as well.

1.5 Sources

There were three distinct categories of emissions analyzed:

1. Anthropogenic
2. Biogenic
3. Fires

Due to resource constraints, CAPCOG chose to aggregate the elevated point sources with the low-level emissions for a single anthropogenic source category. The “Fires” source consisted of emissions in the following source classification codes (SCCs):

- 2810001000: Forest Wildfires
- 2810005000: Managed Burning, Slash;
- 2810015000: Prescribed Forest Burning; and
- 2810020000: Miscellaneous Area Sources: Other Combustion: Prescribed Rangeland Burning.

CAPCOG decided to separate the emissions into these three categories in order to enable direct comparison to EPA’s 2017 source apportionment modeling for the CSAPR update for the 2008 O₃ NAAQS.

There was a total of 81 different source regions analyzed, plus initial and boundary conditions, with the impacts of NO_x and VOC tracked separately:

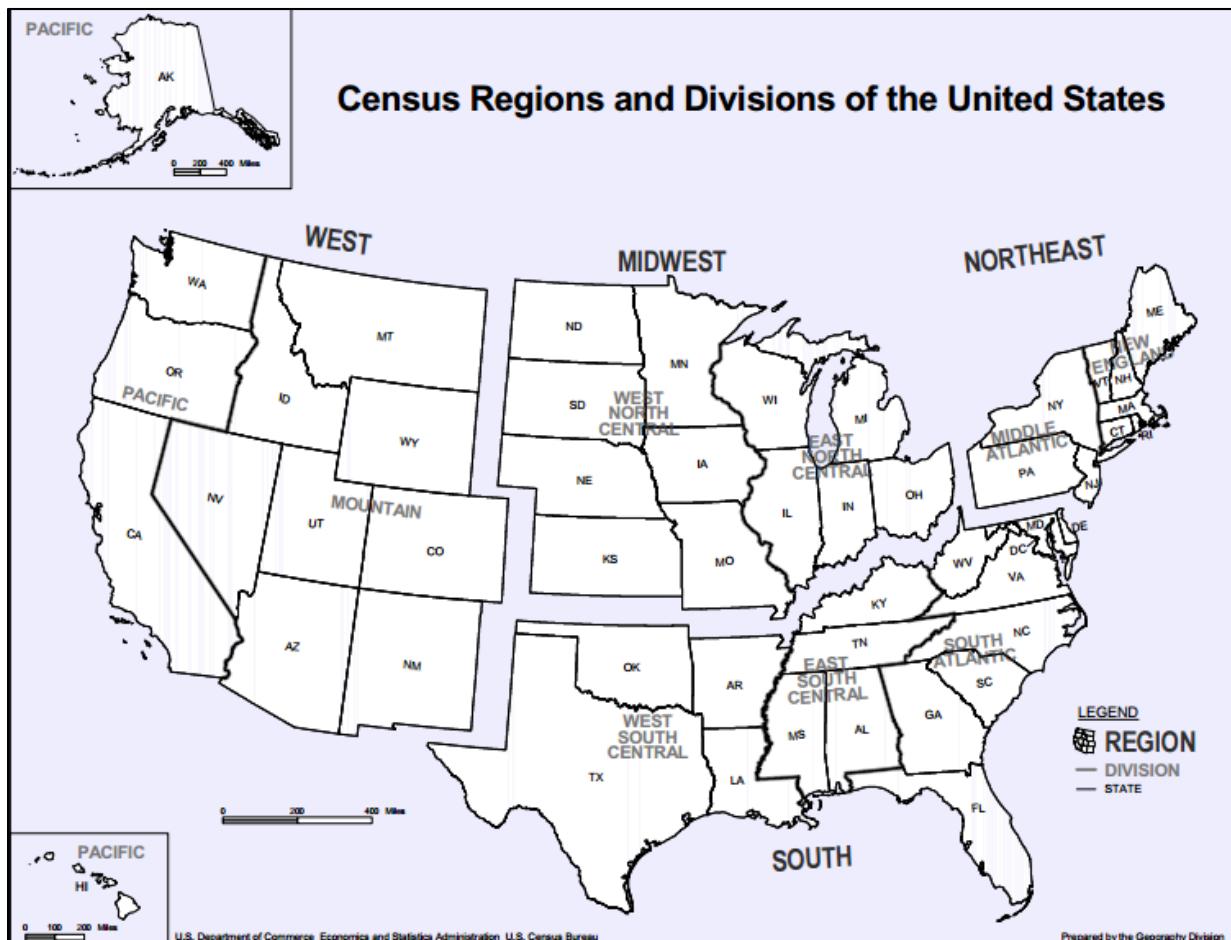
- Initial conditions
- Boundary conditions
- 4 areas outside of the Continental U.S. (Canada, Mexico, Caribbean, and Offshore)
- 30 individual states outside of Texas
- 3 multi-state regions outside of Texas (Northeast, DC/DE/MD, and Pacific)
- 30 individual counties in the CAPCOG, AACOG, and CTCOG regions
- 13 COGs in the eastern half of Texas
- 1 source region covering the rest of Texas

CAPCOG's selected state-level groupings based on EPA's 2011v6.2 platform modeling for 2017 and the U.S. Census Bureau's regional and division groupings.

- Any state with at least a 0.4 ppb impact was modeled individually.
- If a Census region had less than a 0.4 ppb impact, it was modeled together in its entirety. The Census Bureau's Northeast region (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont) met this criteria, and was therefore modeled as a single group.
- Within Census regions that had at least a 0.4 ppb impact, any division with less than a 0.4 ppb impact was modeled as a single group. The Continental U.S. portion of the Pacific division (California, Oregon, and Washington) met this criteria, and was therefore modeled as a single group.
- Within Census division that had more than a 0.4 ppb impact with, the states with the largest impact within that region would be separately modeled until the aggregate impact of the multi-state region was below 0.4 ppb. The Mountain division's contribution met this criteria, with Colorado, Montana, New Mexico, and Wyoming each being individually modeled.
- Within Texas, CAPCOG grouped the state into council of government (COG) regions in the eastern portion of the state, defined as any region with counties included in the Texas Low-Emission Diesel (TxLED) fuel region.
- CAPCOG individually modeled the impact of each county in the CAPCOG region and the adjacent Alamo Area Council of Governments (AACOG) and Central Texas Council of Governments (CTCOG).

The following map shows the U.S. Census Regions and Divisions.

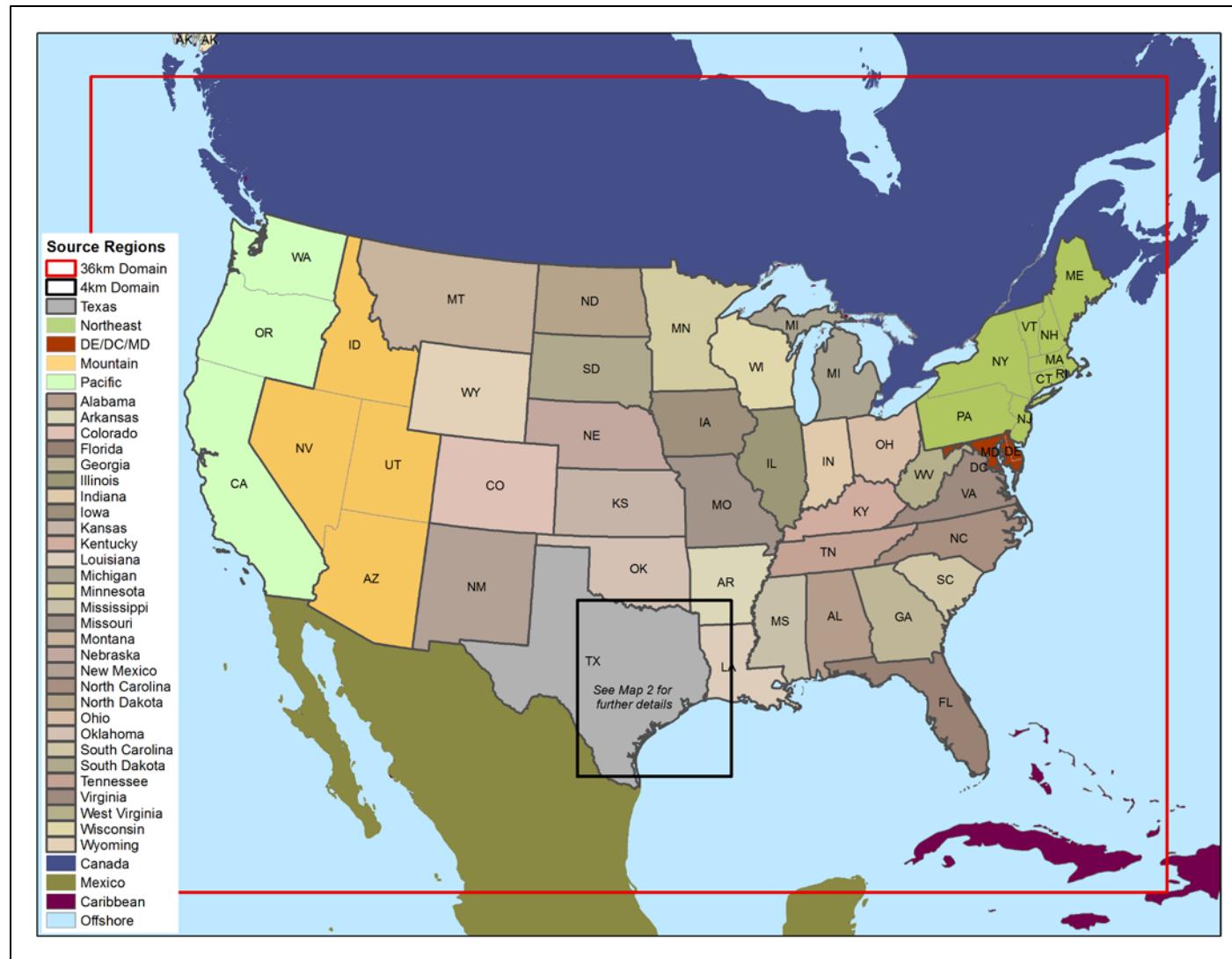
Figure 1-3. Map of U.S. Census Regions and Divisions



The next map shows the domain-scale source regions that were modeled for this project.

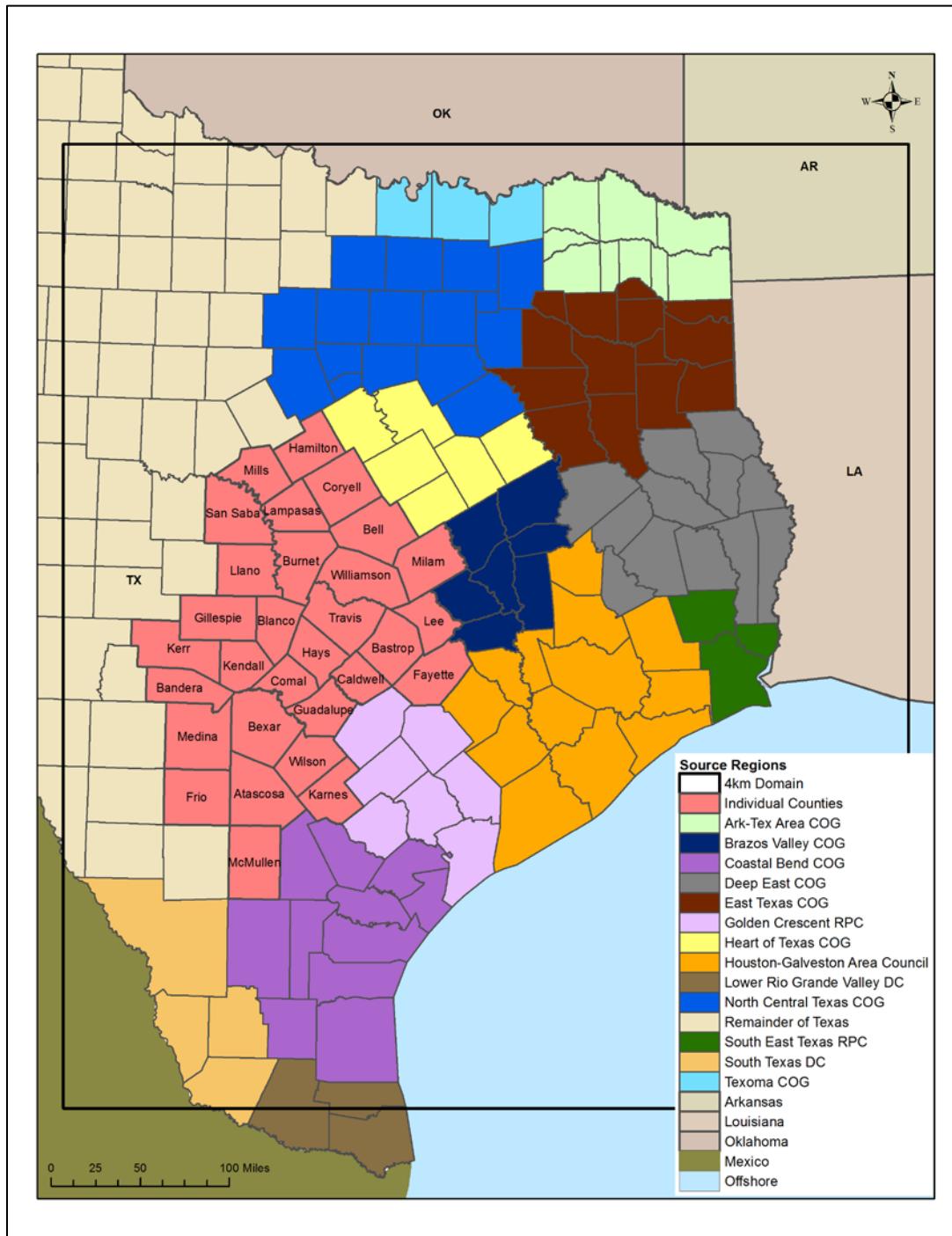
Source Apportionment Modeling Report, April 11, 2017

Figure 1-4. Source Regions Modeled



The following map shows the regions modeled within Texas.

Figure 1-5. Texas Source Regions



1.6 Relative Contribution Factors

A relative contribution factor (RCF) represents the share of a location's ozone design value attributable to a particular source modeled through source apportionment. This concept and the methods EPA used to calculate RCFs for the 2008 Ozone NAAQS Transport Modeling are described in Section 4 of EPA's technical support document (TSD) for that modeling.¹²

EPA used the following contribution categories in its modeling:

- States – anthropogenic NO_x and VOC emissions from each state tracked individually
- Biogenics – biogenic NO_x and VOC emissions domain-wide
- Tribes – emissions from tribal lands for which EPA had point source inventory data in the 2011 National Emissions Inventory (not tracked individually)
- Canada and Mexico – anthropogenic emissions from portions of Canada and Mexico in the modeling domain, combined
- Fires – combined emissions from wild and prescribed fires domain-wide
- Offshore – combined emissions from offshore marine vessels and offshore drilling platforms

EPA calculated the contribution of each source category to each MDA8 at each monitor across the country for each day of the May 1, 2011 – September 30, 2011 episode projected to 2017. EPA then calculated RCFs for each source category based on the fraction of the total MDA8 modeled for the highest days modeled. This consisted of the top five MDA8 values and any other MDA8 values modeled that were ≥ 76 ppb. If there were fewer than five MDA8 values ≥ 60 ppb for a site, that site was not analyzed.

The equation below summarizes how an RCF is calculated.

$$RCF_{i,j} = \frac{\text{Avg. Contribution of source } i \text{ to MDA8 } O_3 \text{ at receptor } j, \text{ top 5 days}}{\text{Avg. MDA8 } O_3 \text{ at receptor } j, \text{ top 5 days}}$$

So, for example, if CAMS 3's top 5 modeled MDA8 values for 2017 were 77.21 ppb, 76.81 ppb, 75.93 ppb, 74.83 ppb, and 74.08 ppb (the values modeled in TCEQ's 2017 source apportionment modeling for CAMS 3), and the contributions from biogenic emissions were 4.07 ppb, 3.72 ppb, 6.06 ppb, 3.45 ppb, and 4.80 ppb, respectively, the RCF for biogenic emissions would be:

$$RCF_{\text{biogenics, CAMS 3}} = \frac{4.07 \text{ ppb} + 3.72 \text{ ppb} + 6.06 \text{ ppb} + 3.45 \text{ ppb} + 4.80 \text{ ppb}}{77.21 \text{ ppb} + 76.81 \text{ ppb} + 75.93 \text{ ppb} + 74.83 \text{ ppb} + 74.08 \text{ ppb}} = 0.0583$$

EPA uses RCFs in a relative sense, applying them to a projected design value rather than using the model output directly, in the same way that it uses modeling projections in a relative sense when calculating future design values. So, while the average modeled contribution of biogenic emissions to CAMS 3's top 5 modeled MDA8 values in 2017 was 4.42 ppb in TCEQ's modeling, the average of the top 5 MDA8 values modeled at CAMS 3 was 75.77 ppb, 14% higher than the 66.6 ppb average design value that EPA projects for the region for 2017 and 15% higher than the region's 2014-2016 design value of 66 ppb.

¹² EPA. Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Cross-State Air Pollution Rule Proposal. Office of Air Quality Planning and Standards, November 2015. Available online at: https://www.epa.gov/sites/production/files/2015-11/documents/air_quality_modeling_tsd_proposed_rule.pdf. Accessed 2/15/2017.

The table below shows the average peak MDA8 O₃ values modeled for the top 5 days at each monitoring station analyzed in the two APCA runs using the June 2006 and June 2012 modeling platforms. These values were the denominators for calculating the RCFs presented in the body of this report. Alternative methods for calculating RCFs are described in Appendix B.

Table 1-2. Avg. Peak 2017 MDA8 O₃ Values Modeled for top 5 Days by Monitoring Station and Modeling Platform

Platform	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
June 2006	72.31	69.47	66.98	70.28	64.63	70.81	67.34
June 2012	68.51	68.24	64.30	66.92	64.67	66.96	65.16

For EPA's interstate transport air quality analysis, it uses a contribution threshold of $\geq 1\%$ of the NAAQS in order to count one state's anthropogenic emissions as being considered a potentially "significant" contributor to nonattainment or interfering with maintenance of a NAAQS in a downwind state. For the 2015 Ozone NAAQS, this would translate into a contribution of at least 0.70 ppb, and for the 2008 Ozone NAAQS, the threshold was 0.75 ppb.

In general, CAPCOG believes that thresholds of 0.50 ppb or 1.00 ppb are more relevant for air quality planning purposes than 1% of the NAAQS, since a 0.50 ppb contribution is as likely as not to have an impact on a downwind location's O₃ design value, and a 1.0 ppb contribution would definitely have a contribution on a downwind location's design value. For this report, the 0.50 ppb, 0.70 ppb, and 1.00 ppb thresholds are discussed and analyzed.

1.7 Projected 2017 Ozone Levels

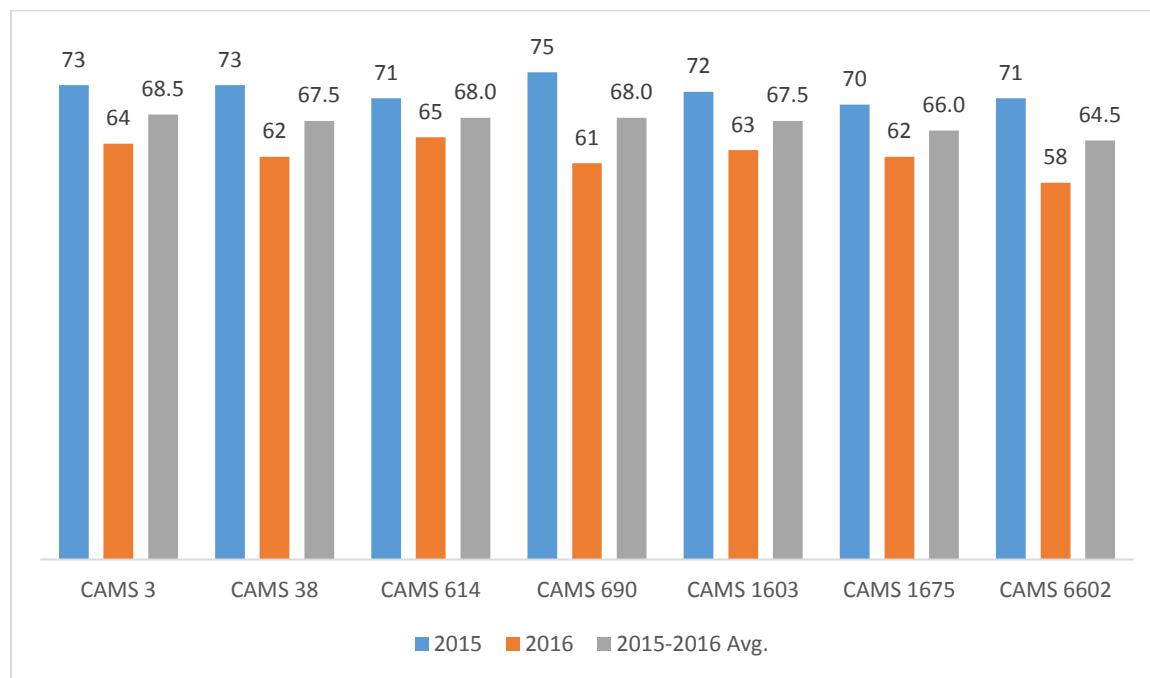
For this project, CAPCOG projected 2017 O₃ levels at each receptor based on the average 4th highest MDA8 O₃ values recorded at the sites in 2015 and 2016. This assumes that the 2017 ozone season's 4th-highest MDA8 O₃ values will be more likely to be mid-way between the 4th highest values in 2015 and 2016 than the 2017 design values projected based on modeling. While there has been a long-run downward trend in O₃ design values since 1999 that this method does not directly account for, this method provides a simple way, somewhat conservative approach to approximating the 2017 design value. Since some of the monitoring stations used in this analysis are relatively new (CAMS 1603) or have data gaps (CAMS 6602), this method also provides the most consistent approach to estimating 2017 O₃ levels.

CAPCOG's decision to use the average of the 2015 and 2016 data as the basis for estimated 2017 ozone levels, rather than a design value projection based on the modeling output, is consistent with EPA guidance on assessing O₃ levels in the near-future. As EPA states in its 2014 modeling guidance related to "weight of evidence" corroboration of attainment modeling, "modeling and related analyses are the most useful corroborative analyses for areas which are more than several years in the future. In contrast, ambient data and emissions trends become more important (and hence, model results become less important) the closer an area is to their attainment date. For example, if an area is only one

or two years away from their attainment date, ambient data is in most cases the best predictor of air quality levels in the near future.”¹³

CAPCOG did calculate 2017 design values using EPA’s recommended modeled attainment test and several variations on the recommended methods, but these produced unrealistically low 2017 design values in light of the region’s 2015 and 2016 O₃ measurements. Additionally, since not all of the monitors that were being analyzed were in service during periods that would allow for a design value projection from a 2006 or 2012 baseline, and one monitor (CAMS 1603) was not in service during either of the periods, the use of the 2015 and 2016 monitoring data provides a more complete representation of the expected 2017 O₃ levels at all seven of the receptors that were being analyzed than using the modeling projections, which would only include subsets of the 7 monitoring stations.

Figure 1-6. 2015 and 2016 4th Highest MDA8 Values at CAMS 3, 38, 614, 690, 1603, 1675, and 6602 (ppb)



For the balance of the body of this report, when source contributions are expressed in terms of a ppb contribution, it should be interpreted as an RCF calculated as described in Section 1.5 applied to the average of a monitor’s 2015–2016 4th-highest MDA8 value. Since the average for CAMS 3 is the highest among the seven monitors analyzed, it would be expected to be the key monitor for setting the region’s design value. Therefore, wherever in this report that a contribution to the region’s design value is discussed, as opposed to the contribution at a particular monitor, it is referring to the contribution at CAMS 3 based on its expected 68.5 ppb 2017 design value.

¹³ EPA. *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze*. December 2014. Available online at: https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf. Last accessed 2/25/2017.

1.8 Organization of Report

The balance of this report is divided into four sections:

- Domain-scale source apportionment (section 2)
- Texas source apportionment (section 3)
- Analysis of ozone contribution-emission ratios (section 4)
- Conclusion and recommendations for future research (section 5)

A series of appendices is also included to provide supplemental data and analysis, including sensitivity analyses of design value projections, alternative RCF calculations, analysis of the impacts of newly permitted power plants in Guadalupe County on O₃ formation in the region, a report of quality-assurance (QA) activities conducted by CAPCOG, and a run log describing each of the modeling runs AACOG performed and all the various parameters for each run.

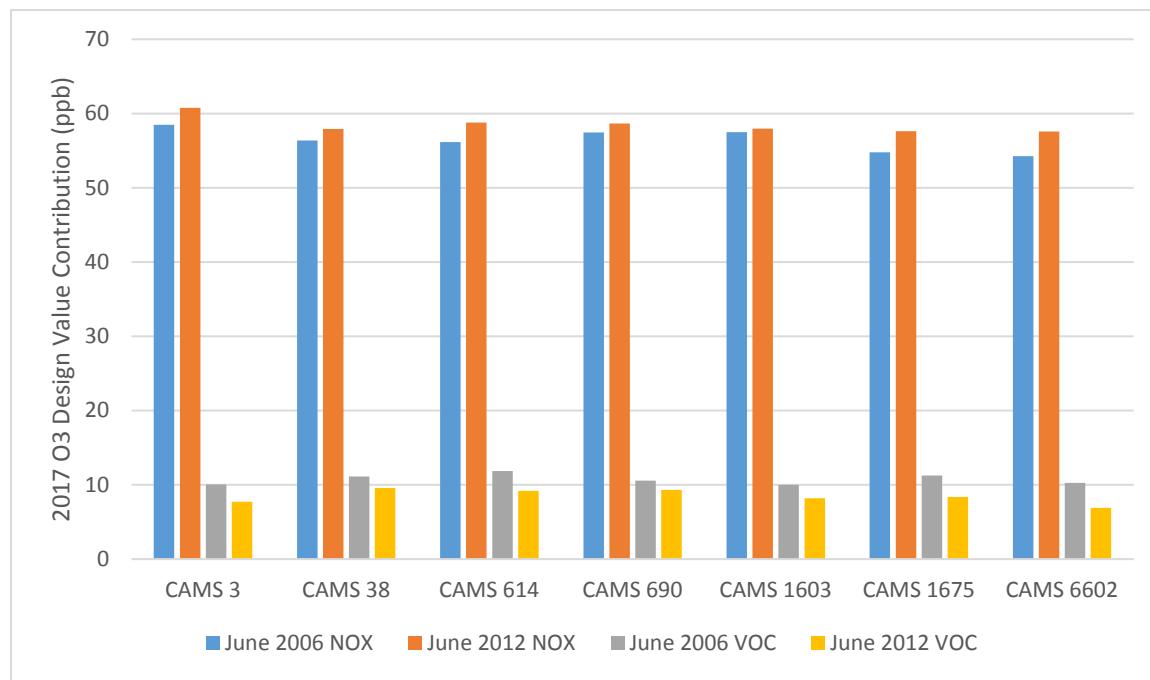
2 Domain-Scale Source Apportionment

This section describes the ozone contributions at that domain/national-level scale. CAPCOG segmented the emissions inventory into three groups of emissions: biogenic emissions, fire emissions, and anthropogenic emissions.

2.1 NO_x and VOC Contributions

The APCA probing tool provides the contributions from both NO_x and VOC to hourly ozone concentrations for each source modeled. The modeling performed for this project showed that peak O₃ concentrations in the Austin area are influenced primarily by NO_x emissions across the entire modeling domain. The following figure shows the average contributions of NO_x and VOC to the five highest MDA8 levels modeled at each monitoring station (referred to in this report as “peak” MDA8 levels) within the region using both the June 2006 and June 2012 modeling platforms.

Figure 2-1. Domain-Wide NO_x and VOC Design Value Contributions in the June 2006 and June 2012 Platforms



NO_x contributed 2-5 percentage points more to peak MDA8 levels in the June 2012 model than it did in the June 2006 model. Since CAMS 3 is expected to have the highest 2017 design value, taking a closer look at the relative importance of NO_x and VOC emissions within the various categories of sources modeled provides further insight.

Source Apportionment Modeling Report, April 11, 2017

Table 2-1. NOx Contribution by Source Category and Monitoring Station, June 2006 Model

Source	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
IC	0.95	0.09	0.05	0.46	0.46	0.55	0.65
BC	11.09	14.02	14.76	12.44	12.18	13.35	11.42
Biogenic	1.29	1.33	1.36	1.38	1.36	1.46	1.39
Fire	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Anthropogenic	45.14	40.91	39.99	43.16	43.50	39.39	40.78
TOTAL	58.47	56.36	56.16	57.44	57.51	54.76	54.24

Table 2-2. VOC Contribution by Source Category and Monitoring Station, June 2006 Model

Source	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
IC	0.66	0.07	0.04	0.32	0.33	0.39	0.45
BC	8.54	10.50	11.29	9.51	9.17	10.17	8.74
Biogenic	0.03	0.02	0.02	0.03	0.02	0.03	0.05
Fire	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anthropogenic	0.80	0.55	0.49	0.71	0.48	0.65	1.02
TOTAL	10.03	11.14	11.84	10.56	9.99	11.24	10.26

Table 2-3. NOx Contribution by Source Category and Monitoring Station, June 2012 Model

Source	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
IC	0.00	0.01	0.00	0.01	0.00	0.00	0.00
BC	9.22	11.58	11.87	10.60	10.25	10.05	8.15
Biogenic	4.22	3.62	4.77	3.65	4.71	4.27	4.67
Fire	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Anthropogenic	47.33	42.72	42.16	44.41	43.02	43.31	44.77
TOTAL	60.78	57.93	58.81	58.68	57.98	57.64	57.60

Table 2-4. VOC Contribution by Source Category and Monitoring Station, June 2012 Model

Source	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
IC	0.00	0.01	0.00	0.01	0.00	0.00	0.00
BC	7.05	8.96	8.81	8.55	7.81	7.55	6.40
Biogenic	0.05	0.05	0.03	0.05	0.04	0.06	0.04
Fire	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anthropogenic	0.62	0.55	0.35	0.70	0.35	0.76	0.47
TOTAL	7.72	9.57	9.19	9.32	8.20	8.36	6.90

This analysis shows that NO_x emissions within the modeling domain accounted for 97% or higher of the peak MDA8 levels modeled at all of the seven monitoring stations for each emissions type (anthropogenic, biogenic, and fire).

These data indicate that, not only is NO_x by far the dominant type of ozone-forming emission for the region, but also that even a total elimination of anthropogenic emissions nation-wide could potentially have less than a 1 ppb impact on the Austin area's O₃ design value.

2.2 Impacts from Initial Conditions, Boundary Conditions, Biogenic Emissions, Fire Emissions, and Anthropogenic Emissions

The figures below show the contribution of initial conditions, boundary conditions, biogenic emissions, fire emissions, and anthropogenic emissions at each of the monitoring stations for each modeling platform.

Figure 2-2. Average Contributions of Initial Conditions, Boundary Conditions, Biogenic Emissions, Fire Emissions, and Anthropogenic Emissions to Peak MDA8 O₃, June 2006 Platform (ppb)

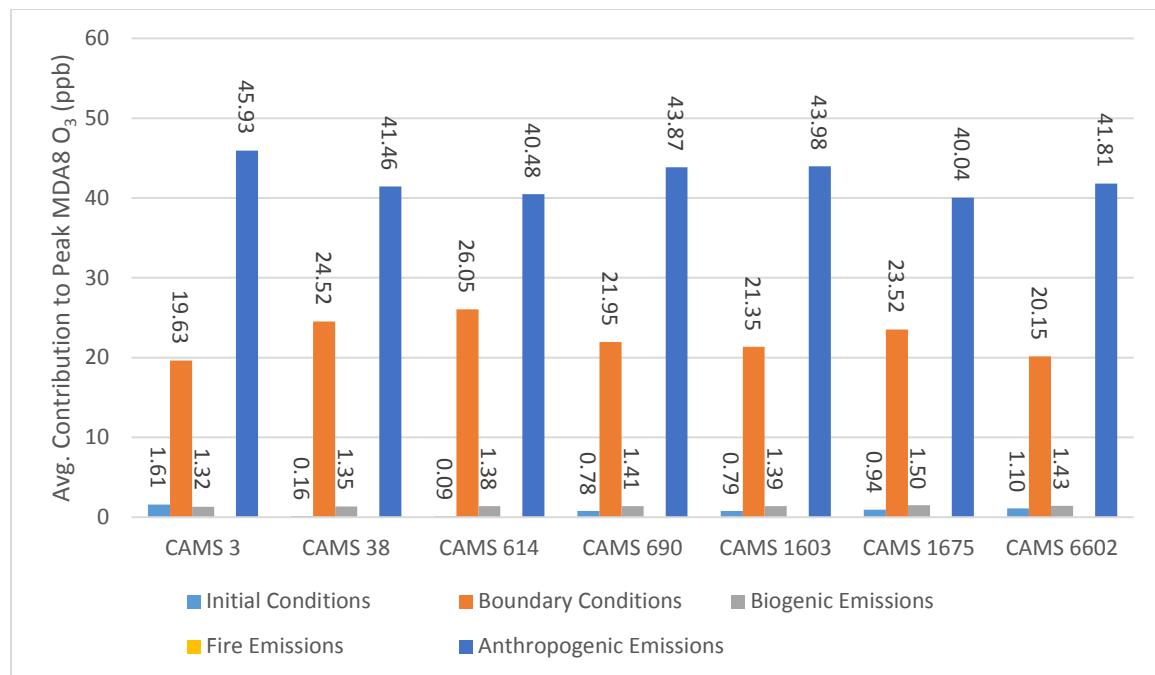
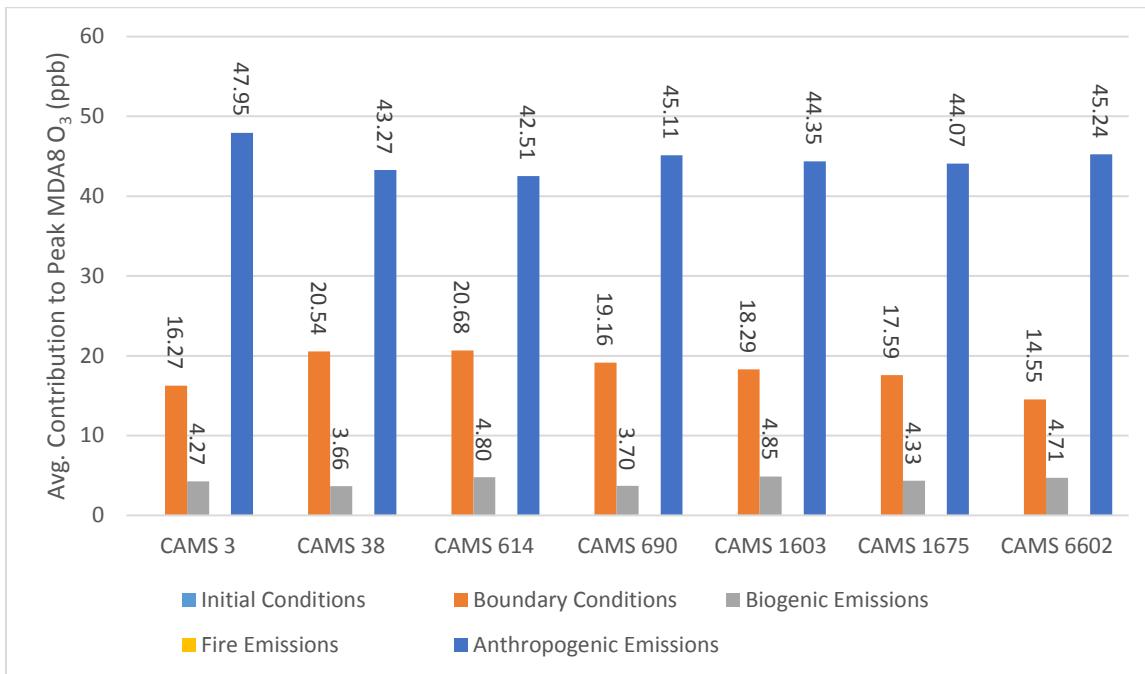


Figure 2-3. Average Contributions of Initial Conditions, Boundary Conditions, Biogenic Emissions, Fire Emissions, and Anthropogenic Emissions to Peak MDA8 O₃, June 2012 Platform



2.3 Continental U.S., Offshore, and International Contributions

The figures below show the contributions of anthropogenic emissions from continental U.S., offshore, and international areas at each of the monitoring stations for each modeling platform.

Source Apportionment Modeling Report, April 11, 2017

Figure 2-4. Contributions of Anthropogenic Emissions from Continental U.S., Offshore, Mexico, Canada, and Caribbean to Peak O₃ Concentrations in the CAPCOG Region, June 2006 Model (ppb)

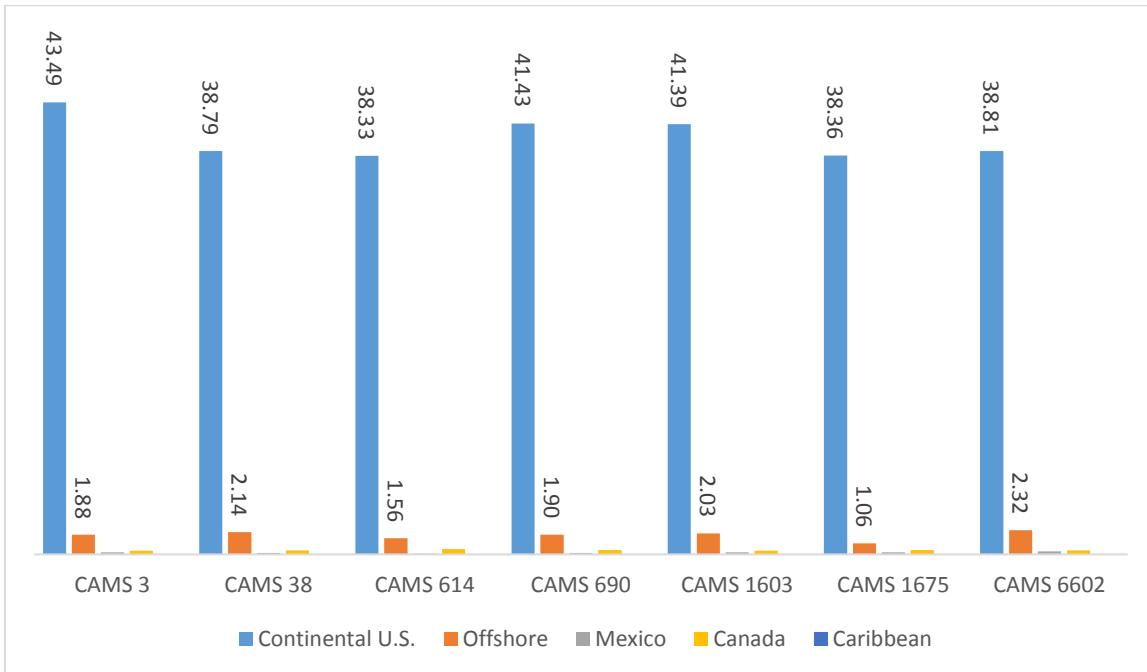
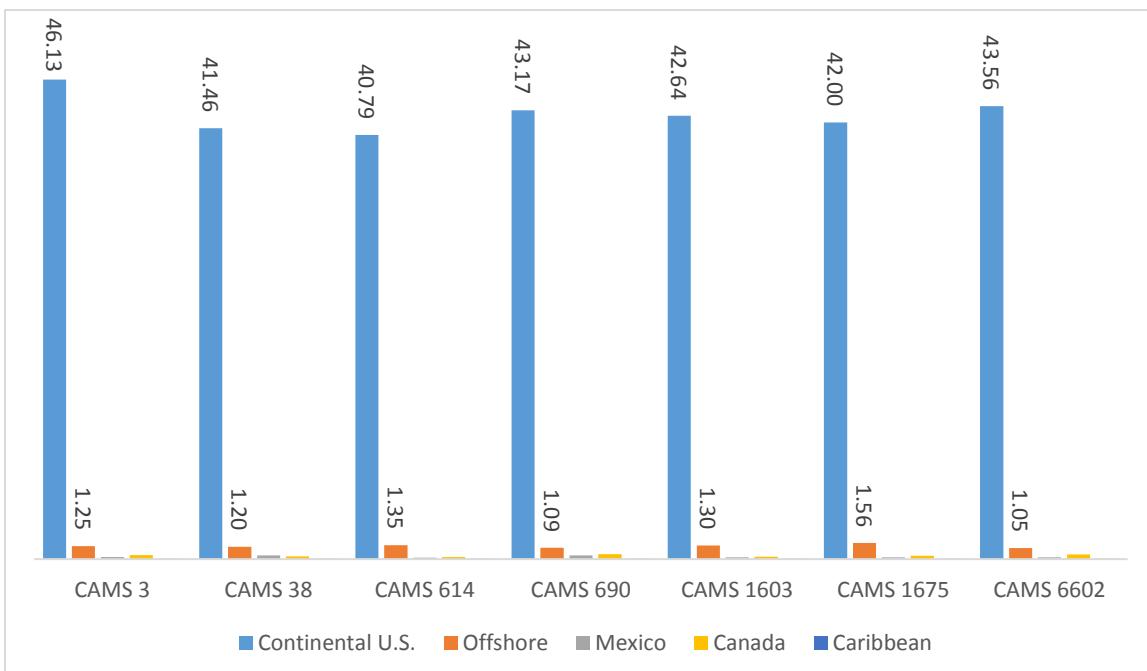


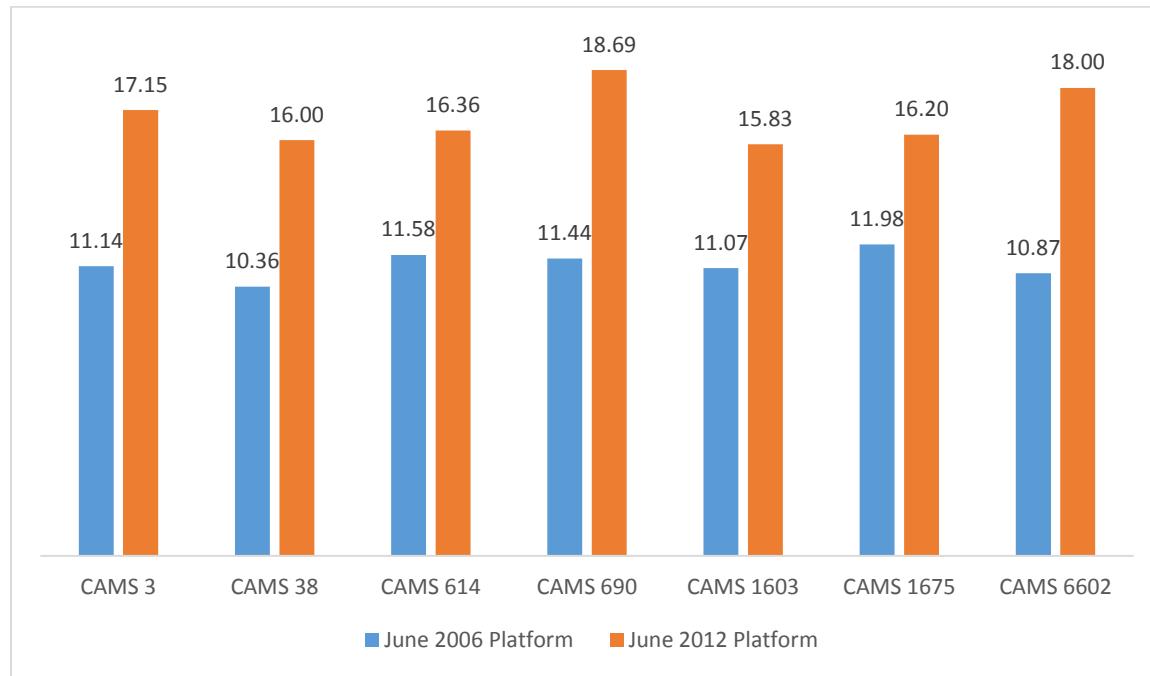
Figure 2-5. Contributions of Anthropogenic Emissions from Continental U.S., Offshore, Mexico, Canada, and Caribbean to Peak O₃ Concentrations in the CAPCOG Region, June 2006 Model (ppb)



2.4 Interstate Transport Contributions

One of the key regulatory uses of source apportionment modeling in recent years has been EPA's source apportionment modeling in support of the Cross State Air Pollution Rule (CSAPR), the update to CSAPR for the 2008 Ozone NAAQS, and quantification of interstate impacts for the 2015 Ozone NAAQS. The EPA's modeling for the 2008 Ozone NAAQS is of particular interest for this study because it models a 2017 future year and uses EPA's 2011 modeling platform, which modeled one of the worst ozone seasons that the CAPCOG region experienced in the past 10 years and was accompanied by significant wildfires and droughts within the region and across the country. The following figure shows the total interstate impacts for the June 2006 and June 2012 models. As the figure shows, interstate transport constituted a much more significant factor in peak ozone concentrations in the modeling performed using the June 2012 model compared to the June 2006 model.

Figure 2-6. Interstate Anthropogenic Emissions Contributions by Monitoring Station (ppb)



CAPCOG configured the source apportionment modeling for this project in order to provide as direct a comparison to EPA's modeling for the 2008 Ozone NAAQS as possible. While the two sets of modeling use somewhat different modeling domains, EPA uses different methods for modeling future year emissions than TCEQ does, EPA's modeling covers an entire ozone season while the episodes used for this project only covered a month, and CAPCOG did not include tribal impacts (modeled to have a 0.02 ppb impact on local monitors in EPA's modeling), comparisons across these three source apportionment modeling runs helps provide some perspective on the extent to which a state (or other source modeled) would be expected to be considered a "significant" contributor to local ozone levels based on 0.5 ppb and 1.0 ppb thresholds. The tables below show the impacts for CAMS 3 and 38 using all three models, with sources contributing at least 0.5 ppb marked in blue and sources contributing at least 1.0 ppb marked in red.

Table 2-5. Comparison of CAMS 3 APCA Contributions Results for 2017 by Base Case Used

Source	EPA 2011 v6.2	TCEQ June 2006	TCEQ June 2012
Initial and Boundary	27.43	21.24	16.27
Biogenic	4.38	1.32	4.27
Fire	2.96	0.00	0.01
Canada, Caribbean, Mexico	0.27	0.56	0.57
Offshore	1.70	1.88	1.25
Alabama	0.66	0.20	1.24
Arkansas	0.67	0.67	1.82
Colorado	0.23	0.17	0.26
Delaware, DC, and Maryland	0.01	0.02	0.01
Florida	0.23	0.27	0.12
Georgia	0.25	0.14	0.34
Illinois	0.44	0.36	0.48
Indiana	0.19	0.13	0.44
Iowa	0.10	0.53	0.11
Kansas	0.38	0.82	0.59
Kentucky	0.12	0.07	0.68
Louisiana	1.96	3.58	5.18
Michigan	0.05	0.21	0.19
Minnesota	0.04	0.26	0.07
Mississippi	0.44	0.40	1.55
Missouri	0.50	0.48	0.67
Montana	0.12	0.07	0.06
Mountain States (Arizona, Idaho, Nevada, and Utah)	0.30	0.13	0.31
Nebraska	0.15	0.28	0.15
New Mexico	0.09	0.10	0.17
North Carolina	0.06	0.06	0.05
North Dakota	0.02	0.14	0.07
Northeast (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont)	0.02	0.11	0.15
Ohio	0.06	0.07	0.24
Oklahoma	0.64	1.01	0.79
Pacific	0.25	0.07	0.18
South Carolina	0.05	0.05	0.03
South Dakota	0.03	0.12	0.05
Tennessee	0.28	0.08	0.80
Texas	20.86	32.35	28.98
Virginia	0.03	0.03	0.04
West Virginia	0.02	0.02	0.04
Wisconsin	0.11	0.32	0.06
Wyoming	0.25	0.15	0.20
Projected 2017 Design Value	66.6	68.5	68.5

Table 2-6. Comparison of CAMS 38 APCA Contributions Results for 2017 by Base Case Used (ppb)

Source	EPA 2011 v6.2	TCEQ June 2006	TCEQ June 2012
Initial and Boundary	27.25	24.68	20.56
Biogenic	4.46	1.35	3.66
Fire	2.56	0.00	0.01
Canada, Caribbean, Mexico	0.19	0.53	0.61
Offshore	2.24	2.14	1.20
Alabama	0.39	0.28	1.46
Arkansas	0.46	0.73	0.87
Colorado	0.27	0.19	0.20
Delaware, DC, and Maryland	0.00	0.00	0.01
Florida	0.29	0.07	0.15
Georgia	0.21	0.03	0.53
Illinois	0.41	0.42	0.42
Indiana	0.18	0.15	0.36
Iowa	0.09	0.47	0.15
Kansas	0.41	0.38	0.76
Kentucky	0.11	0.09	0.60
Louisiana	1.73	3.94	3.87
Michigan	0.06	0.23	0.08
Minnesota	0.04	0.26	0.09
Mississippi	0.16	0.54	1.36
Missouri	0.46	0.44	0.47
Montana	0.11	0.09	0.12
Mountain States (Arizona, Idaho, Nevada, and Utah)	0.30	0.17	0.31
Nebraska	0.15	0.26	0.31
New Mexico	0.06	0.13	0.13
North Carolina	0.09	0.01	0.08
North Dakota	0.02	0.14	0.08
Northeast (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont)	0.01	0.02	0.05
Ohio	0.06	0.06	0.15
Oklahoma	0.74	0.38	1.93
Pacific	0.24	0.12	0.25
South Carolina	0.12	0.01	0.05
South Dakota	0.03	0.13	0.08
Tennessee	0.12	0.11	0.75
Texas	19.70	28.43	25.47
Virginia	0.03	0.00	0.06
West Virginia	0.02	0.01	0.04
Wisconsin	0.10	0.32	0.06
Wyoming	0.28	0.19	0.21
Projected 2017 Design Value	64.4	67.5	67.5

Some key take-aways from this analysis are:

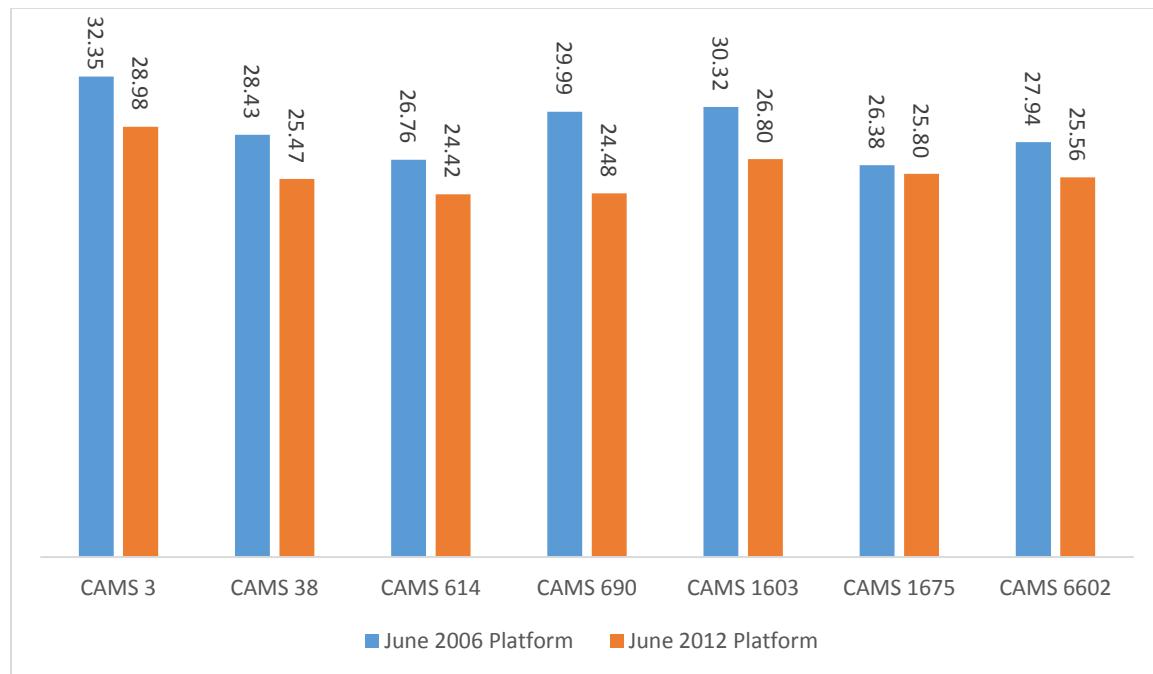
- Anthropogenic emissions from Texas were the single largest source of peak O₃ levels for CAMS 3 and 38 in the TCEQ's two platforms, followed by boundary and initial conditions, with the reverse true for EPA's platform.
- Biogenic emissions, offshore anthropogenic emissions, and Louisiana anthropogenic emissions were the only sources that were consistently significant contributors to peak O₃ at both monitoring stations in all three model runs.
- Anthropogenic emissions from Arkansas and Oklahoma were consistently significant contributors to peak O₃ at CAMS 3 at the ≥ 0.5 ppb level, with Arkansas contributing ≥ 1.0 ppb level in the June 2012 platform and Oklahoma contributing ≥ 1.0 in the June 2006 platform.
- Alabama and Mississippi each contribute ≥ 1.0 ppb to CAMS 3 and 38 in the June 2012 platform.
- Other states that contribute ≥ 0.5 ppb to at least one monitor in one of the modeling platforms include Georgia, Iowa, Kansas, Kentucky, Missouri, and Tennessee.

3 Texas Source Apportionment

One of the key purposes of this project was to assess the extent to which anthropogenic emissions from within the State of Texas are expected to impact O₃ levels in the CAPCOG region in 2017. This section provides analysis of the contributions state-wide, at the COG-level, and at the individual county-level, and includes an analysis of which counties could be considered to constitute an airshed for the seven monitors analyzed for this project.

The figure below shows the total anthropogenic emissions contribution to peak 2017 O₃ levels modeled for each of the seven monitoring stations using the 2006 and 2012 modeling platforms. The 2012 modeling platform had lower modeled impacts on peak O₃ levels in the region at all monitoring stations, with impacts ranging from 26.38 – 32.35 ppb in the 2006 platform and 24.42 ppb – 28.98 ppb in the 2012 platform.

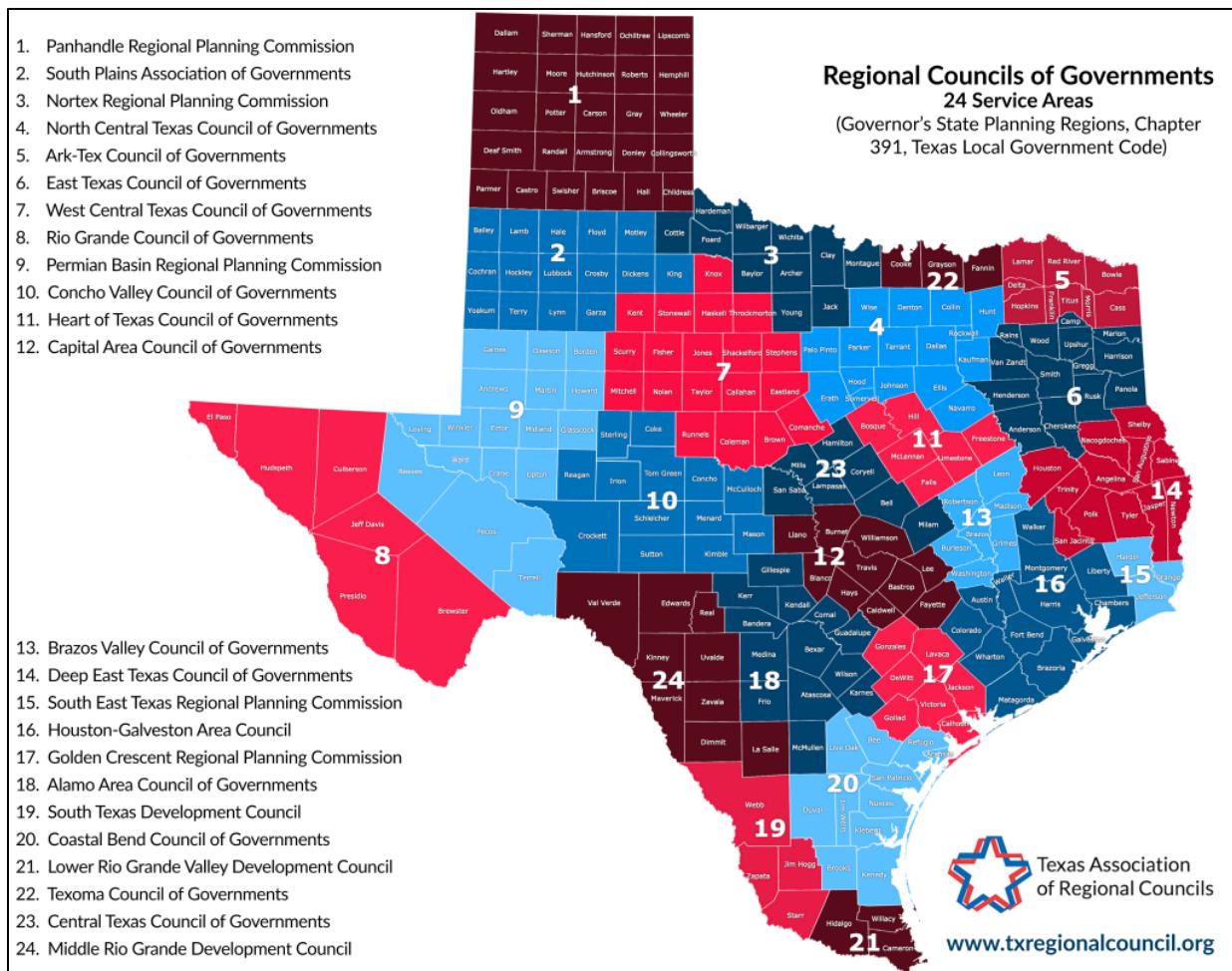
Figure 3-1. Texas Anthropogenic Emissions Contributions by Monitoring Station (ppb)



3.1 Impacts by COG Region

CAPCOG used COG regions to divide the state into different source areas. The figure below shows all 24 COGs in the state of Texas.

Figure 3-2. Map of Regional Councils of Government in the State of Texas



COGs that intersected with or were east of Interstate Highway (IH) 35 were modeled separately, while COGs that were entirely west of IH 35 were grouped together in a single “remainder of Texas” grouping. CAPCOG modeled the impact of individual counties in the CAPCOG region and the two COG regions immediately adjacent to CAPCOG to the north and south – Central Texas Council of Governments (CTCOG) and Alamo Area Council of Governments (AACOG) along IH-35. These two COGs are home to the Killeen-Temple MSA and San Antonio-New Braunfels, MSA, respectively. The table below defines the names and describes the modeling resolution of each COG in the state.

Table 3-1. Councils of Governments in Texas

COG Name	Abbreviated Name	Modeling Resolution
Alamo Area Council of Governments	AACOG	Individual Counties
Ark-Tex Area Council of Governments	Ark-Tex COG	Entire COG
Brazos Valley Council of Governments	BVCOG	Entire COG
Capital Area Council of Governments	CAPCOG	Individual Counties
Central Texas Council of Governments	CTCOG	Individual Counties
Coastal Bend Council of Governments	CBCOG	Entire COG

COG Name	Abbreviated Name	Modeling Resolution
Concho Valley Council of Governments	CVCOG	Remainder of Texas
Deep East Texas Council of Governments	DETCOG	Entire COG
East Texas Council of Governments	ETCOG	Entire COG
Golden Crescent Regional Planning Commission	GCRPC	Entire COG
Heart of Texas Council of Governments	HOTCOG	Entire COG
Houston-Galveston Area Council	H-GAC	Entire COG
Lower Rio Grande Valley Development Council	LRGVDC	Entire COG
Middle Rio Grande Development Council	MRGDC	Remainder of Texas
North Central Texas Council of Governments	NCTCOG	Entire COG
Nortex Regional Planning Commission	Nortex RPC	Remainder of Texas
Panhandle Regional Planning Commission	PRPC	Remainder of Texas
Permian Basin Regional Planning Commission	PBRPC	Remainder of Texas
Rio Grande Council of Governments	RGCOG	Remainder of Texas
South East Texas Regional Planning Commission	SETRPC	Entire COG
South Plains Association of Governments	SPAG	Remainder of Texas
South Texas Development Council	STDC	Entire COG
Texoma Council of Governments	Texoma COG	Entire COG
West Central Texas Council of Governments	WCTCOG	Remainder of Texas

The following two figures show the modeled contributions from each region on peak 2017 O₃ levels at each monitor in the CAPCOG region using the 2006 and 2012 platforms.

Figure 3-3. Contributions from Anthropogenic Emissions in East Texas COGs and Rest of Texas, June 2006 Platform

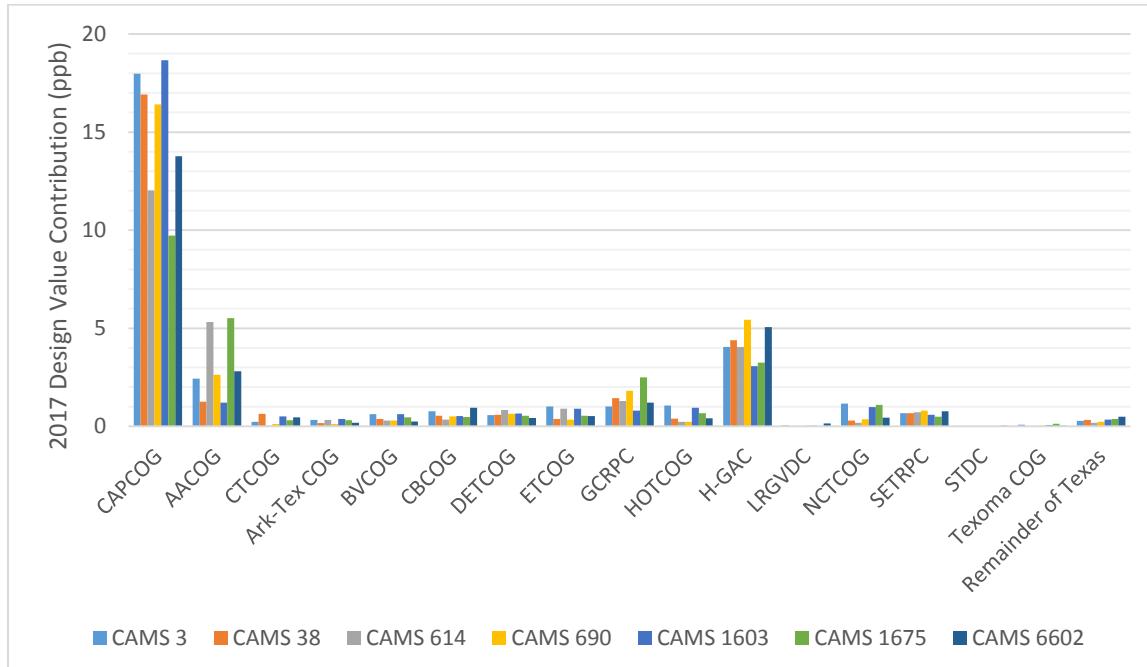
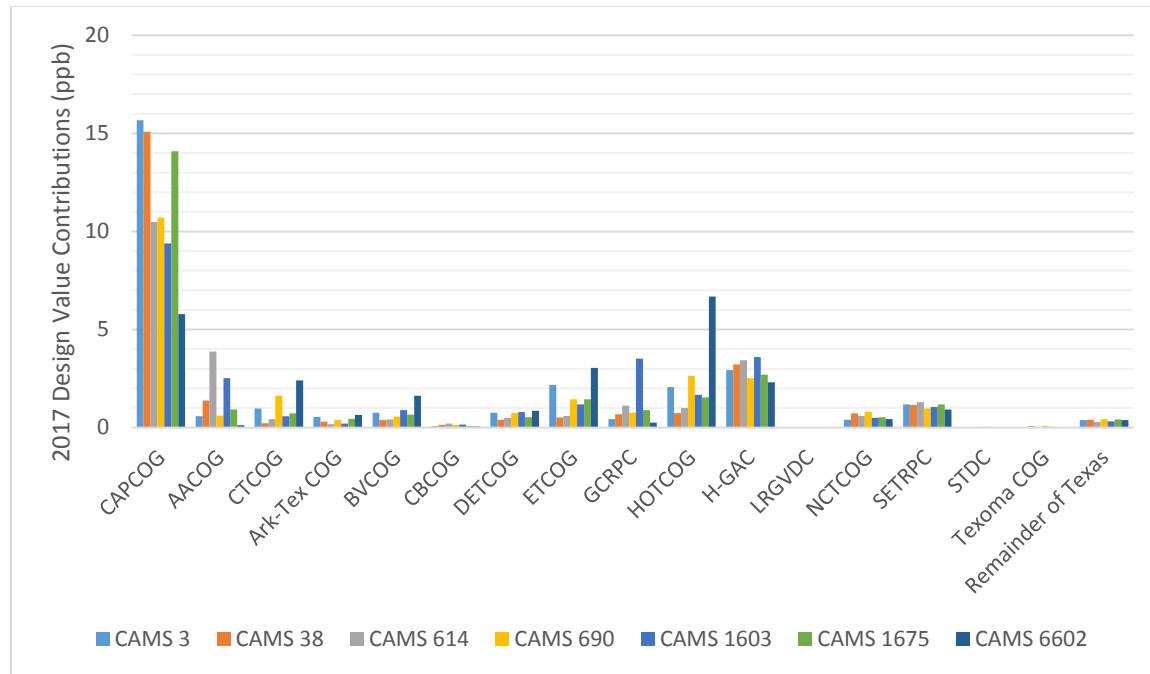


Figure 3-4. Contributions from Anthropogenic Emissions in East Texas COGs and Rest of Texas, June 2012 Platform



The table below summarizes the range of impacts from each region across all seven monitoring stations. Impacts of 1 ppb or more are highlighted in red, while impacts of 0.5-1.0 ppb or more are highlighted in blue.

Table 3-2. Minimum and Maximum Contributions of COG Regions and Rest of Texas on CAPCOG Receptors

Region	Minimum Avg. Contribution	Maximum Avg. Contribution
CAPCOG	5.79	18.67
AACOG	0.13	5.51
CTCOG	0.04	2.41
Ark-Tex COG	0.12	0.64
BVCOG	0.24	1.62
CBCOG	0.06	0.95
DETCOG	0.40	0.85
ETCOG	0.35	3.05
GCRPC	0.25	3.44
HOTCOG	0.23	6.68
H-GAC	2.32	5.43
LRGVDC	0.01	0.15
NCTCOG	0.18	1.17
SETRPC	0.49	1.29
STDC	0.01	0.04
Texoma COG	0.02	0.13
Remainder of Texas	0.19	0.49

Emissions from the CAPCOG region and H-GAC region contribute at least 1 ppb O₃ to all seven monitoring stations using both modeling platforms. AACOG, CTCOG, BVCOG, ETCOG, GCRPC, HOTCOG, NCTCOG, and the SETRPC. The Ark-Tex COG, CBCOG, and DETCOG regions all have at least a 0.50 ppb contribution to at least one monitoring station using one of the two modeling platforms. Emissions from the LRGVDC, STDC, Texoma COG, and the rest of Texas contribute less than 0.5 ppb to all seven monitoring stations using both modeling platforms.

3.2 Impacts from Counties in the CAPCOG, AACOG, and CTCOG Regions

The following table shows the modeled impact of individual counties in the CAPCOG, AACOG, and CTCOG regions on 2017 O₃ design values at each of the seven monitoring stations analyzed. The table below summarizes the range of impacts from each region across all seven monitoring stations. Impacts of 1 ppb or more are highlighted in red, while impacts of 0.5-1.0 ppb or more are highlighted in blue.

Table 3-3. Modeled Impacts from Individual Counties - June 2006 Base Case, 2017 Future Year (ppb)

County	C0003	C0038	C0614	C0690	C1603	C1675	C6602
Atascosa	0.1674	0.0476	0.3232	0.1941	0.0580	0.2560	0.1834
Bandera	0.0006	0.0007	0.0004	0.0004	0.0008	0.0005	0.0021
Bastrop	1.4408	1.1173	1.0468	1.2568	1.4020	0.9513	1.5941
Bell	0.0713	0.0739	0.0099	0.0259	0.3263	0.0800	0.0761
Bexar	0.6420	0.3479	1.3975	0.8071	0.4420	1.2058	0.9255
Blanco	0.0045	0.0024	0.0014	0.0046	0.0093	0.0021	0.0065
Burnet	0.0191	0.0122	0.0083	0.0185	0.0235	0.0033	0.0230
Caldwell	0.4292	0.3660	0.8293	0.4969	0.5151	1.7663	0.3759
Comal	0.0469	0.0241	0.2741	0.0536	0.0247	0.1360	0.0580
Coryell	0.0033	0.0014	0.0008	0.0027	0.0028	0.0018	0.0031
Fayette	0.2516	0.3245	0.2963	0.3720	0.1828	0.1185	0.2953
Frio	0.0025	0.0026	0.0020	0.0025	0.0025	0.0024	0.0205
Gillespie	0.0026	0.0015	0.0008	0.0030	0.0017	0.0011	0.0044
Guadalupe	0.9951	0.5282	2.6594	0.9137	0.4056	2.5084	0.8680
Hamilton	0.0002	0.0001	0.0000	0.0001	0.0002	0.0002	0.0001
Hays	1.9919	1.7221	3.3199	1.4521	2.1063	3.4366	1.4635
Karnes	0.4534	0.2681	0.4780	0.5210	0.2290	1.1497	0.5695
Kendall	0.0018	0.0016	0.0008	0.0017	0.0031	0.0017	0.0047
Kerr	0.0012	0.0012	0.0007	0.0010	0.0014	0.0010	0.0032
Lampasas	0.0060	0.0020	0.0010	0.0068	0.0048	0.0019	0.0069
Lee	0.1008	0.2034	0.1234	0.1556	0.0624	0.0483	0.2652
Llano	0.0031	0.0008	0.0006	0.0036	0.0010	0.0005	0.0036
McMullen	0.0720	0.0189	0.0463	0.0723	0.0222	0.0440	0.1062
Medina	0.0027	0.0031	0.0023	0.0021	0.0032	0.0027	0.0137
Milam	0.1470	0.5566	0.0246	0.0679	0.1650	0.2224	0.3605
Mills	0.0043	0.0010	0.0006	0.0050	0.0015	0.0009	0.0045
San Saba	0.0034	0.0007	0.0004	0.0041	0.0009	0.0006	0.0037
Travis	13.0284	11.2314	6.3798	10.2161	13.5372	3.1044	8.3215
Williamson	0.7093	1.9397	0.0180	2.4357	0.8289	0.2973	1.4252
Wilson	0.0447	0.0166	0.1376	0.0487	0.0162	0.1990	0.0411

Table 3-4. Modeled Impacts from Individual Counties - June 2012 Base Case, 2017 Future Year (ppb)

County	C0003	C0038	C0614	C0690	C1603	C1675	C6602
Atascosa	0.0142	0.0265	0.0433	0.0211	0.0162	0.0387	0.0087
Bandera	0.0010	0.0009	0.0005	0.0011	0.0005	0.0013	0.0008
Bastrop	1.1519	0.8852	0.4403	1.2651	1.1751	0.7360	1.2597
Bell	0.7785	0.0226	0.1005	1.3315	0.1250	0.1824	1.1179
Bexar	0.1843	0.3935	0.9388	0.0932	0.3095	0.3063	0.0295
Blanco	0.0064	0.0044	0.0097	0.0031	0.0069	0.0079	0.0025
Burnet	0.0181	0.0031	0.1169	0.0038	0.0449	0.0134	0.0237
Caldwell	0.3335	0.5667	1.0633	0.2294	1.0077	1.3587	0.0334
Comal	0.0083	0.0330	0.1675	0.0143	0.0146	0.0398	0.0023
Coryell	0.0014	0.0021	0.0057	0.0024	0.0028	0.0034	0.0012
Fayette	0.3723	0.2772	0.2903	0.4356	0.3859	0.5264	0.5978
Frio	0.0034	0.0035	0.0021	0.0043	0.0021	0.0042	0.0027
Gillespie	0.0027	0.0011	0.0020	0.0017	0.0013	0.0035	0.0017
Guadalupe	0.2567	0.5751	1.8978	0.3145	0.4613	1.6572	0.0379
Hamilton	0.0000	0.0020	0.0000	0.0020	0.0000	0.0000	0.0000
Hays	0.6571	1.9334	4.8361	0.4284	3.2508	2.4509	0.0632
Karnes	0.0779	0.2989	0.7315	0.1215	0.1124	0.3509	0.0294
Kendall	0.0020	0.0029	0.0024	0.0028	0.0013	0.0034	0.0013
Kerr	0.0019	0.0016	0.0008	0.0021	0.0009	0.0022	0.0014
Lampasas	0.0023	0.0040	0.0029	0.0044	0.0022	0.0032	0.0017
Lee	0.1082	0.1110	0.1047	0.1448	0.2071	0.2509	0.2400
Llano	0.0014	0.0006	0.0039	0.0009	0.0010	0.0015	0.0010
McMullen	0.0077	0.0105	0.0090	0.0114	0.0057	0.0155	0.0061
Medina	0.0042	0.0040	0.0027	0.0050	0.0024	0.0050	0.0032
Milam	0.1886	0.1833	0.3153	0.2787	0.6163	0.3694	1.2896
Mills	0.0014	0.0022	0.0011	0.0025	0.0011	0.0016	0.0010
San Saba	0.0013	0.0010	0.0005	0.0013	0.0007	0.0014	0.0009
Travis	11.7229	11.0400	3.1580	6.7929	7.7675	3.4169	2.4722
Williamson	1.2982	0.2599	0.4574	1.4005	0.5670	0.4224	1.0930
Wilson	0.0073	0.0259	0.0767	0.0137	0.0121	0.0345	0.0025

The following table shows a summary of the minimum and maximum average modeled contribution from each county and MSA in the CAPCOG, AACOG, and CTCOG regions to the seven receptors analyzed in the CAPCOG region.

Table 3-5. Modeled Impacts from Counties in the CAPCOG, AACOG, and CTCOG Region - June 2006 Base Case, 2017 Future Year (ppb)

County	Minimum	Maximum	Average
Atascosa	0.0087	0.3232	0.0999
Bandera	0.0004	0.0021	0.0008
Bastrop	0.4403	1.5941	1.1230
Bell	0.0099	1.3315	0.3087
Bexar	0.0295	1.3975	0.5731
Blanco	0.0014	0.0097	0.0051
Burnet	0.0031	0.1169	0.0237
Caldwell	0.0334	1.7663	0.6694
Comal	0.0023	0.2741	0.0641
Coryell	0.0008	0.0057	0.0025
Fayette	0.1185	0.5978	0.3376
Frio	0.0020	0.0205	0.0041
Gillespie	0.0008	0.0044	0.0021
Guadalupe	0.0379	2.6594	1.0056
Hamilton	0.0000	0.0020	0.0004
Hays	0.0632	4.8361	2.0795
Karnes	0.0294	1.1497	0.3851
Kendall	0.0008	0.0047	0.0023
Kerr	0.0007	0.0032	0.0015
Lampasas	0.0010	0.0069	0.0036
Lee	0.0483	0.2652	0.1518
Llano	0.0005	0.0039	0.0017
McMullen	0.0057	0.1062	0.0320
Medina	0.0021	0.0137	0.0040
Milam	0.0246	1.2896	0.3418
Mills	0.0006	0.0050	0.0021
San Saba	0.0004	0.0041	0.0015
Travis	2.4722	13.5372	8.0135
Williamson	0.0180	2.4357	0.9395
Wilson	0.0025	0.1990	0.0483

The only county that had contributions of at least 1 ppb in all scenarios for all monitoring stations was Travis County. No other county had over a 0.4 ppb contribution in all scenarios modeled.

Other counties that had a contribution of 1 ppb or more in at least one scenario included:

- Bastrop County (max of 1.59 ppb)
- Bell County (max of 1.33 ppb)
- Bexar County (max of 1.40 ppb)
- Caldwell County (max of 1.77 ppb)
- Guadalupe County (max of 2.66 ppb)
- Hays County (max of 4.84 ppb)

- Karnes County (max of 1.15 ppb)
- Milam County (max of 1.29 ppb)
- Williamson County (max of 2.44 ppb)

The only other county that meets any of the thresholds CAPCOG previously discussed (≥ 0.50 ppb, ≥ 0.70 ppb, or ≥ 1.00 ppb) was Fayette County, which is modeled to contribute 0.53 ppb to CAMS 1675 and 0.60 ppb to CAMS 6602 in the June 2012 modeling platform.

All of the other 19 counties in the CAPCOG, CTCOG, and AACOG regions have average contributions of less than 0.5 ppb on all seven of the monitoring stations analyzed. The maximum average contributions modeled for each of these counties ranged from 0.0020 ppb to 0.3232 ppb, with the minimum contribution of 0.0000 ppb to 0.0483 ppb. The subtotal for all 19 of these counties had an average impact of 0.19 – 0.92 ppb on the seven stations in the region.

3.3 Analysis of “AirSheds” for Each of the Seven Monitors

One of the ways that an “airshed” could be defined for each of the seven monitors analyzed in this project would be to use a contribution threshold, whereby a set of contiguous counties all had an average impact of at least 0.5 ppb or 1.0 ppb to peak O₃ levels at that monitor. Defined in this way, the airshed would constitute all of the counties near a monitor that would be expected to have been able to change an area’s design value as calculated by the EPA. As described earlier, an impact of at least 0.5 ppb would have at least a 50% chance of impacting that receptor’s design value, while an impact of at least 1 ppb would have a 100% chance of impacting that receptor’s design value.

Since CAPCOG used two separate modeling runs for this project, it is also possible to analyze the extent to which the boundaries that would be used to define an airshed using these screening thresholds is consistent across modeling platforms. If a county has a 1 ppb impact on a monitoring station in one modeling run, but less than a 0.5 ppb impact in another modeling run, there is less evidence that changes in emissions in that county would be expected to have a significant impact on peak ozone levels at that monitor than a county that had an average impact of over 1 ppb on the monitor under both sets of meteorological conditions. The following two tables show the set of counties

Table 3-6. Airsheds for each monitor based on a county contributing at least 1.0 ppb or 0.5 ppb in at least one platform

Station	1.0 ppb Threshold Counties	Additional 0.5 ppb Threshold Counties
CAMS 3	Bastrop, Hays, Travis, Williamson	Bell, Bexar, Guadalupe
CAMS 38	Bastrop, Hays, Travis, Williamson	Caldwell, Guadalupe, Milam
CAMS 614	Bastrop, Bexar, Caldwell, Guadalupe, Hays, Travis	Karnes
CAMS 690	Bastrop, Bell, Hays, Travis, Williamson	Bexar, Guadalupe, Karnes
CAMS 1603	Bastrop, Caldwell, Hays, Travis	Milam, Williamson
CAMS 1675	Bexar, Caldwell, Guadalupe, Hays, Karnes, Travis	Bastrop, Fayette
CAMS 6602	Bastrop, Bell, Hays, Milam, Travis, Williamson	Bexar, Fayette, Guadalupe, Karnes

Table 3-7. Airsheds for each monitor based on a county contributing at least 1.0 ppb or 0.5 ppb in both platforms

Station	1.0 ppb Threshold Counties	Additional 0.5 ppb Threshold Counties
CAMS 3	Bastrop, Travis	Hays, Williamson
CAMS 38	Hays, Travis	Bastrop, Guadalupe
CAMS 614	Guadalupe, Hays, Travis	Bexar, Caldwell
CAMS 690	Bastrop, Travis, Williamson	n/a
CAMS 1603	Bastrop, Hays, Travis	Caldwell, Williamson
CAMS 1675	Caldwell, Guadalupe, Hays, Travis	Bastrop
CAMS 6602	Bastrop, Travis, Williamson	n/a

Some notable items from this analysis:

- For the more robust analysis in Table 3-6, Guadalupe County constitutes a significant source at the 1.0 ppb threshold for both monitoring stations in Hays County
- Caldwell County does not consistently have an impact of 1.0 ppb or more on monitoring stations in Travis County, and is not modeled to have even a 0.5 ppb impact on CAMS 3 in either analysis
- Bastrop County is consistently modeled to have a significant contribution to all monitoring stations except for CAMS 614, but is modeled to have at least a 1.0 ppb contribution to CAMS 614 in one of the two model runs
- Williamson County is less consistently a significant contributor to peak ozone levels across the region than Bastrop County
- While Guadalupe County and Bexar County are both consistently modeled to be significant contributors to monitors in Hays County, the other counties within the three COG regions that were modeled to have impacts over 0.5 ppb outside of the Austin-Round Rock MSA (Bell, Fayette, Karnes, and Milam Counties) are not consistently significant contributors to peak ozone levels within the MSA.
- Comal County is notably absent from the list of counties that would be considered part of the airshed for any of the monitoring stations analyzed for this project, given its location and emissions.

4 Analysis of Ozone Contribution-NO_x Emissions Ratios

While assessing the relative or absolute contribution of a source region to peak O₃ levels at monitoring stations in the CAPCOG region is the primary way that source apportionment modeling is typically used, it is also possible to calculate the ratios of modeled O₃ contributions to emissions as a way to approximate the sensitivity of O₃ levels at a receptor location to changes in emissions at one of the sources modeled. While different types of modeling would be needed to calculate the marginal change in O₃ levels due to a marginal change in emissions to calculate a true sensitivity ratio, and those ratios would change depending on the scale of the change in emissions, this type of analysis can still be used to get a better understanding of the relationships between emissions and ozone within the region. For

this analysis, due to NO_x emissions accounting for about 99% of the anthropogenic emissions contribution, CAPCOG focuses only on ratios of NO_x contributions to NO_x emissions. CAPCOG used EPA's 2017 average May-September ozone season day emissions derived from an emission reports for EPA's 2011v6.3 modeling platform.¹⁴ While EPA's 2017 emissions estimates are different from the 2017 projections developed by TCEQ, resource constraints precluded CAPCOG from spending the time and effort that would have been necessary to aggregate comparable county-level and state-level data from TCEQ's emissions modeling files. These ratios, therefore, should be considered more as screening tools than as precise ratios of the relationship between emissions and O₃ concentrations in any specific modeling scenario.

4.1 CAPCOG, AACOG, and CTCOG Regions

The table below shows the minimum, maximum, and average O₃ contribution modeled for each county in the CAPCOG, AACOG, and CTCOG regions per tpd of NO_x emissions. The table also includes subtotals for each COG and the Austin-Round Rock MSA, San Antonio-New Braunfels MSA, and Killeen-Temple MSA. Ozone/NO_x ratios of 0.1 ppb/tpd or more are marked in red.

Table 4-1. Average Peak O₃ Contribution per tpd of NO_x emissions for CAPCOG, AACOG, and CTCOG Regions

Area	Min. ppb O ₃ /tpd NO _x	Max. ppb O ₃ /tpd NO _x	Avg. ppb O ₃ /tpd NO _x
Atascosa Co	0.0005	0.0194	0.0060
Bandera Co	0.0004	0.0022	0.0009
Bastrop Co	0.0789	0.2857	0.2009
Bell Co	0.0006	0.0857	0.0198
Bexar Co	0.0004	0.0176	0.0073
Blanco Co	0.0020	0.0142	0.0075
Burnet Co	0.0015	0.0584	0.0118
Caldwell Co	0.0068	0.3604	0.1352
Comal Co	0.0001	0.0122	0.0028
Coryell Co	0.0003	0.0025	0.0011
Fayette Co	0.0050	0.0255	0.0143
Frio Co	0.0002	0.0025	0.0005
Gillespie Co	0.0007	0.0035	0.0017
Guadalupe Co	0.0036	0.2498	0.0939
Hamilton Co	0.0000	0.0017	0.0003
Hays Co	0.0046	0.3544	0.1515
Karnes Co	0.0007	0.0267	0.0086
Kendall Co	0.0005	0.0030	0.0014
Kerr Co	0.0004	0.0019	0.0009
Lampasas Co	0.0005	0.0039	0.0020
Lee Co	0.0131	0.0725	0.0412
Llano Co	0.0004	0.0030	0.0013
Mc Mullen Co	0.0002	0.0041	0.0012
Medina Co	0.0004	0.0026	0.0008

¹⁴ ftp://ftp.epa.gov/EmisInventory/2011v6/v3platform/reports/2017ek_county_monthly_report.xlsx

Area	Min. ppb O ₃ /tpd NO _x	Max. ppb O ₃ /tpd NO _x	Avg. ppb O ₃ /tpd NO _x
Milam Co	0.0017	0.0908	0.0239
Mills Co	0.0005	0.0043	0.0018
San Saba Co	0.0006	0.0062	0.0022
Travis Co	0.0805	0.4410	0.2587
Williamson Co	0.0015	0.2066	0.0792
Wilson Co	0.0006	0.0511	0.0121
Austin-Round Rock MSA	0.0738	0.2756	0.1910
San Antonio-New Braunfels MSA	0.0006	0.0344	0.0129
Killeen-Temple MSA	0.0006	0.0681	0.0159
CAPCOG	0.0591	0.1906	0.1354
AACOG	0.0006	0.0252	0.0101
CTCOG	0.0010	0.0653	0.0178
TOTAL	0.0238	0.0584	0.0460

4.2 Regions within Texas

The following table shows the minimum, maximum, and average ratios of ozone contribution to NO_x emissions for each COG modeled for this project, the remainder of Texas, and Texas as a whole. Values in red are at least as high as the state-wide ratio. Some notable points about this analysis:

Table 4-2. Average Peak O₃ Contribution per tpd NO_x emissions for Texas by COG Region

Region	Min. ppb O ₃ /tpd NO _x	Max. ppb O ₃ /tpd NO _x	Avg. ppb O ₃ /tpd NO _x
CAPCOG	0.0591	0.1906	0.1354
AACOG	0.0006	0.0252	0.0101
CTCOG	0.0010	0.0653	0.0178
Ark-Tex COG	0.0018	0.0095	0.0047
BVCOG	0.0035	0.0232	0.0084
CBCOG	0.0006	0.0093	0.0035
DETCOG	0.0073	0.0157	0.0115
ETCOG	0.0019	0.0166	0.0058
GCRPC	0.0022	0.0295	0.0108
HOTCOG	0.0020	0.0571	0.0124
H-GAC	0.0070	0.0161	0.0106
LRGVDC	0.0001	0.0032	0.0006
NCTCOG	0.0006	0.0040	0.0021
SETRPC	0.0060	0.0161	0.0110
STDC	0.0001	0.0004	0.0002
Texoma COG	0.0008	0.0061	0.0022
Remainder of Texas	0.0002	0.0005	0.0004
Texas-Total	0.0085	0.0112	0.0095

- CAPCOG's ozone levels are more likely to be influenced by emissions changes in the CTCOG region on a ppb/tpd basis than changes in any other COG outside of CAPCOG itself, followed by HOTCOG
- Some monitors are more likely to be influenced by changes in NO_x emissions in COG regions that are not adjacent to the CAPCOG region (such as DETCOG, HOTCOG, H-GAC, SETRPC), than they are to NO_x emissions from the adjacent AACOG region
- The seven monitors are relatively insensitive to NO_x emissions changes in the northern tier of COGs analyzed for this project (Texoma COG, NCTCOG, ETCOG, and Ark-Tex COG), the southern tier of COGs (LRVGDC and STDC), and the rest of the state relative to the area bounded generally by Corpus Christi, San Antonio, Waco, Nacogdoches, and down to the coast.

4.3 Interstate Transport and Offshore Sources

The following tables show the O₃/NO_x ratios for interstate transport and offshore contributions to the seven monitoring stations in the region. Values in red are above the average interstate contribution for the continental U.S.

Table 4-3. Interstate and Offshore Ozone Contribution to NO_x Emissions Ratios by State (excluding Texas)

State	Min. ppb O ₃ /tpd NO _x	Max. ppb O ₃ /tpd NO _x	Avg. ppb O ₃ /tpd NO _x
Alabama	0.000274	0.003277	0.001327
Arkansas	0.001000	0.005451	0.002519
Colorado	0.000177	0.000614	0.000385
DE/DC/MD	0.000002	0.000047	0.000022
Florida	0.000019	0.000229	0.000125
Georgia	0.000022	0.001077	0.000360
Illinois	0.000214	0.000612	0.000426
Indiana	0.000080	0.000692	0.000292
Iowa	0.000206	0.001244	0.000642
Kansas	0.000529	0.001345	0.000873
Kentucky	0.000101	0.001450	0.000585
Louisiana	0.002751	0.005020	0.003848
Michigan	0.000060	0.000324	0.000201
Minnesota	0.000098	0.000783	0.000324
Mississippi	0.001115	0.004686	0.002910
Missouri	0.000501	0.001156	0.000789
Montana	0.000258	0.000560	0.000345
AZ/ID/NV/UT	0.000087	0.000320	0.000197
Nebraska	0.000312	0.000995	0.000573
New Mexico	0.000151	0.000460	0.000310
North Carolina	0.000005	0.000161	0.000072
North Dakota	0.000125	0.000403	0.000249
Northeast	0.000006	0.000054	0.000028
Offshore to EEZ	0.001665	0.003686	0.002452
Ohio	0.000036	0.000328	0.000126

State	Min. ppb O ₃ /tpd NO _x	Max. ppb O ₃ /tpd NO _x	Avg. ppb O ₃ /tpd NO _x
Oklahoma	0.000459	0.002620	0.001174
CA/OR/WA	0.000044	0.000166	0.000099
South Carolina	0.000007	0.000201	0.000090
South Dakota	0.000332	0.001095	0.000650
Tennessee	0.000132	0.001809	0.000794
Virginia	0.000004	0.000138	0.000059
West Virginia	0.000011	0.000122	0.000059
Wisconsin	0.000081	0.000945	0.000394
Wyoming	0.000305	0.000630	0.000459
Interstate Total	0.000438	0.000790	0.000594

Table 4-4. Ozone Contribution to NO_x Emission Ratios by Census Region/Division

Census Region or Division	Min. ppb O ₃ /tpd	Max. ppb O ₃ /tpd	Avg. ppb O ₃ /tpd
Northeast Region	0.000006	0.000054	0.000028
East North Central Division	0.000165	0.000440	0.000286
West North Central Division	0.000403	0.000904	0.000643
East South Central Division	0.000025	0.000604	0.000262
South Atlantic Division	0.000183	0.001262	0.000645
West South Central Division	0.002118	0.003481	0.002676
Mountain Division	0.000184	0.000476	0.000327
Pacific Division	0.000044	0.000166	0.000099
Interstate Total	0.000438	0.000790	0.000594

5 Conclusions and Recommendations for Future Research

CAPCOG's source apportionment modeling of local O₃ levels in 2017 using TCEQ June 2006 and June 2012 revealed several important points for the region's air quality planning efforts. These include:

- Within the U.S., NO_x emissions are by far the dominant contributor to local peak O₃ levels, with VOC emissions nation-wide contributing less than 1.0 ppb to peak O₃ levels at all but one monitoring station in one modeling scenario.
- Boundary conditions make up a very large portion of the O₃ concentrations we expect to see in the region in 2017 (15-26 ppb across the region).
- While fire emissions was a very significant impact on the region's modeled 2017 O₃ design values in EPA's modeling using the 2011v6.2 platform, they only constitute a tiny contribution using TCEQ's 2006 and 2012 modeling platforms, which suggests that while fires can be a significant factor in the region's compliance with the O₃ NAAQS, it is not necessarily typically a significant factor.
- TCEQ's two modeling platform has show a much larger impact from anthropogenic emissions on peak O₃ concentrations in the region than EPA's modeling platform

- Biogenic emissions, offshore anthropogenic emissions, and anthropogenic emissions from Louisiana were consistently modeled to have significant impacts (≥ 1.0 ppb) on O₃ levels in the region in 2017
- Anthropogenic emissions from Alabama, Arkansas, Georgia, Iowa, Kansas, Kentucky, Missouri, Oklahoma, could each also be considered to be significant contributors to O₃ formation in the Austin area depending on the model run and whether the higher (≥ 1.0 ppb) or lower (≥ 0.5 ppb) thresholds were used.
- Anthropogenic emissions from most of the Eastern portion of Texas were significant contributors to O₃ formation across the region.
- Travis County is the only individual county that consistently has an impact of ≥ 1.0 ppb in both models, and is also the only county that has a consistent impact of ≥ 0.5 ppb.
- All five counties in the region were modeled to have impacts of ≥ 1.0 ppb on monitors analyzed for this project, but Bell County, Guadalupe County, Karnes County, and Milam County each were also modeled to have impact of ≥ 1.0 ppb on at least one monitoring station in at least one modeling platform.
- Fayette County is the only other county that meets any of the criteria, contributing between 0.5 ppb and 1 ppb.
- Using recent monitoring data is a better method for estimating expected 2017 O₃ concentrations than using the modeled attainment test described in EPA's draft modeling guidance.

Future research or analysis using these data may include analysis of the average O₃ contributions per tpd of VOC emissions from each source, updating the NO_x ppb/tpd analysis to include episode-specific emissions inventories, and calculating contributions to different O₃ averaging times. These may be pursued under task 6.4.

Appendix A: Coding for APCA Spreadsheets

The APCA spreadsheets used the following coding in order to denote the receptors, emission sources, and regions:

- Receptors:
 - 1 = CAMS 3
 - 2 = CAMS 38
 - 3 = CAMS 614
 - 4 = CAMS 690
 - 5 = CAMS 1675
 - 6 = CAMS 1603
 - 7 = CAMS 6602
- Sources:
 - 1 = Biogenics
 - 2 = Anthropogenic
 - 3 = Fires
- Regions:
 - IC = Initial Conditions
 - BC = Boundary Conditions
 - 1 = Offshore
 - 2 = Remainder of Texas
 - 3 = Louisiana
 - 4 = Arkansas
 - 5 = Oklahoma
 - 6 = Mexico
 - 7 = Kansas
 - 8 = Missouri
 - 9 = Kentucky
 - 10 = Tennessee
 - 11 = Mississippi
 - 12 = New Mexico
 - 13 = Colorado
 - 14 = Alabama
 - 15 = Georgia
 - 16 = Florida
 - 17 = South Carolina
 - 18 = North Carolina
 - 19 = Virginia
 - 20 = West Virginia
 - 21 = Ohio
 - 22 = Indiana
 - 23 = Illinois
 - 24 = Northeast (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont)

- 25 = Minnesota
- 26 = Mountain (Arizona, Idaho, Nevada, Utah)
- 27 = DE/DC/MD
- 28 = Michigan
- 29 = Wisconsin
- 30 = Iowa
- 31 = Nebraska
- 32 = South Dakota
- 33 = North Dakota
- 34 = Wyoming
- 35 = Pacific (California, Oregon, Washington)
- 36 = Caribbean
- 37 = Canada
- 38 = Atascosa County
- 39 = Medina County
- 40 = Bandera County
- 41 = Kendall County
- 42 = Bexar County
- 43 = Comal County
- 44 = Guadalupe County
- 45 = Wilson County
- 46 = Kerr County
- 47 = Frio County
- 48 = McMullen County
- 49 = Karnes County
- 50 = Caldwell County
- 51 = Fayette County
- 52 = Bastrop County
- 53 = Hays County
- 54 = Blanco County
- 55 = Travis County
- 56 = Gillespie County
- 57 = Lee County
- 58 = Williamson County
- 59 = Deep East Texas COG
- 60 = Brazos Valley COG
- 61 = Burnet County
- 62 = Llano County
- 63 = San Saba County
- 64 = Lampasas County
- 65 = Mills County
- 66 = Coryell County
- 67 = Hamilton County
- 68 = Bell county

- 69 = Milam County
- 70 = Texoma COG
- 71 = Ark-Tex Area COG
- 72 = East Texas COG
- 73 = South East Texas RPC
- 74 = Golden Crescent RPC
- 75 = Houston-Galveston Area Council
- 76 = North Central Texas COG
- 77 = Coastal Bend COG
- 78 = South Texas DC
- 79 = Lower Rio Grande Valley COG
- 80 = Heart of Texas COG
- 81 = Montana

Appendix B: Sensitivity Analysis: Alternative RCF Calculations

CAPCOG was interested in calculating alternative relative contribution factors using: 1) MDA8 values for all days modeled, 2) MDA8 values for the top 10 MDA8 value days, 3) MDA8 values for all days ≥ 60 ppb, and 4) MDA8 values for all days ≥ 71 ppb. The table below summarizes the denominators used for each of these scenarios. There are at least five days with modeled MDA8 $O_3 \geq 60$ ppb in 2017 at all seven monitoring stations using both the June 2006 and June 2012 modeling platforms. However, there are fewer than 4 days with modeled MDA8 O_3 ppb at all seven monitoring stations using both modeling platforms. Therefore, CAPCOG did not use the ≥ 71 ppb threshold for calculating any alternative RCFs.

In general, the most notable impact that changing the basis for calculating the RCFs had was that using additional episode days tended to increase the relative contribution of boundary conditions and non-anthropogenic sources of emissions relative to the use of the top 5 days as the basis. This suggests that the difference between more frequently occurring, lower O_3 levels, and the less common, higher O_3 levels can primarily be attributed to the interaction between meteorology and emissions within the modeling domain, rather than changes in O_3 levels coming into the modeling domain.

Table B-1. Avg. Peak 2017 MDA8 O_3 Values Modeled and Number of Days Used in Alternative RCF Calculations, June 2006 Platform

Basis	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
Avg. MDA8, All Days (ppb)	56.31	54.43	53.75	54.49	52.97	55.98	53.60
Avg. MDA8, Top 5 Days (ppb)	72.31	69.47	66.98	70.28	64.63	70.81	67.34
Avg. MDA8, Top 10 Days (ppb)	69.57	66.72	65.49	66.72	62.66	68.23	64.18
Avg. MDA8 ≥ 60 ppb (ppb)	66.84	65.32	65.49	65.72	63.10	67.49	65.36
Avg. MDA8 ≥ 71 ppb (ppb)	73.23	72.94	n/a	73.21	n/a	73.19	n/a
Days MDA8 ≥ 60 ppb	15	13	10	12	9	12	8
Days MDA8 ≥ 71 ppb	4	2	0	2	0	2	0

Table B-2. Avg. Peak 2017 MDA8 O_3 Values Modeled and Number of Days Used in Alternative RCF Calculations, June 2012 Platform

Basis	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
Avg. MDA8, All Days (ppb)	53.13	53.40	51.31	53.42	49.73	51.83	50.62
Avg. MDA8, Top 5 Days (ppb)	68.51	68.24	64.30	66.92	64.67	66.96	65.16
Avg. MDA8, Top 10 Days (ppb)	65.80	65.32	62.78	63.77	61.47	64.06	61.88
Avg. MDA8 ≥ 60 ppb (ppb)	65.80	64.55	62.78	64.96	64.67	64.53	64.42
Avg. MDA8 ≥ 71 ppb (ppb)	72.43	73.50	n/a	71.79	72.08	n/a	72.13
Days MDA8 ≥ 60 ppb	10	12	10	8	5	9	6
Days MDA8 ≥ 71 ppb	1	1	0	1	1	0	1

2006 Episode

Table B-3. CAMS 3 RCFs for June 2006 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0235	0.0145	0.0153	0.0237
BC	0.2866	0.3221	0.3405	0.3709
Biogenic Total	0.0193	0.0201	0.0206	0.0198
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0275	0.0263	0.0225	0.0338
Caribbean	0.0001	0.0000	0.0001	0.0005
Canada	0.0054	0.0046	0.0052	0.0047
Mexico	0.0027	0.0039	0.0042	0.0037
Alabama	0.0030	0.0037	0.0032	0.0043
Arkansas	0.0098	0.0077	0.0104	0.0076
Colorado	0.0025	0.0035	0.0039	0.0035
DE/DC/MD	0.0003	0.0002	0.0002	0.0003
Florida	0.0039	0.0031	0.0032	0.0089
Georgia	0.0021	0.0015	0.0015	0.0031
Illinois	0.0053	0.0046	0.0056	0.0045
Indiana	0.0018	0.0016	0.0026	0.0020
Iowa	0.0077	0.0062	0.0058	0.0043
Kansas	0.0120	0.0105	0.0107	0.0105
Kentucky	0.0011	0.0011	0.0017	0.0013
Louisiana	0.0523	0.0403	0.0387	0.0350
Michigan	0.0031	0.0026	0.0029	0.0019
Minnesota	0.0039	0.0037	0.0048	0.0031
Mississippi	0.0058	0.0052	0.0058	0.0056
Missouri	0.0070	0.0056	0.0059	0.0055
Montana	0.0011	0.0011	0.0014	0.0015
Mountain	0.0019	0.0029	0.0035	0.0031
Nebraska	0.0041	0.0042	0.0052	0.0052
New Mexico	0.0015	0.0024	0.0025	0.0020
North Carolina	0.0009	0.0005	0.0005	0.0011
North Dakota	0.0021	0.0018	0.0019	0.0021
Northeast	0.0017	0.0010	0.0010	0.0019
Ohio	0.0010	0.0007	0.0014	0.0011
Oklahoma	0.0147	0.0133	0.0186	0.0175
Pacific	0.0010	0.0016	0.0020	0.0018
South Carolina	0.0008	0.0005	0.0005	0.0010
South Dakota	0.0018	0.0017	0.0019	0.0020
Tennessee	0.0011	0.0011	0.0011	0.0010
Virginia	0.0005	0.0003	0.0003	0.0006
West Virginia	0.0003	0.0002	0.0002	0.0004
Wisconsin	0.0047	0.0046	0.0045	0.0029
Wyoming	0.0021	0.0029	0.0037	0.0033
Atascosa	0.0024	0.0025	0.0025	0.0016
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0094	0.0111	0.0112	0.0079
Comal	0.0007	0.0010	0.0010	0.0010
Frio	0.0000	0.0002	0.0002	0.0001
Gillespie	0.0000	0.0001	0.0000	0.0001
Guadalupe	0.0145	0.0128	0.0149	0.0146
Karnes	0.0066	0.0057	0.0110	0.0093
Kendall	0.0000	0.0001	0.0000	0.0001
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0011	0.0012	0.0010	0.0007
Medina	0.0000	0.0002	0.0001	0.0001
Wilson	0.0007	0.0005	0.0009	0.0007
Bastrop	0.0210	0.0183	0.0147	0.0112
Blanco	0.0001	0.0001	0.0001	0.0001
Burnet	0.0003	0.0003	0.0003	0.0009
Caldwell	0.0063	0.0064	0.0088	0.0084
Fayette	0.0037	0.0046	0.0038	0.0031
Hays	0.0291	0.0270	0.0249	0.0207
Lee	0.0015	0.0025	0.0036	0.0027
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.1902	0.1962	0.1664	0.1287
Williamson	0.0104	0.0127	0.0138	0.0133
Bell	0.0010	0.0050	0.0064	0.0088
Coryell	0.0000	0.0000	0.0000	0.0001
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0001	0.0001	0.0001	0.0001
Milam	0.0021	0.0018	0.0036	0.0043
Mills	0.0001	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0048	0.0056	0.0053	0.0037
Brazos Valley COG	0.0091	0.0070	0.0077	0.0067
Coastal Bend COG	0.0111	0.0093	0.0091	0.0092
Deep East Texas COG	0.0084	0.0108	0.0088	0.0068
East Texas COG	0.0149	0.0163	0.0137	0.0102
Golden Crescent RPC	0.0149	0.0180	0.0232	0.0384
Heart of Texas COG	0.0154	0.0108	0.0133	0.0220
Houston-Galveston Area Council	0.0590	0.0513	0.0388	0.0307
Lower Rio Grande Valley DC	0.0008	0.0014	0.0013	0.0012
North Central Texas COG	0.0170	0.0105	0.0102	0.0142
South East Texas RPC	0.0098	0.0070	0.0056	0.0047
South Texas DC	0.0002	0.0004	0.0004	0.0004
Texoma COG	0.0012	0.0008	0.0010	0.0008
Remainder of Texas	0.0041	0.0068	0.0067	0.0052

Table B-4. CAMS 38 RCFs for June 2006 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0023	0.0114	0.0146	0.0232
BC	0.3633	0.3570	0.3611	0.3911
Biogenic Total	0.0201	0.0215	0.0215	0.0217
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0317	0.0223	0.0252	0.0320
Caribbean	0.0000	0.0000	0.0000	0.0005
Canada	0.0058	0.0052	0.0047	0.0048
Mexico	0.0021	0.0029	0.0043	0.0042
Alabama	0.0042	0.0031	0.0041	0.0041
Arkansas	0.0108	0.0140	0.0121	0.0074
Colorado	0.0028	0.0038	0.0041	0.0040
DE/DC/MD	0.0000	0.0001	0.0001	0.0003
Florida	0.0011	0.0027	0.0032	0.0084
Georgia	0.0005	0.0011	0.0015	0.0030
Illinois	0.0062	0.0070	0.0062	0.0044
Indiana	0.0022	0.0034	0.0029	0.0019
Iowa	0.0069	0.0062	0.0057	0.0043
Kansas	0.0057	0.0089	0.0104	0.0113
Kentucky	0.0014	0.0020	0.0018	0.0013
Louisiana	0.0584	0.0442	0.0407	0.0325
Michigan	0.0034	0.0037	0.0030	0.0019
Minnesota	0.0039	0.0037	0.0032	0.0030
Mississippi	0.0080	0.0071	0.0078	0.0053
Missouri	0.0066	0.0072	0.0069	0.0054
Montana	0.0013	0.0017	0.0016	0.0016
Mountain	0.0025	0.0036	0.0037	0.0034
Nebraska	0.0039	0.0049	0.0048	0.0056
New Mexico	0.0019	0.0019	0.0023	0.0023
North Carolina	0.0001	0.0003	0.0005	0.0011
North Dakota	0.0021	0.0018	0.0017	0.0021
Northeast	0.0003	0.0008	0.0010	0.0018
Ohio	0.0009	0.0018	0.0016	0.0011
Oklahoma	0.0056	0.0106	0.0137	0.0195
Pacific	0.0017	0.0022	0.0022	0.0020
South Carolina	0.0001	0.0003	0.0005	0.0010
South Dakota	0.0019	0.0019	0.0018	0.0021
Tennessee	0.0016	0.0012	0.0013	0.0010
Virginia	0.0001	0.0002	0.0003	0.0006
West Virginia	0.0001	0.0002	0.0002	0.0003
Wisconsin	0.0047	0.0044	0.0037	0.0027
Wyoming	0.0028	0.0043	0.0042	0.0037
Atascosa	0.0007	0.0034	0.0029	0.0020
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0052	0.0139	0.0131	0.0106
Comal	0.0004	0.0010	0.0012	0.0011
Frio	0.0000	0.0000	0.0000	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0001
Guadalupe	0.0078	0.0146	0.0181	0.0130
Karnes	0.0040	0.0093	0.0136	0.0093
Kendall	0.0000	0.0000	0.0000	0.0001
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0003	0.0011	0.0010	0.0008
Medina	0.0000	0.0000	0.0000	0.0001
Wilson	0.0002	0.0010	0.0013	0.0008
Bastrop	0.0166	0.0116	0.0097	0.0072
Blanco	0.0000	0.0001	0.0000	0.0002
Burnet	0.0002	0.0003	0.0003	0.0020
Caldwell	0.0054	0.0078	0.0087	0.0071
Fayette	0.0048	0.0053	0.0043	0.0032
Hays	0.0255	0.0276	0.0303	0.0212
Lee	0.0030	0.0038	0.0030	0.0020
Llano	0.0000	0.0000	0.0000	0.0001
Travis	0.1664	0.1392	0.1223	0.0910
Williamson	0.0287	0.0248	0.0253	0.0246
Bell	0.0011	0.0010	0.0016	0.0131
Coryell	0.0000	0.0000	0.0000	0.0001
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0001	0.0001	0.0003
Milam	0.0082	0.0101	0.0083	0.0055
Mills	0.0000	0.0001	0.0001	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0024	0.0051	0.0053	0.0043
Brazos Valley COG	0.0055	0.0077	0.0080	0.0066
Coastal Bend COG	0.0081	0.0101	0.0106	0.0096
Deep East Texas COG	0.0087	0.0089	0.0081	0.0064
East Texas COG	0.0055	0.0127	0.0139	0.0105
Golden Crescent RPC	0.0214	0.0260	0.0257	0.0364
Heart of Texas COG	0.0059	0.0065	0.0096	0.0240
Houston-Galveston Area Council	0.0651	0.0461	0.0372	0.0273
Lower Rio Grande Valley DC	0.0003	0.0007	0.0016	0.0014
North Central Texas COG	0.0045	0.0073	0.0116	0.0175
South East Texas RPC	0.0099	0.0064	0.0055	0.0043
South Texas DC	0.0002	0.0003	0.0004	0.0005
Texoma COG	0.0003	0.0008	0.0010	0.0009
Remainder of Texas	0.0047	0.0046	0.0059	0.0063

Table B-5. CAMS 614 RCFs for June 2006 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0013	0.0120	0.0120	0.0237
BC	0.3830	0.3633	0.3633	0.3990
Biogenic Total	0.0203	0.0219	0.0219	0.0215
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0229	0.0220	0.0220	0.0324
Caribbean	0.0000	0.0000	0.0000	0.0005
Canada	0.0074	0.0050	0.0050	0.0046
Mexico	0.0013	0.0029	0.0029	0.0045
Alabama	0.0023	0.0033	0.0033	0.0040
Arkansas	0.0139	0.0121	0.0121	0.0069
Colorado	0.0016	0.0035	0.0035	0.0040
DE/DC/MD	0.0000	0.0001	0.0001	0.0003
Florida	0.0003	0.0024	0.0024	0.0089
Georgia	0.0002	0.0012	0.0012	0.0031
Illinois	0.0057	0.0061	0.0061	0.0042
Indiana	0.0018	0.0028	0.0028	0.0017
Iowa	0.0089	0.0061	0.0061	0.0041
Kansas	0.0107	0.0113	0.0113	0.0105
Kentucky	0.0009	0.0018	0.0018	0.0012
Louisiana	0.0613	0.0455	0.0455	0.0328
Michigan	0.0041	0.0031	0.0031	0.0016
Minnesota	0.0058	0.0036	0.0036	0.0030
Mississippi	0.0096	0.0069	0.0069	0.0051
Missouri	0.0082	0.0071	0.0071	0.0055
Montana	0.0013	0.0016	0.0016	0.0016
Mountain	0.0016	0.0034	0.0034	0.0034
Nebraska	0.0054	0.0050	0.0050	0.0054
New Mexico	0.0010	0.0017	0.0017	0.0022
North Carolina	0.0000	0.0004	0.0004	0.0011
North Dakota	0.0026	0.0018	0.0018	0.0020
Northeast	0.0002	0.0008	0.0008	0.0018
Ohio	0.0008	0.0015	0.0015	0.0010
Oklahoma	0.0077	0.0147	0.0147	0.0192
Pacific	0.0015	0.0022	0.0022	0.0020
South Carolina	0.0000	0.0004	0.0004	0.0010
South Dakota	0.0024	0.0019	0.0019	0.0020
Tennessee	0.0012	0.0012	0.0012	0.0010
Virginia	0.0000	0.0002	0.0002	0.0006
West Virginia	0.0001	0.0002	0.0002	0.0003
Wisconsin	0.0070	0.0041	0.0041	0.0026
Wyoming	0.0019	0.0039	0.0039	0.0037
Atascosa	0.0048	0.0049	0.0049	0.0035
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0206	0.0223	0.0223	0.0251
Comal	0.0040	0.0034	0.0034	0.0039
Frio	0.0000	0.0001	0.0001	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0001
Guadalupe	0.0391	0.0301	0.0301	0.0298
Karnes	0.0070	0.0086	0.0086	0.0139
Kendall	0.0000	0.0000	0.0000	0.0001
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0007	0.0014	0.0014	0.0011
Medina	0.0000	0.0001	0.0001	0.0001
Wilson	0.0020	0.0015	0.0015	0.0018
Bastrop	0.0154	0.0169	0.0169	0.0086
Blanco	0.0000	0.0002	0.0002	0.0005
Burnet	0.0001	0.0004	0.0004	0.0015
Caldwell	0.0122	0.0095	0.0095	0.0079
Fayette	0.0044	0.0051	0.0051	0.0032
Hays	0.0488	0.0391	0.0391	0.0311
Lee	0.0018	0.0032	0.0032	0.0018
Llano	0.0000	0.0000	0.0000	0.0001
Travis	0.0938	0.1139	0.1139	0.0657
Williamson	0.0003	0.0025	0.0025	0.0080
Bell	0.0001	0.0006	0.0006	0.0065
Coryell	0.0000	0.0000	0.0000	0.0002
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0001	0.0001	0.0003
Milam	0.0004	0.0020	0.0020	0.0033
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0048	0.0053	0.0053	0.0039
Brazos Valley COG	0.0044	0.0072	0.0072	0.0054
Coastal Bend COG	0.0050	0.0100	0.0100	0.0131
Deep East Texas COG	0.0122	0.0097	0.0097	0.0063
East Texas COG	0.0132	0.0142	0.0142	0.0096
Golden Crescent RPC	0.0189	0.0198	0.0198	0.0320
Heart of Texas COG	0.0035	0.0104	0.0104	0.0196
Houston-Galveston Area Council	0.0594	0.0415	0.0415	0.0275
Lower Rio Grande Valley DC	0.0001	0.0007	0.0007	0.0016
North Central Texas COG	0.0026	0.0134	0.0134	0.0165
South East Texas RPC	0.0106	0.0065	0.0065	0.0045
South Texas DC	0.0001	0.0003	0.0003	0.0005
Texoma COG	0.0004	0.0012	0.0012	0.0010
Remainder of Texas	0.0027	0.0048	0.0048	0.0063

Table B-6. CAMS 690 RCFs for June 2006 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0115	0.0140	0.0120	0.0245
BC	0.3227	0.3333	0.3557	0.3816
Biogenic Total	0.0207	0.0216	0.0214	0.0222
Fire Total	0.0001	0.0000	0.0001	0.0000
Offshore	0.0279	0.0312	0.0299	0.0326
Caribbean	0.0000	0.0000	0.0000	0.0005
Canada	0.0059	0.0044	0.0047	0.0050
Mexico	0.0019	0.0046	0.0042	0.0039
Alabama	0.0026	0.0049	0.0047	0.0042
Arkansas	0.0135	0.0102	0.0099	0.0080
Colorado	0.0024	0.0043	0.0040	0.0038
DE/DC/MD	0.0001	0.0001	0.0001	0.0003
Florida	0.0026	0.0036	0.0034	0.0089
Georgia	0.0010	0.0014	0.0013	0.0033
Illinois	0.0057	0.0053	0.0052	0.0047
Indiana	0.0019	0.0019	0.0018	0.0022
Iowa	0.0077	0.0052	0.0059	0.0045
Kansas	0.0068	0.0064	0.0080	0.0123
Kentucky	0.0010	0.0013	0.0012	0.0014
Louisiana	0.0661	0.0536	0.0473	0.0339
Michigan	0.0035	0.0024	0.0027	0.0021
Minnesota	0.0040	0.0027	0.0035	0.0032
Mississippi	0.0103	0.0106	0.0096	0.0055
Missouri	0.0074	0.0061	0.0061	0.0055
Montana	0.0013	0.0014	0.0014	0.0016
Mountain	0.0019	0.0035	0.0033	0.0033
Nebraska	0.0040	0.0039	0.0043	0.0059
New Mexico	0.0010	0.0027	0.0025	0.0022
North Carolina	0.0003	0.0004	0.0004	0.0012
North Dakota	0.0021	0.0016	0.0017	0.0023
Northeast	0.0008	0.0009	0.0008	0.0019
Ohio	0.0010	0.0009	0.0009	0.0013
Oklahoma	0.0064	0.0084	0.0087	0.0193
Pacific	0.0015	0.0020	0.0019	0.0020
South Carolina	0.0003	0.0004	0.0004	0.0011
South Dakota	0.0019	0.0016	0.0017	0.0022
Tennessee	0.0013	0.0015	0.0014	0.0010
Virginia	0.0002	0.0002	0.0002	0.0006
West Virginia	0.0002	0.0002	0.0002	0.0004
Wisconsin	0.0050	0.0032	0.0042	0.0029
Wyoming	0.0025	0.0037	0.0035	0.0036
Atascosa	0.0029	0.0023	0.0020	0.0014
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0119	0.0105	0.0090	0.0070
Comal	0.0008	0.0009	0.0008	0.0007
Frio	0.0000	0.0001	0.0000	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0001
Guadalupe	0.0134	0.0145	0.0132	0.0092
Karnes	0.0077	0.0136	0.0118	0.0070
Kendall	0.0000	0.0000	0.0000	0.0001
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0011	0.0009	0.0008	0.0007
Medina	0.0000	0.0001	0.0000	0.0001
Wilson	0.0007	0.0010	0.0008	0.0005
Bastrop	0.0185	0.0161	0.0143	0.0104
Blanco	0.0001	0.0001	0.0000	0.0001
Burnet	0.0003	0.0002	0.0002	0.0012
Caldwell	0.0073	0.0087	0.0075	0.0049
Fayette	0.0055	0.0057	0.0059	0.0046
Hays	0.0214	0.0206	0.0190	0.0113
Lee	0.0023	0.0015	0.0016	0.0012
Llano	0.0001	0.0000	0.0000	0.0001
Travis	0.1502	0.1326	0.1213	0.0791
Williamson	0.0358	0.0337	0.0437	0.0386
Bell	0.0004	0.0032	0.0028	0.0201
Coryell	0.0000	0.0001	0.0000	0.0001
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0001	0.0001	0.0001	0.0003
Milam	0.0010	0.0021	0.0075	0.0085
Mills	0.0001	0.0001	0.0001	0.0000
San Saba	0.0001	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0018	0.0027	0.0040	0.0047
Brazos Valley COG	0.0042	0.0042	0.0052	0.0067
Coastal Bend COG	0.0076	0.0141	0.0125	0.0084
Deep East Texas COG	0.0094	0.0067	0.0077	0.0061
East Texas COG	0.0051	0.0064	0.0105	0.0115
Golden Crescent RPC	0.0266	0.0430	0.0377	0.0340
Heart of Texas COG	0.0034	0.0066	0.0065	0.0301
Houston-Galveston Area Council	0.0798	0.0564	0.0509	0.0297
Lower Rio Grande Valley DC	0.0005	0.0021	0.0018	0.0012
North Central Texas COG	0.0053	0.0075	0.0067	0.0211
South East Texas RPC	0.0118	0.0080	0.0070	0.0047
South Texas DC	0.0002	0.0005	0.0004	0.0004
Texoma COG	0.0005	0.0006	0.0006	0.0009
Remainder of Texas	0.0033	0.0068	0.0061	0.0062

Table B-7. CAMS 1603 RCFs for June 2006 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0116	0.0125	0.0120	0.0238
BC	0.3162	0.3503	0.3389	0.3777
Biogenic Total	0.0205	0.0205	0.0214	0.0200
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0301	0.0249	0.0237	0.0333
Caribbean	0.0000	0.0000	0.0000	0.0005
Canada	0.0054	0.0048	0.0045	0.0044
Mexico	0.0028	0.0028	0.0041	0.0039
Alabama	0.0040	0.0039	0.0036	0.0041
Arkansas	0.0095	0.0089	0.0113	0.0073
Colorado	0.0032	0.0032	0.0038	0.0036
DE/DC/MD	0.0001	0.0001	0.0001	0.0003
Florida	0.0021	0.0027	0.0026	0.0087
Georgia	0.0013	0.0014	0.0013	0.0030
Illinois	0.0053	0.0045	0.0059	0.0044
Indiana	0.0018	0.0015	0.0028	0.0018
Iowa	0.0072	0.0061	0.0055	0.0042
Kansas	0.0110	0.0108	0.0102	0.0103
Kentucky	0.0012	0.0011	0.0018	0.0012
Louisiana	0.0555	0.0457	0.0461	0.0340
Michigan	0.0028	0.0025	0.0028	0.0017
Minnesota	0.0038	0.0036	0.0032	0.0029
Mississippi	0.0062	0.0078	0.0069	0.0053
Missouri	0.0069	0.0062	0.0067	0.0056
Montana	0.0011	0.0013	0.0015	0.0015
Mountain	0.0025	0.0026	0.0036	0.0031
Nebraska	0.0042	0.0043	0.0046	0.0050
New Mexico	0.0021	0.0018	0.0023	0.0020
North Carolina	0.0005	0.0005	0.0004	0.0011
North Dakota	0.0021	0.0018	0.0017	0.0020
Northeast	0.0010	0.0009	0.0009	0.0018
Ohio	0.0009	0.0007	0.0015	0.0011
Oklahoma	0.0152	0.0124	0.0139	0.0172
Pacific	0.0015	0.0017	0.0021	0.0018
South Carolina	0.0004	0.0004	0.0004	0.0010
South Dakota	0.0018	0.0017	0.0017	0.0019
Tennessee	0.0012	0.0013	0.0013	0.0010
Virginia	0.0003	0.0003	0.0002	0.0006
West Virginia	0.0002	0.0002	0.0002	0.0003
Wisconsin	0.0045	0.0043	0.0038	0.0027
Wyoming	0.0024	0.0028	0.0037	0.0033
Atascosa	0.0009	0.0030	0.0037	0.0023
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0065	0.0113	0.0165	0.0122
Comal	0.0004	0.0011	0.0016	0.0018
Frio	0.0000	0.0000	0.0002	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0001
Guadalupe	0.0060	0.0198	0.0206	0.0228
Karnes	0.0034	0.0102	0.0093	0.0123
Kendall	0.0000	0.0000	0.0001	0.0001
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0003	0.0009	0.0012	0.0007
Medina	0.0000	0.0000	0.0001	0.0001
Wilson	0.0002	0.0012	0.0011	0.0011
Bastrop	0.0208	0.0202	0.0207	0.0121
Blanco	0.0001	0.0001	0.0001	0.0002
Burnet	0.0003	0.0003	0.0003	0.0008
Caldwell	0.0076	0.0127	0.0118	0.0118
Fayette	0.0027	0.0044	0.0053	0.0036
Hays	0.0312	0.0436	0.0437	0.0412
Lee	0.0009	0.0017	0.0031	0.0020
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.2006	0.1419	0.1429	0.0943
Williamson	0.0123	0.0066	0.0058	0.0091
Bell	0.0048	0.0027	0.0023	0.0061
Coryell	0.0000	0.0000	0.0000	0.0001
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0001	0.0001	0.0001	0.0002
Milam	0.0024	0.0016	0.0016	0.0033
Mills	0.0000	0.0001	0.0001	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0055	0.0053	0.0054	0.0036
Brazos Valley COG	0.0093	0.0064	0.0064	0.0055
Coastal Bend COG	0.0077	0.0091	0.0095	0.0107
Deep East Texas COG	0.0097	0.0104	0.0107	0.0072
East Texas COG	0.0134	0.0143	0.0145	0.0093
Golden Crescent RPC	0.0118	0.0254	0.0219	0.0401
Heart of Texas COG	0.0140	0.0092	0.0082	0.0200
Houston-Galveston Area Council	0.0455	0.0470	0.0419	0.0297
Lower Rio Grande Valley DC	0.0006	0.0007	0.0015	0.0014
North Central Texas COG	0.0146	0.0106	0.0105	0.0138
South East Texas RPC	0.0088	0.0072	0.0064	0.0047
South Texas DC	0.0002	0.0003	0.0004	0.0004
Texoma COG	0.0010	0.0008	0.0010	0.0008
Remainder of Texas	0.0052	0.0048	0.0064	0.0051

Table B-8. CAMS 1675 RCFs for June 2006 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0143	0.0147	0.0162	0.0261
BC	0.3564	0.3409	0.3487	0.4005
Biogenic Total	0.0227	0.0244	0.0232	0.0209
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0161	0.0292	0.0312	0.0387
Caribbean	0.0000	0.0000	0.0000	0.0006
Canada	0.0062	0.0063	0.0066	0.0046
Mexico	0.0031	0.0035	0.0034	0.0038
Alabama	0.0049	0.0043	0.0044	0.0043
Arkansas	0.0068	0.0112	0.0096	0.0072
Colorado	0.0037	0.0040	0.0035	0.0039
DE/DC/MD	0.0001	0.0001	0.0002	0.0003
Florida	0.0029	0.0031	0.0033	0.0109
Georgia	0.0016	0.0015	0.0016	0.0032
Illinois	0.0032	0.0059	0.0049	0.0043
Indiana	0.0011	0.0024	0.0017	0.0017
Iowa	0.0056	0.0065	0.0069	0.0044
Kansas	0.0147	0.0117	0.0121	0.0099
Kentucky	0.0011	0.0017	0.0013	0.0012
Louisiana	0.0465	0.0583	0.0572	0.0364
Michigan	0.0014	0.0025	0.0023	0.0016
Minnesota	0.0071	0.0057	0.0062	0.0033
Mississippi	0.0110	0.0091	0.0096	0.0058
Missouri	0.0050	0.0072	0.0068	0.0057
Montana	0.0015	0.0016	0.0014	0.0015
Mountain	0.0032	0.0035	0.0029	0.0034
Nebraska	0.0068	0.0061	0.0060	0.0051
New Mexico	0.0020	0.0024	0.0023	0.0023
North Carolina	0.0005	0.0005	0.0005	0.0011
North Dakota	0.0023	0.0024	0.0025	0.0020
Northeast	0.0009	0.0009	0.0010	0.0018
Ohio	0.0006	0.0012	0.0008	0.0009
Oklahoma	0.0326	0.0230	0.0221	0.0164
Pacific	0.0022	0.0022	0.0018	0.0020
South Carolina	0.0005	0.0005	0.0005	0.0010
South Dakota	0.0021	0.0022	0.0022	0.0019
Tennessee	0.0016	0.0015	0.0015	0.0011
Virginia	0.0003	0.0003	0.0003	0.0006
West Virginia	0.0002	0.0002	0.0002	0.0003
Wisconsin	0.0041	0.0046	0.0050	0.0029
Wyoming	0.0032	0.0038	0.0030	0.0036
Atascosa	0.0039	0.0032	0.0035	0.0021
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0183	0.0146	0.0160	0.0103
Comal	0.0021	0.0017	0.0019	0.0014
Frio	0.0000	0.0000	0.0000	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0000
Guadalupe	0.0380	0.0428	0.0469	0.0369
Karnes	0.0174	0.0180	0.0195	0.0227
Kendall	0.0000	0.0000	0.0000	0.0001
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0007	0.0008	0.0009	0.0005
Medina	0.0000	0.0001	0.0001	0.0001
Wilson	0.0030	0.0027	0.0029	0.0027
Bastrop	0.0144	0.0121	0.0106	0.0087
Blanco	0.0000	0.0001	0.0001	0.0002
Burnet	0.0001	0.0003	0.0003	0.0003
Caldwell	0.0268	0.0326	0.0313	0.0207
Fayette	0.0018	0.0100	0.0048	0.0064
Hays	0.0521	0.0348	0.0376	0.0302
Lee	0.0007	0.0010	0.0008	0.0011
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.0470	0.0261	0.0287	0.0241
Williamson	0.0045	0.0027	0.0029	0.0034
Bell	0.0012	0.0009	0.0010	0.0023
Coryell	0.0000	0.0001	0.0001	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0001	0.0001	0.0001
Milam	0.0034	0.0024	0.0026	0.0038
Mills	0.0000	0.0001	0.0001	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0047	0.0044	0.0040	0.0035
Brazos Valley COG	0.0068	0.0059	0.0060	0.0058
Coastal Bend COG	0.0071	0.0110	0.0112	0.0148
Deep East Texas COG	0.0081	0.0085	0.0071	0.0062
East Texas COG	0.0082	0.0094	0.0081	0.0084
Golden Crescent RPC	0.0379	0.0420	0.0438	0.0567
Heart of Texas COG	0.0101	0.0092	0.0090	0.0131
Houston-Galveston Area Council	0.0493	0.0581	0.0508	0.0413
Lower Rio Grande Valley DC	0.0002	0.0007	0.0007	0.0011
North Central Texas COG	0.0166	0.0149	0.0136	0.0103
South East Texas RPC	0.0074	0.0091	0.0096	0.0063
South Texas DC	0.0003	0.0003	0.0003	0.0003
Texoma COG	0.0020	0.0017	0.0014	0.0010
Remainder of Texas	0.0056	0.0062	0.0060	0.0053

Table B-9. CAMS 6602 RCFs for June 2006 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0171	0.0100	0.0120	0.0248
BC	0.3125	0.3682	0.3491	0.3786
Biogenic Total	0.0222	0.0230	0.0228	0.0219
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0360	0.0309	0.0320	0.0400
Caribbean	0.0000	0.0000	0.0000	0.0005
Canada	0.0060	0.0048	0.0050	0.0052
Mexico	0.0044	0.0039	0.0040	0.0036
Alabama	0.0026	0.0042	0.0041	0.0047
Arkansas	0.0119	0.0150	0.0107	0.0096
Colorado	0.0034	0.0041	0.0038	0.0036
DE/DC/MD	0.0001	0.0001	0.0001	0.0004
Florida	0.0036	0.0029	0.0030	0.0095
Georgia	0.0015	0.0012	0.0012	0.0034
Illinois	0.0066	0.0076	0.0058	0.0054
Indiana	0.0023	0.0043	0.0021	0.0025
Iowa	0.0081	0.0054	0.0061	0.0049
Kansas	0.0072	0.0064	0.0066	0.0123
Kentucky	0.0013	0.0027	0.0014	0.0016
Louisiana	0.0607	0.0565	0.0618	0.0417
Michigan	0.0039	0.0036	0.0028	0.0023
Minnesota	0.0043	0.0029	0.0033	0.0034
Mississippi	0.0068	0.0081	0.0090	0.0064
Missouri	0.0072	0.0070	0.0064	0.0062
Montana	0.0011	0.0018	0.0014	0.0017
Mountain	0.0026	0.0043	0.0032	0.0034
Nebraska	0.0043	0.0044	0.0041	0.0058
New Mexico	0.0026	0.0025	0.0026	0.0020
North Carolina	0.0005	0.0003	0.0004	0.0013
North Dakota	0.0022	0.0017	0.0019	0.0023
Northeast	0.0011	0.0007	0.0008	0.0021
Ohio	0.0011	0.0023	0.0009	0.0015
Oklahoma	0.0076	0.0099	0.0089	0.0178
Pacific	0.0013	0.0027	0.0020	0.0021
South Carolina	0.0005	0.0003	0.0003	0.0011
South Dakota	0.0020	0.0018	0.0017	0.0022
Tennessee	0.0013	0.0016	0.0016	0.0013
Virginia	0.0003	0.0002	0.0002	0.0007
West Virginia	0.0002	0.0002	0.0002	0.0004
Wisconsin	0.0055	0.0034	0.0039	0.0032
Wyoming	0.0028	0.0045	0.0034	0.0036
Atascosa	0.0028	0.0021	0.0025	0.0010
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0143	0.0124	0.0151	0.0064
Comal	0.0009	0.0006	0.0008	0.0005
Frio	0.0003	0.0002	0.0002	0.0001
Gillespie	0.0001	0.0000	0.0001	0.0000
Guadalupe	0.0135	0.0113	0.0136	0.0081
Karnes	0.0088	0.0065	0.0077	0.0063
Kendall	0.0001	0.0001	0.0001	0.0000
Kerr	0.0001	0.0000	0.0000	0.0000
McMullen	0.0016	0.0010	0.0012	0.0005
Medina	0.0002	0.0001	0.0002	0.0001
Wilson	0.0006	0.0005	0.0006	0.0004
Bastrop	0.0247	0.0208	0.0240	0.0157
Blanco	0.0001	0.0001	0.0001	0.0001
Burnet	0.0004	0.0003	0.0004	0.0007
Caldwell	0.0058	0.0053	0.0061	0.0048
Fayette	0.0046	0.0040	0.0046	0.0049
Hays	0.0227	0.0169	0.0196	0.0119
Lee	0.0041	0.0042	0.0029	0.0027
Llano	0.0001	0.0000	0.0000	0.0000
Travis	0.1290	0.1024	0.1165	0.0713
Williamson	0.0221	0.0233	0.0222	0.0196
Bell	0.0012	0.0065	0.0079	0.0120
Coryell	0.0000	0.0000	0.0000	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0001	0.0001	0.0001	0.0001
Milam	0.0056	0.0170	0.0038	0.0116
Mills	0.0001	0.0000	0.0001	0.0000
San Saba	0.0001	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0028	0.0039	0.0033	0.0042
Brazos Valley COG	0.0038	0.0109	0.0041	0.0091
Coastal Bend COG	0.0148	0.0100	0.0117	0.0076
Deep East Texas COG	0.0066	0.0081	0.0092	0.0075
East Texas COG	0.0080	0.0090	0.0088	0.0123
Golden Crescent RPC	0.0187	0.0191	0.0209	0.0334
Heart of Texas COG	0.0063	0.0052	0.0059	0.0271
Houston-Galveston Area Council	0.0785	0.0594	0.0693	0.0447
Lower Rio Grande Valley DC	0.0023	0.0013	0.0015	0.0011
North Central Texas COG	0.0068	0.0052	0.0057	0.0168
South East Texas RPC	0.0118	0.0085	0.0101	0.0059
South Texas DC	0.0005	0.0004	0.0005	0.0003
Texoma COG	0.0005	0.0005	0.0005	0.0008
Remainder of Texas	0.0076	0.0069	0.0074	0.0052

2012 Episode

Table B-10. CAMS 3 RCFs for June 2012 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0001	0.0002	0.0002	0.0005
BC	0.2375	0.3025	0.3025	0.4240
Biogenic Total	0.0624	0.0595	0.0595	0.0432
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0182	0.0162	0.0162	0.0452
Caribbean	0.0001	0.0001	0.0001	0.0005
Canada	0.0055	0.0046	0.0046	0.0028
Mexico	0.0028	0.0042	0.0042	0.0078
Alabama	0.0181	0.0185	0.0185	0.0097
Arkansas	0.0266	0.0211	0.0211	0.0096
Colorado	0.0037	0.0047	0.0047	0.0046
DE/DC/MD	0.0002	0.0002	0.0002	0.0003
Florida	0.0018	0.0043	0.0043	0.0092
Georgia	0.0050	0.0072	0.0072	0.0061
Illinois	0.0071	0.0056	0.0056	0.0027
Indiana	0.0065	0.0051	0.0051	0.0026
Iowa	0.0016	0.0017	0.0017	0.0010
Kansas	0.0086	0.0090	0.0090	0.0048
Kentucky	0.0099	0.0081	0.0081	0.0041
Louisiana	0.0757	0.0621	0.0621	0.0334
Michigan	0.0027	0.0016	0.0016	0.0009
Minnesota	0.0011	0.0010	0.0010	0.0006
Mississippi	0.0226	0.0204	0.0204	0.0100
Missouri	0.0098	0.0066	0.0066	0.0033
Montana	0.0009	0.0013	0.0013	0.0009
Mountain	0.0045	0.0052	0.0052	0.0043
Nebraska	0.0022	0.0034	0.0034	0.0020
New Mexico	0.0025	0.0025	0.0025	0.0035
North Carolina	0.0008	0.0013	0.0013	0.0019
North Dakota	0.0010	0.0010	0.0010	0.0006
Northeast	0.0021	0.0015	0.0015	0.0017
Ohio	0.0035	0.0025	0.0025	0.0015
Oklahoma	0.0115	0.0188	0.0188	0.0090
Pacific	0.0027	0.0030	0.0030	0.0024
South Carolina	0.0004	0.0009	0.0009	0.0013
South Dakota	0.0007	0.0009	0.0009	0.0006
Tennessee	0.0116	0.0104	0.0104	0.0053
Virginia	0.0006	0.0009	0.0009	0.0010
West Virginia	0.0006	0.0006	0.0006	0.0005
Wisconsin	0.0009	0.0007	0.0007	0.0004

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Wyoming	0.0030	0.0036	0.0036	0.0026
Atascosa	0.0002	0.0003	0.0003	0.0005
Bandera	0.0000	0.0000	0.0000	0.0000
Bexar	0.0027	0.0020	0.0020	0.0021
Comal	0.0001	0.0002	0.0002	0.0003
Frio	0.0000	0.0001	0.0001	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0000
Guadalupe	0.0037	0.0043	0.0043	0.0075
Karnes	0.0011	0.0024	0.0024	0.0128
Kendall	0.0000	0.0000	0.0000	0.0000
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0001	0.0001	0.0001	0.0002
Medina	0.0001	0.0001	0.0001	0.0001
Wilson	0.0001	0.0002	0.0002	0.0007
Bastrop	0.0168	0.0190	0.0190	0.0138
Blanco	0.0001	0.0001	0.0001	0.0001
Burnet	0.0003	0.0004	0.0004	0.0002
Caldwell	0.0049	0.0055	0.0055	0.0107
Fayette	0.0054	0.0078	0.0078	0.0079
Hays	0.0096	0.0094	0.0094	0.0151
Lee	0.0016	0.0035	0.0035	0.0023
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.1711	0.1389	0.1389	0.1098
Williamson	0.0190	0.0147	0.0147	0.0081
Bell	0.0114	0.0069	0.0069	0.0044
Coryell	0.0000	0.0000	0.0000	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0001	0.0001	0.0000
Milam	0.0028	0.0096	0.0096	0.0061
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0080	0.0059	0.0059	0.0026
Brazos Valley COG	0.0112	0.0113	0.0113	0.0063
Coastal Bend COG	0.0011	0.0012	0.0012	0.0109
Deep East Texas COG	0.0110	0.0101	0.0101	0.0049
East Texas COG	0.0317	0.0229	0.0229	0.0097
Golden Crescent RPC	0.0063	0.0099	0.0099	0.0408
Heart of Texas COG	0.0301	0.0303	0.0303	0.0135
Houston-Galveston Area Council	0.0427	0.0310	0.0310	0.0234
Lower Rio Grande Valley DC	0.0001	0.0003	0.0003	0.0009
North Central Texas COG	0.0059	0.0108	0.0108	0.0050
South East Texas RPC	0.0174	0.0106	0.0106	0.0059
South Texas DC	0.0002	0.0004	0.0004	0.0009
Texoma COG	0.0003	0.0006	0.0006	0.0003
Remainder of Texas	0.0057	0.0059	0.0059	0.0058

Table B-11. CAMS 38 RCFs for June 2012 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0003	0.0002	0.0002	0.0005
BC	0.3043	0.3085	0.3303	0.4179
Biogenic Total	0.0543	0.0600	0.0562	0.0453
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0177	0.0137	0.0187	0.0423
Caribbean	0.0001	0.0001	0.0001	0.0005
Canada	0.0039	0.0045	0.0045	0.0029
Mexico	0.0051	0.0041	0.0040	0.0081
Alabama	0.0216	0.0168	0.0155	0.0091
Arkansas	0.0129	0.0182	0.0172	0.0091
Colorado	0.0030	0.0049	0.0051	0.0044
DE/DC/MD	0.0001	0.0001	0.0004	0.0003
Florida	0.0022	0.0023	0.0046	0.0089
Georgia	0.0078	0.0062	0.0072	0.0059
Illinois	0.0062	0.0052	0.0045	0.0025
Indiana	0.0053	0.0050	0.0044	0.0025
Iowa	0.0022	0.0017	0.0015	0.0010
Kansas	0.0112	0.0091	0.0080	0.0048
Kentucky	0.0089	0.0076	0.0068	0.0039
Louisiana	0.0573	0.0514	0.0515	0.0314
Michigan	0.0011	0.0017	0.0016	0.0009
Minnesota	0.0013	0.0010	0.0009	0.0005
Mississippi	0.0201	0.0189	0.0174	0.0095
Missouri	0.0069	0.0061	0.0052	0.0030
Montana	0.0018	0.0014	0.0013	0.0009
Mountain	0.0047	0.0050	0.0051	0.0043
Nebraska	0.0045	0.0035	0.0032	0.0020
New Mexico	0.0019	0.0029	0.0030	0.0035
North Carolina	0.0011	0.0011	0.0022	0.0018
North Dakota	0.0011	0.0009	0.0009	0.0006
Northeast	0.0007	0.0014	0.0025	0.0017
Ohio	0.0022	0.0025	0.0024	0.0015
Oklahoma	0.0286	0.0187	0.0164	0.0090
Pacific	0.0037	0.0031	0.0029	0.0024
South Carolina	0.0008	0.0007	0.0015	0.0013
South Dakota	0.0011	0.0009	0.0008	0.0006
Tennessee	0.0111	0.0095	0.0085	0.0050
Virginia	0.0008	0.0008	0.0013	0.0010
West Virginia	0.0006	0.0006	0.0007	0.0005
Wisconsin	0.0009	0.0007	0.0006	0.0004
Wyoming	0.0031	0.0036	0.0034	0.0025
Atascosa	0.0004	0.0003	0.0003	0.0008

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bandera	0.0000	0.0000	0.0000	0.0000
Bexar	0.0058	0.0038	0.0034	0.0037
Comal	0.0005	0.0004	0.0003	0.0007
Frio	0.0001	0.0000	0.0000	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0000
Guadalupe	0.0085	0.0068	0.0071	0.0146
Karnes	0.0044	0.0034	0.0044	0.0151
Kendall	0.0000	0.0000	0.0000	0.0000
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0002	0.0001	0.0001	0.0003
Medina	0.0001	0.0001	0.0001	0.0001
Wilson	0.0004	0.0003	0.0003	0.0011
Bastrop	0.0131	0.0136	0.0121	0.0090
Blanco	0.0001	0.0001	0.0001	0.0001
Burnet	0.0000	0.0008	0.0008	0.0004
Caldwell	0.0084	0.0053	0.0057	0.0101
Fayette	0.0041	0.0059	0.0053	0.0050
Hays	0.0286	0.0189	0.0201	0.0308
Lee	0.0016	0.0022	0.0022	0.0015
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.1636	0.1508	0.1413	0.1042
Williamson	0.0038	0.0176	0.0178	0.0117
Bell	0.0003	0.0122	0.0106	0.0083
Coryell	0.0000	0.0000	0.0000	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0001	0.0001	0.0001	0.0000
Milam	0.0027	0.0064	0.0084	0.0061
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0045	0.0055	0.0047	0.0025
Brazos Valley COG	0.0058	0.0082	0.0077	0.0048
Coastal Bend COG	0.0022	0.0021	0.0022	0.0112
Deep East Texas COG	0.0059	0.0083	0.0087	0.0049
East Texas COG	0.0077	0.0218	0.0191	0.0095
Golden Crescent RPC	0.0100	0.0097	0.0118	0.0310
Heart of Texas COG	0.0110	0.0312	0.0269	0.0165
Houston-Galveston Area Council	0.0477	0.0306	0.0300	0.0219
Lower Rio Grande Valley DC	0.0004	0.0003	0.0003	0.0010
North Central Texas COG	0.0107	0.0117	0.0102	0.0055
South East Texas RPC	0.0170	0.0098	0.0090	0.0059
South Texas DC	0.0005	0.0004	0.0004	0.0009
Texoma COG	0.0012	0.0007	0.0006	0.0003
Remainder of Texas	0.0060	0.0057	0.0054	0.0057

Table B-12. CAMS 614 RCFs for June 2012 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0000	0.0002	0.0002	0.0005
BC	0.3041	0.3372	0.3372	0.4293
Biogenic Total	0.0707	0.0640	0.0640	0.0482
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0198	0.0219	0.0219	0.0423
Caribbean	0.0001	0.0001	0.0001	0.0005
Canada	0.0032	0.0037	0.0037	0.0027
Mexico	0.0022	0.0044	0.0044	0.0085
Alabama	0.0279	0.0178	0.0178	0.0096
Arkansas	0.0157	0.0204	0.0204	0.0094
Colorado	0.0046	0.0053	0.0053	0.0043
DE/DC/MD	0.0001	0.0004	0.0004	0.0003
Florida	0.0027	0.0057	0.0057	0.0087
Georgia	0.0110	0.0095	0.0095	0.0065
Illinois	0.0071	0.0049	0.0049	0.0026
Indiana	0.0059	0.0036	0.0036	0.0025
Iowa	0.0015	0.0017	0.0017	0.0010
Kansas	0.0063	0.0089	0.0089	0.0046
Kentucky	0.0101	0.0065	0.0065	0.0040
Louisiana	0.0649	0.0529	0.0529	0.0310
Michigan	0.0010	0.0008	0.0008	0.0008
Minnesota	0.0009	0.0009	0.0009	0.0005
Mississippi	0.0242	0.0178	0.0178	0.0094
Missouri	0.0073	0.0063	0.0063	0.0031
Montana	0.0010	0.0013	0.0013	0.0008
Mountain	0.0054	0.0056	0.0056	0.0042
Nebraska	0.0021	0.0035	0.0035	0.0019
New Mexico	0.0022	0.0029	0.0029	0.0036
North Carolina	0.0015	0.0029	0.0029	0.0019
North Dakota	0.0009	0.0009	0.0009	0.0006
Northeast	0.0008	0.0024	0.0024	0.0017
Ohio	0.0024	0.0016	0.0016	0.0014
Oklahoma	0.0086	0.0186	0.0186	0.0087
Pacific	0.0030	0.0031	0.0031	0.0023
South Carolina	0.0011	0.0020	0.0020	0.0014
South Dakota	0.0007	0.0009	0.0009	0.0005
Tennessee	0.0134	0.0090	0.0090	0.0053
Virginia	0.0011	0.0017	0.0017	0.0011
West Virginia	0.0007	0.0007	0.0007	0.0005
Wisconsin	0.0009	0.0006	0.0006	0.0004
Wyoming	0.0036	0.0037	0.0037	0.0024
Atascosa	0.0006	0.0007	0.0007	0.0019
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0138	0.0091	0.0091	0.0113
Comal	0.0025	0.0024	0.0024	0.0048
Frio	0.0000	0.0001	0.0001	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0000
Guadalupe	0.0279	0.0247	0.0247	0.0457
Karnes	0.0108	0.0086	0.0086	0.0215
Kendall	0.0000	0.0000	0.0000	0.0000
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0001	0.0002	0.0002	0.0005
Medina	0.0000	0.0001	0.0001	0.0001
Wilson	0.0011	0.0010	0.0010	0.0029
Bastrop	0.0065	0.0093	0.0093	0.0065
Blanco	0.0001	0.0003	0.0003	0.0001
Burnet	0.0017	0.0010	0.0010	0.0006
Caldwell	0.0156	0.0123	0.0123	0.0104
Fayette	0.0043	0.0053	0.0053	0.0041
Hays	0.0711	0.0596	0.0596	0.0456
Lee	0.0015	0.0023	0.0023	0.0016
Llano	0.0001	0.0000	0.0000	0.0000
Travis	0.0464	0.0591	0.0591	0.0364
Williamson	0.0067	0.0052	0.0052	0.0045
Bell	0.0015	0.0012	0.0012	0.0046
Coryell	0.0001	0.0001	0.0001	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0001	0.0001	0.0001
Milam	0.0046	0.0057	0.0057	0.0038
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0025	0.0047	0.0047	0.0023
Brazos Valley COG	0.0062	0.0078	0.0078	0.0049
Coastal Bend COG	0.0030	0.0028	0.0028	0.0160
Deep East Texas COG	0.0074	0.0071	0.0071	0.0045
East Texas COG	0.0087	0.0131	0.0131	0.0088
Golden Crescent RPC	0.0164	0.0160	0.0160	0.0294
Heart of Texas COG	0.0147	0.0196	0.0196	0.0170
Houston-Galveston Area Council	0.0504	0.0351	0.0351	0.0214
Lower Rio Grande Valley DC	0.0001	0.0003	0.0003	0.0009
North Central Texas COG	0.0086	0.0106	0.0106	0.0056
South East Texas RPC	0.0190	0.0109	0.0109	0.0062
South Texas DC	0.0001	0.0004	0.0004	0.0009
Texoma COG	0.0004	0.0007	0.0007	0.0003
Remainder of Texas	0.0043	0.0063	0.0063	0.0057

Table B-13. CAMS 690 RCFs for June 2012 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0003	0.0002	0.0002	0.0005
BC	0.2817	0.3177	0.3023	0.4165
Biogenic Total	0.0544	0.0635	0.0626	0.0460
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0160	0.0178	0.0186	0.0413
Caribbean	0.0001	0.0001	0.0001	0.0005
Canada	0.0072	0.0053	0.0061	0.0031
Mexico	0.0053	0.0041	0.0046	0.0082
Alabama	0.0202	0.0190	0.0167	0.0097
Arkansas	0.0165	0.0191	0.0208	0.0091
Colorado	0.0023	0.0046	0.0042	0.0045
DE/DC/MD	0.0001	0.0004	0.0005	0.0003
Florida	0.0013	0.0037	0.0029	0.0090
Georgia	0.0062	0.0082	0.0073	0.0060
Illinois	0.0080	0.0056	0.0067	0.0027
Indiana	0.0094	0.0055	0.0066	0.0029
Iowa	0.0025	0.0018	0.0022	0.0010
Kansas	0.0119	0.0097	0.0113	0.0050
Kentucky	0.0135	0.0083	0.0098	0.0043
Louisiana	0.0692	0.0578	0.0542	0.0338
Michigan	0.0034	0.0020	0.0024	0.0011
Minnesota	0.0017	0.0011	0.0014	0.0006
Mississippi	0.0221	0.0214	0.0193	0.0103
Missouri	0.0076	0.0064	0.0077	0.0030
Montana	0.0020	0.0015	0.0016	0.0009
Mountain	0.0041	0.0051	0.0050	0.0043
Nebraska	0.0047	0.0036	0.0041	0.0020
New Mexico	0.0018	0.0026	0.0027	0.0034
North Carolina	0.0009	0.0025	0.0025	0.0019
North Dakota	0.0014	0.0010	0.0012	0.0006
Northeast	0.0024	0.0031	0.0035	0.0018
Ohio	0.0050	0.0030	0.0036	0.0017
Oklahoma	0.0296	0.0196	0.0232	0.0114
Pacific	0.0039	0.0032	0.0035	0.0025
South Carolina	0.0007	0.0016	0.0017	0.0013
South Dakota	0.0012	0.0009	0.0011	0.0006
Tennessee	0.0153	0.0101	0.0118	0.0054
Virginia	0.0007	0.0015	0.0015	0.0011
West Virginia	0.0008	0.0008	0.0008	0.0005
Wisconsin	0.0012	0.0008	0.0010	0.0004
Wyoming	0.0028	0.0035	0.0035	0.0026
Atascosa	0.0003	0.0002	0.0002	0.0006
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0014	0.0019	0.0011	0.0024
Comal	0.0002	0.0002	0.0002	0.0004
Frio	0.0001	0.0000	0.0001	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0000
Guadalupe	0.0046	0.0035	0.0034	0.0070
Karnes	0.0018	0.0020	0.0023	0.0099
Kendall	0.0000	0.0000	0.0000	0.0000
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0002	0.0001	0.0001	0.0003
Medina	0.0001	0.0001	0.0001	0.0001
Wilson	0.0002	0.0002	0.0002	0.0006
Bastrop	0.0186	0.0148	0.0144	0.0123
Blanco	0.0000	0.0000	0.0000	0.0001
Burnet	0.0001	0.0005	0.0005	0.0002
Caldwell	0.0034	0.0027	0.0032	0.0068
Fayette	0.0064	0.0094	0.0057	0.0067
Hays	0.0063	0.0049	0.0052	0.0139
Lee	0.0021	0.0042	0.0019	0.0020
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.0999	0.0807	0.0835	0.0925
Williamson	0.0206	0.0351	0.0295	0.0240
Bell	0.0196	0.0195	0.0232	0.0106
Coryell	0.0000	0.0000	0.0000	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0001	0.0001	0.0001	0.0001
Milam	0.0041	0.0082	0.0062	0.0060
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0057	0.0063	0.0075	0.0028
Brazos Valley COG	0.0083	0.0090	0.0094	0.0051
Coastal Bend COG	0.0020	0.0014	0.0016	0.0092
Deep East Texas COG	0.0108	0.0094	0.0091	0.0056
East Texas COG	0.0213	0.0217	0.0259	0.0102
Golden Crescent RPC	0.0112	0.0107	0.0119	0.0304
Heart of Texas COG	0.0388	0.0373	0.0456	0.0264
Houston-Galveston Area Council	0.0372	0.0354	0.0310	0.0233
Lower Rio Grande Valley DC	0.0004	0.0002	0.0003	0.0010
North Central Texas COG	0.0120	0.0143	0.0173	0.0129
South East Texas RPC	0.0142	0.0112	0.0105	0.0063
South Texas DC	0.0005	0.0003	0.0004	0.0009
Texoma COG	0.0012	0.0007	0.0009	0.0006
Remainder of Texas	0.0063	0.0059	0.0067	0.0062

Table B-14. CAMS 1603 RCFs for June 2012 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0000	0.0002	0.0002	0.0006
BC	0.2709	0.3147	0.2966	0.4346
Biogenic Total	0.0719	0.0597	0.0632	0.0455
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0192	0.0218	0.0176	0.0458
Caribbean	0.0001	0.0001	0.0001	0.0005
Canada	0.0034	0.0047	0.0047	0.0028
Mexico	0.0027	0.0046	0.0049	0.0083
Alabama	0.0178	0.0181	0.0190	0.0098
Arkansas	0.0281	0.0190	0.0209	0.0098
Colorado	0.0055	0.0047	0.0047	0.0048
DE/DC/MD	0.0001	0.0004	0.0001	0.0003
Florida	0.0021	0.0048	0.0040	0.0091
Georgia	0.0056	0.0087	0.0074	0.0063
Illinois	0.0064	0.0056	0.0060	0.0027
Indiana	0.0035	0.0051	0.0055	0.0025
Iowa	0.0016	0.0018	0.0019	0.0010
Kansas	0.0096	0.0091	0.0099	0.0049
Kentucky	0.0068	0.0082	0.0087	0.0040
Louisiana	0.0665	0.0556	0.0591	0.0328
Michigan	0.0008	0.0017	0.0017	0.0008
Minnesota	0.0009	0.0011	0.0011	0.0005
Mississippi	0.0210	0.0181	0.0191	0.0099
Missouri	0.0101	0.0067	0.0073	0.0034
Montana	0.0010	0.0013	0.0014	0.0009
Mountain	0.0059	0.0052	0.0053	0.0044
Nebraska	0.0027	0.0034	0.0037	0.0020
New Mexico	0.0030	0.0029	0.0027	0.0038
North Carolina	0.0009	0.0026	0.0012	0.0019
North Dakota	0.0008	0.0010	0.0010	0.0006
Northeast	0.0008	0.0028	0.0014	0.0017
Ohio	0.0013	0.0026	0.0026	0.0014
Oklahoma	0.0125	0.0186	0.0204	0.0091
Pacific	0.0030	0.0030	0.0031	0.0024
South Carolina	0.0005	0.0018	0.0008	0.0013
South Dakota	0.0008	0.0009	0.0009	0.0006
Tennessee	0.0093	0.0105	0.0112	0.0053
Virginia	0.0007	0.0015	0.0008	0.0010
West Virginia	0.0004	0.0007	0.0006	0.0005
Wisconsin	0.0006	0.0008	0.0008	0.0004
Wyoming	0.0041	0.0035	0.0037	0.0026
Atascosa	0.0002	0.0004	0.0004	0.0007
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0046	0.0032	0.0035	0.0029
Comal	0.0002	0.0003	0.0004	0.0005
Frio	0.0000	0.0001	0.0001	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0000
Guadalupe	0.0068	0.0084	0.0074	0.0153
Karnes	0.0017	0.0067	0.0049	0.0188
Kendall	0.0000	0.0000	0.0000	0.0000
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0001	0.0002	0.0002	0.0003
Medina	0.0000	0.0001	0.0001	0.0001
Wilson	0.0002	0.0005	0.0004	0.0013
Bastrop	0.0174	0.0139	0.0152	0.0112
Blanco	0.0001	0.0001	0.0001	0.0001
Burnet	0.0007	0.0005	0.0005	0.0002
Caldwell	0.0149	0.0141	0.0130	0.0162
Fayette	0.0057	0.0045	0.0048	0.0055
Hays	0.0482	0.0383	0.0374	0.0410
Lee	0.0031	0.0032	0.0035	0.0023
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.1151	0.0903	0.0987	0.0605
Williamson	0.0084	0.0108	0.0118	0.0059
Bell	0.0019	0.0055	0.0060	0.0028
Coryell	0.0000	0.0000	0.0000	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0001	0.0001	0.0000
Milam	0.0091	0.0085	0.0093	0.0047
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0067	0.0052	0.0057	0.0024
Brazos Valley COG	0.0100	0.0097	0.0106	0.0057
Coastal Bend COG	0.0012	0.0021	0.0019	0.0131
Deep East Texas COG	0.0081	0.0085	0.0093	0.0045
East Texas COG	0.0219	0.0202	0.0222	0.0089
Golden Crescent RPC	0.0135	0.0193	0.0149	0.0419
Heart of Texas COG	0.0235	0.0275	0.0302	0.0119
Houston-Galveston Area Council	0.0408	0.0303	0.0299	0.0217
Lower Rio Grande Valley DC	0.0001	0.0003	0.0003	0.0010
North Central Texas COG	0.0079	0.0107	0.0116	0.0049
South East Texas RPC	0.0179	0.0113	0.0118	0.0059
South Texas DC	0.0001	0.0004	0.0005	0.0009
Texoma COG	0.0004	0.0006	0.0007	0.0003
Remainder of Texas	0.0064	0.0064	0.0068	0.0060

Table B-15. CAMS 1675 RCFs for June 2012 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0000	0.0000	0.0000	0.0006
BC	0.2665	0.3061	0.2665	0.4518
Biogenic Total	0.0656	0.0627	0.0656	0.0460
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0237	0.0275	0.0237	0.0488
Caribbean	0.0001	0.0001	0.0001	0.0006
Canada	0.0047	0.0041	0.0047	0.0027
Mexico	0.0028	0.0029	0.0028	0.0086
Alabama	0.0159	0.0219	0.0159	0.0111
Arkansas	0.0223	0.0213	0.0223	0.0097
Colorado	0.0047	0.0051	0.0047	0.0049
DE/DC/MD	0.0002	0.0004	0.0002	0.0004
Florida	0.0029	0.0041	0.0029	0.0099
Georgia	0.0048	0.0111	0.0048	0.0074
Illinois	0.0065	0.0063	0.0065	0.0029
Indiana	0.0053	0.0052	0.0053	0.0025
Iowa	0.0015	0.0019	0.0015	0.0011
Kansas	0.0062	0.0074	0.0062	0.0045
Kentucky	0.0089	0.0087	0.0089	0.0042
Louisiana	0.0853	0.0692	0.0853	0.0358
Michigan	0.0020	0.0014	0.0020	0.0007
Minnesota	0.0010	0.0010	0.0010	0.0005
Mississippi	0.0254	0.0212	0.0254	0.0104
Missouri	0.0075	0.0078	0.0075	0.0035
Montana	0.0010	0.0010	0.0010	0.0008
Mountain	0.0046	0.0049	0.0046	0.0044
Nebraska	0.0021	0.0024	0.0021	0.0019
New Mexico	0.0024	0.0031	0.0024	0.0043
North Carolina	0.0009	0.0029	0.0009	0.0022
North Dakota	0.0010	0.0009	0.0010	0.0006
Northeast	0.0017	0.0027	0.0017	0.0018
Ohio	0.0026	0.0025	0.0026	0.0014
Oklahoma	0.0087	0.0090	0.0087	0.0080
Pacific	0.0026	0.0026	0.0026	0.0023
South Carolina	0.0005	0.0020	0.0005	0.0016
South Dakota	0.0007	0.0009	0.0007	0.0006
Tennessee	0.0110	0.0117	0.0110	0.0057
Virginia	0.0007	0.0017	0.0007	0.0012
West Virginia	0.0005	0.0008	0.0005	0.0005
Wisconsin	0.0008	0.0008	0.0008	0.0004
Wyoming	0.0032	0.0032	0.0032	0.0026
Atascosa	0.0006	0.0005	0.0006	0.0006
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0046	0.0059	0.0046	0.0032
Comal	0.0006	0.0010	0.0006	0.0005
Frio	0.0001	0.0001	0.0001	0.0001
Gillespie	0.0001	0.0000	0.0001	0.0000
Guadalupe	0.0251	0.0253	0.0251	0.0270
Karnes	0.0053	0.0145	0.0053	0.0287
Kendall	0.0001	0.0001	0.0001	0.0000
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0002	0.0002	0.0002	0.0003
Medina	0.0001	0.0001	0.0001	0.0001
Wilson	0.0005	0.0010	0.0005	0.0020
Bastrop	0.0112	0.0087	0.0112	0.0061
Blanco	0.0001	0.0001	0.0001	0.0001
Burnet	0.0002	0.0001	0.0002	0.0001
Caldwell	0.0206	0.0208	0.0206	0.0150
Fayette	0.0080	0.0074	0.0080	0.0082
Hays	0.0371	0.0380	0.0371	0.0183
Lee	0.0038	0.0026	0.0038	0.0021
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.0518	0.0434	0.0518	0.0185
Williamson	0.0064	0.0047	0.0064	0.0020
Bell	0.0028	0.0018	0.0028	0.0009
Coryell	0.0001	0.0000	0.0001	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0000	0.0000	0.0000
Milam	0.0056	0.0037	0.0056	0.0024
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0029	0.0038	0.0029	0.0020
Brazos Valley COG	0.0131	0.0105	0.0131	0.0064
Coastal Bend COG	0.0023	0.0039	0.0023	0.0180
Deep East Texas COG	0.0117	0.0078	0.0117	0.0043
East Texas COG	0.0176	0.0162	0.0176	0.0074
Golden Crescent RPC	0.0521	0.0452	0.0521	0.0607
Heart of Texas COG	0.0248	0.0167	0.0248	0.0091
Houston-Galveston Area Council	0.0532	0.0408	0.0532	0.0280
Lower Rio Grande Valley DC	0.0002	0.0002	0.0002	0.0009
North Central Texas COG	0.0073	0.0049	0.0073	0.0040
South East Texas RPC	0.0155	0.0132	0.0155	0.0065
South Texas DC	0.0003	0.0003	0.0003	0.0010
Texoma COG	0.0003	0.0002	0.0003	0.0002
Remainder of Texas	0.0047	0.0052	0.0047	0.0062

Table B-16. CAMS 6602 RCFs for June 2012 Episode

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
IC	0.0001	0.0002	0.0000	0.0005
BC	0.2255	0.3268	0.2597	0.4255
Biogenic Total	0.0730	0.0613	0.0709	0.0474
Fire Total	0.0001	0.0001	0.0001	0.0000
Offshore	0.0163	0.0201	0.0160	0.0451
Caribbean	0.0000	0.0001	0.0001	0.0005
Canada	0.0069	0.0059	0.0064	0.0034
Mexico	0.0027	0.0041	0.0025	0.0079
Alabama	0.0155	0.0167	0.0211	0.0104
Arkansas	0.0377	0.0246	0.0330	0.0109
Colorado	0.0047	0.0050	0.0043	0.0048
DE/DC/MD	0.0001	0.0004	0.0001	0.0004
Florida	0.0010	0.0048	0.0014	0.0098
Georgia	0.0035	0.0075	0.0069	0.0069
Illinois	0.0093	0.0068	0.0103	0.0032
Indiana	0.0075	0.0060	0.0091	0.0030
Iowa	0.0023	0.0023	0.0024	0.0012
Kansas	0.0096	0.0101	0.0089	0.0054
Kentucky	0.0114	0.0093	0.0140	0.0047
Louisiana	0.0790	0.0646	0.0720	0.0379
Michigan	0.0030	0.0020	0.0028	0.0011
Minnesota	0.0014	0.0013	0.0014	0.0007
Mississippi	0.0245	0.0204	0.0252	0.0107
Missouri	0.0119	0.0076	0.0112	0.0036
Montana	0.0012	0.0016	0.0012	0.0010
Mountain	0.0048	0.0052	0.0048	0.0044
Nebraska	0.0029	0.0041	0.0028	0.0023
New Mexico	0.0024	0.0027	0.0022	0.0035
North Carolina	0.0005	0.0025	0.0010	0.0025
North Dakota	0.0012	0.0012	0.0013	0.0007
Northeast	0.0024	0.0031	0.0021	0.0024
Ohio	0.0040	0.0031	0.0044	0.0018
Oklahoma	0.0122	0.0207	0.0111	0.0130
Pacific	0.0029	0.0033	0.0030	0.0025
South Carolina	0.0003	0.0016	0.0007	0.0017
South Dakota	0.0010	0.0011	0.0010	0.0006
Tennessee	0.0147	0.0120	0.0179	0.0061
Virginia	0.0005	0.0015	0.0008	0.0014
West Virginia	0.0006	0.0008	0.0008	0.0006
Wisconsin	0.0011	0.0009	0.0012	0.0005
Wyoming	0.0041	0.0039	0.0039	0.0028
Atascosa	0.0001	0.0002	0.0001	0.0005
Bandera	0.0000	0.0000	0.0000	0.0000

Source	Top 5 Days	Top 10 Days	Days ≥60 ppb	All Days
Bexar	0.0005	0.0005	0.0004	0.0016
Comal	0.0000	0.0001	0.0000	0.0002
Frio	0.0000	0.0000	0.0000	0.0001
Gillespie	0.0000	0.0000	0.0000	0.0000
Guadalupe	0.0006	0.0008	0.0011	0.0028
Karnes	0.0005	0.0009	0.0009	0.0064
Kendall	0.0000	0.0000	0.0000	0.0000
Kerr	0.0000	0.0000	0.0000	0.0000
McMullen	0.0001	0.0001	0.0001	0.0002
Medina	0.0000	0.0001	0.0000	0.0001
Wilson	0.0000	0.0001	0.0001	0.0003
Bastrop	0.0195	0.0229	0.0198	0.0211
Blanco	0.0000	0.0000	0.0000	0.0001
Burnet	0.0004	0.0002	0.0003	0.0001
Caldwell	0.0005	0.0015	0.0017	0.0048
Fayette	0.0093	0.0149	0.0080	0.0140
Hays	0.0010	0.0013	0.0018	0.0030
Lee	0.0037	0.0057	0.0031	0.0038
Llano	0.0000	0.0000	0.0000	0.0000
Travis	0.0383	0.0309	0.0377	0.0369
Williamson	0.0169	0.0111	0.0143	0.0068
Bell	0.0173	0.0096	0.0146	0.0070
Coryell	0.0000	0.0000	0.0000	0.0000
Hamilton	0.0000	0.0000	0.0000	0.0000
Lampasas	0.0000	0.0000	0.0000	0.0001
Milam	0.0200	0.0201	0.0169	0.0124
Mills	0.0000	0.0000	0.0000	0.0000
San Saba	0.0000	0.0000	0.0000	0.0000
Ark-Tex Area COG	0.0099	0.0069	0.0085	0.0031
Brazos Valley COG	0.0251	0.0176	0.0212	0.0092
Coastal Bend COG	0.0010	0.0012	0.0011	0.0092
Deep East Texas COG	0.0132	0.0096	0.0116	0.0056
East Texas COG	0.0473	0.0282	0.0402	0.0121
Golden Crescent RPC	0.0039	0.0125	0.0110	0.0411
Heart of Texas COG	0.1035	0.0674	0.0873	0.0359
Houston-Galveston Area Council	0.0359	0.0315	0.0333	0.0407
Lower Rio Grande Valley DC	0.0001	0.0003	0.0001	0.0009
North Central Texas COG	0.0066	0.0089	0.0058	0.0121
South East Texas RPC	0.0142	0.0105	0.0128	0.0072
South Texas DC	0.0002	0.0004	0.0002	0.0009
Texoma COG	0.0004	0.0007	0.0003	0.0007
Remainder of Texas	0.0059	0.0060	0.0055	0.0063

Appendix C: Alternative 2017 Design Value Projections

2017 Design Value Projections Using EPA Recommendations for Modeled Attainment Test

For conducting the modeled attainment test, EPA's guidance recommends using the highest MDA8 levels in a 3 x 3 grid cell array around monitoring stations as the basis for calculating the baseline used to project a design value. EPA then recommends using the 10 top MDA8 values ≥ 60 ppb and averaging those values in order to establish the modeling baseline. Once a future year modeling run is completed, you then calculate the average MDA8 values in the same grid cells on the same set of days that were used in the baseline. Dividing the future year average by the baseline average produces a relative response factor (RRF). This is then applied to "baseline design value" that uses a monitoring station's official design value for the baseline year and the next two subsequent years, each of which would include the analysis year's monitoring data. This produces a center-weighted design value based on monitoring data that is then projected to a future year using the RRF.

EPA's guidance indicates that alternative methods of calculating future design values may also be valid. For example, it is possible to use the MDA8 at the grid cell where the monitor is located rather than the grid cell with the highest MDA8 levels in the baseline year. For this analysis, since the RCF is based on the top five modeled MDA8 values at each monitoring station, there is also a value to calculating an alternative projection using just the top five MDA8 values in the baseline year. Also, if a particular location did not have monitoring data for all of the five years used in the baseline design value calculation, EPA recommends calculation of a baseline design value only if there are three consecutive years' worth of monitoring data such that at least one of the design values used in the baseline design value calculation could be used.

The following tables summarize the baseline design values, RRFs, and projected design values for each monitoring station using EPA's recommended approach for both the June 2006 and June 2012 modeling platforms.

Table C-1. Design Value Projection Using EPA's Modeled Attainment Test and June 2006 Modeling Platform

Metric	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
2006 Baseline DV (Monitored)	79.7	77.3	69.7	n/a	n/a	68.7	n/a
2006 Avg. MDA8 top 10 days ≥ 60 ppb	90.7	86.3	83.6	84.1	90.6	77.3	80.1
2017 Avg. MDA8 top 10 days ≥ 60 ppb in 2006	70.3	67.3	65.4	66.8	70.4	62.7	64.1
2017/2006 RRF	0.7751	0.7798	0.7823	0.7943	0.7770	0.8111	0.8002
2017 Projected DV (pre-truncated)	61.8	60.3	54.5	n/a	n/a	55.7	n/a
2017 Projected DV (truncated)	61	60	54	n/a	n/a	55	n/a

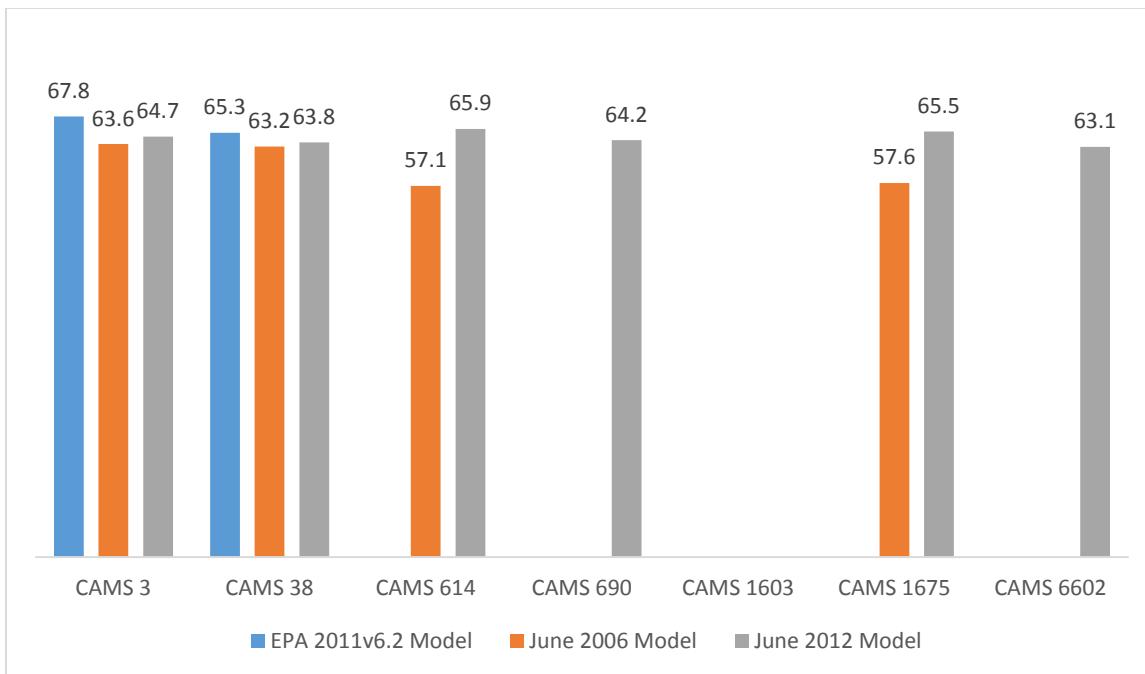
Table C-2. Design Value Projection Using EPA's Modeled Attainment Test and June 2012 Modeling Platform

Metric	CAMS 3	CAMS 38	CAMS 614	CAMS 690	CAMS 1603	CAMS 1675	CAMS 6602
2012 Baseline DV (Monitored)	71.3	71.7	71.0	71.3	n/a	70.7	71.0
2012 Avg. MDA8 top 10 days ≥ 60 ppb	76.3	76.5	71.3	72.7	74.9	69.2	69.4
2017 Avg. MDA8 top 10 days ≥ 60 ppb in 2012	66.7	66.9	63.5	63.9	65.6	62.1	61.7
2017/2012 RRF	0.8742	0.8745	0.8906	0.8790	0.8758	0.8974	0.8890
2017 Projected DV (pre-truncated)	62.3	62.7	63.2	62.7	n/a	63.4	63.1
2017 Projected DV (truncated)	62	62	63	62	n/a	63	63

Using this method shows that O₃ levels in the vicinity of all seven monitoring stations analyzed would be expected to be attaining the 2015 O₃ NAAQS. This is in agreement with EPA's 2017 modeling, which showed both CAMS 3 and 38 also in attainment of the 2015 Ozone NAAQS, but with design values of 66.6 and 64.4 ppb, respectively.

EPA's modeling also includes a "maximum design value" that is used for analysis of locations that could have issues with maintaining the 2015 Ozone NAAQS based on the maximum design value of the three used in the baseline design value calculation in conjunction with the RRF used for the modeled attainment test. EPA's "maximum design value" was 67.8 ppb for CAMS 3 and 65.3 ppb for CAMS 38. The following figure shows the maximum design value calculation for each monitoring station using this method using each of the modeling platforms.

Figure C-1. Projected Maximum Design Value Using Modeled Attainment Test Projections (ppb)



Alternative 2017 Design Value Projections Using Modeling Data

For this project, there were multiple different methods available for projecting an area's 2017 design value using RRFs. For the 2006 modeling platform, for example, there was both a "normal" 2017 future year run (labeled as "Run 3" or "fy17_06.CAIR" in AACOG's spreadsheets) and an 2017 APCA run ("Run X" or "APCA.17.2006"). Other alternatives used for the design value projection included using the grid cell where the monitor was located, rather than the highest grid cells in the 3x3 array around the grid cell, and using the top 5 days modeled, rather than the top 10 at or above 60 ppb. The table below shows the range of RRF values calculated for each monitoring stations in each episode.

Table C-3. Range of RRF Values for 2006 and 2012 Episodes Using Alternative Calculation Methods

Monitor	Low RRF, 2006 Episode	High RRF, 2006 Episode	Low RRF, 2012 Episode	High RRF, 2012 Episode
CAMS 3	0.7606	0.8277	0.8612	0.8787
CAMS 38	0.7789	0.8251	0.8547	0.8762
CAMS 614	0.7714	0.8359	0.8753	0.8936
CAMS 690	0.7846	0.8440	0.8763	0.8832
CAMS 1603	0.7595	0.8440	0.8704	0.8815
CAMS 1675	0.8090	0.8509	0.8847	0.8975
CAMS 6602	0.8003	0.8429	0.8836	0.8945

Appendix D: Analysis of Potential Impacts Newly Permitted EGUs in Guadalupe County on 2017 Modeled Contributions

One of the findings in this study that stood out as a new insight was the contribution of Guadalupe County to peak MDA8 values at the seven monitoring stations in the Austin-Round Rock MSA. Given its location and estimated emissions in 2017 relative to the other nearby counties in the AACOG region, its consistently high impact across both modeling platforms was notable.

Table D-1. NO_x Emissions and Ozone Impacts of Counties Near Guadalupe County on CAMS 614

County	2017 NO _x Emissions (tpd)	Impact at CAMS 614, 2006 Episode	Impact at CAMS 614, 2012 Episode	O ₃ ppb / tpd NO _x , 2006 Episode	O ₃ ppb / tpd NO _x , 2006 Episode
Bexar	76.59	1.3975	0.9388	0.0176	0.0122
Caldwell	4.89	0.8255	1.0569	0.1688	0.2161
Comal	21.92	0.2741	0.1675	0.0122	0.0075
Hays	13.63	3.3199	4.8361	0.2431	0.3544
Guadalupe	10.60	2.6594	1.8978	0.2498	0.1784
Travis	30.54	6.3798	3.1580	0.2076	0.1033
Wilson	3.86	0.1376	0.0767	0.0354	0.0194

A modeling report completed by AACOG in 2015 included identification of the impact of emissions from individual counties in the San Antonio MSA on ozone levels in the San Antonio area, and showed Guadalupe County's impact was similarly larger than what would have been expected given its 2017 emissions estimates from EPA.¹⁵

According to Appendix B to the TCEQ's July 2016 attainment demonstration SIP revision for the Dallas-Fort Worth 2008 Ozone Nonattainment Area,¹⁶ TCEQ's 2017 projection for Electric Generating Units (EGUs), TCEQ used:

- Averaged NO_x emissions for each hour for each unit in EPA's Air Market Program Data (AMPD) from June 1, 2014 – September 30, 2014, for existing units
- Ratios of NH₃, CO, PM_{2.5}, and VOC to NO_x from existing AMPD facilities' submissions into TCEQ's STARS database
- The Maximum Allowable Emission Rates Table (MAERT) were used for newly permitted EGUs as of May 2015 that were not fully operating in 2014, relying on the 30-day pound per hour limits when available

TCEQ notes in this appendix, "The emission rates calculated represent worst case for some units, but for most, they represent a typical summer day during the ozone season, corresponding to some of the highest days of electricity demand."

¹⁵ <http://aacog.com/DocumentCenter/View/34696>, accessed 3/7/2017.

¹⁶

https://www.tceq.texas.gov/assets/public/implementation/air/sip/dfw/dfw_ad_sip_2015/AD/Adoption/DFW_SIP_Appendix_B_060315.pdf, accessed 3/7/2017.

The two new units with the highest tpd NO_x permitted were units at Guadalupe Generating Station in Guadalupe County at 1.020 tpd each. Based on facility attribute data for this facility downloaded from AMPD, four gas turbines (CTG-1, CTG-2, CTG-3, and CTG-4) have been operating at this facility since 2001. For 2017, there are two new units in the facility attributes table: CTG-7 and CTG-8. These are scheduled to start June 1, 2017, according to the table.

The facility's existing four units each emitted an average of 0.38 – 0.58 tpd in 2016, for a facility-wide total of 1.93 tpd. The extra 2.040 tpd modeled for 2017 would more than double the total NO_x emissions from the facility in 2017 compared to 2016 data.

In addition, TCEQ used 2017 CAIR allocations for the point source emissions inventories that CAPCOG and AACOG used for this project. While CAPCOG could not locate the CAIR allocations for each unit or access the point source file in a spreadsheet application in time for this analysis, CAPCOG did examine the CSAPR OSD allocations for 2017 for the 1997 Ozone NAAQS program. The table below shows these allocations.

Table D-2. Guadalupe County 2016 OSD EGU NO_x Emissions (tpd)

Facility	Unit	2016 OSD NO _x Emissions	2017 CSAPR Allocations	Difference
Guadalupe Generating Center	CTG-1	0.46	0.91	0.45
Guadalupe Generating Center	CTG-2	0.38	1.50	1.12
Guadalupe Generating Center	CTG-3	0.52	1.39	0.87
Guadalupe Generating Center	CTG-4	0.58	0.88	0.30
Rio Nogales	CTG-1	0.44	0.46	0.02
Rio Nogales	CTG-2	0.47	0.93	0.46
Rio Nogales	CTG-3	0.48	0.42	-0.06
TOTAL	n/a	3.33	6.48	3.15

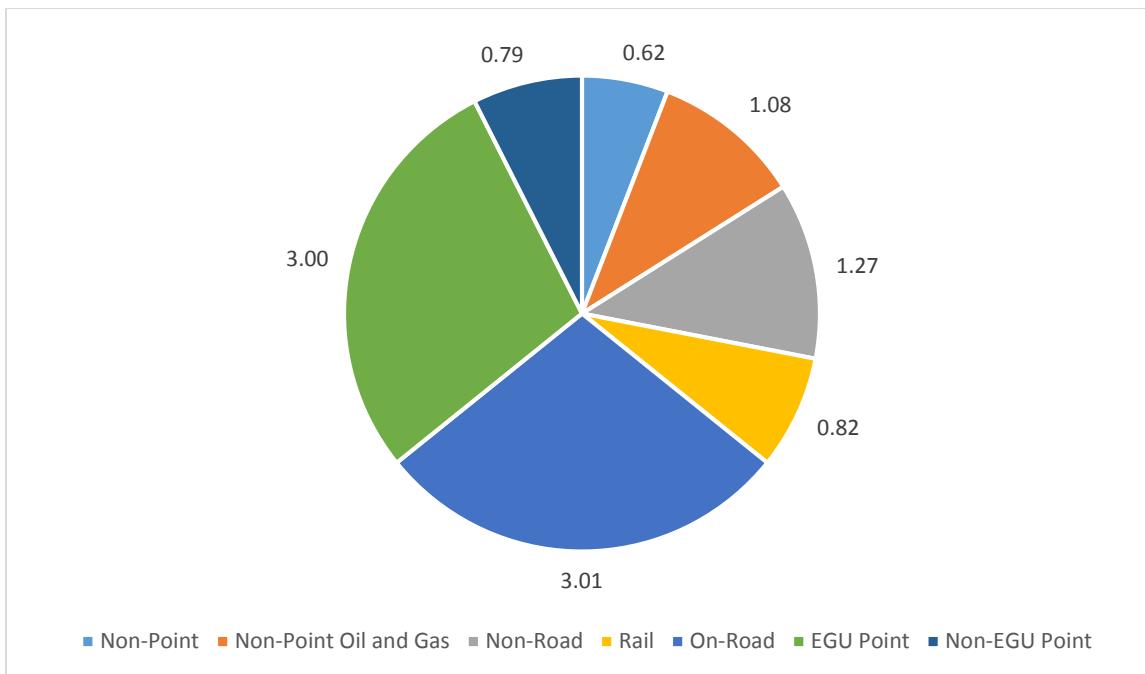
EPA's most recent modeling (2011v6.3) projects the following values for the two Guadalupe County power plants in 2017:

Table D-3. EPA 2011 and 2017 Emissions Modeled for Guadalupe County OSD EGU NO_x Emissions (tpd)

Facility	ORIS Boiler ID	2011 OSD NO _x Emissions	2017 OSD NO _x Emissions Modeled
Guadalupe Generating Center	CTG-1	0.28	0.20
Guadalupe Generating Center	CTG-2	0.27	0.20
Guadalupe Generating Center	CTG-3	0.23	0.19
Guadalupe Generating Center	CTG-4	0.25	0.19
Guadalupe Generating Center	STG1	0.00	0.27
Guadalupe Generating Center	STG2	0.00	0.26
Rio Nogales Power Plant	CTG-1	0.37	0.32
Rio Nogales Power Plant	CTG-2	0.36	0.34
Rio Nogales Power Plant	CTG-3	0.36	0.35
Rio Nogales Power Plant	STG1	0.00	0.67
TOTAL	n/a	2.13	3.00

EPA's 2011v6.3 inventories account for a total of 3.00 tpd of NO_x emissions from these two facilities, including new units. This means that the emissions modeled by TCEQ for Guadalupe County are approximately 5 tpd more than the emissions modeled by EPA for Guadalupe County, counting the unused cap for existing units and the new units. This winds up constituting approximately a 50% increase in the county's total NO_x emissions. The pie chart below shows the emissions by source type in EPA's 2017 estimate. This difference in the 2017 emissions data TCEQ used for Guadalupe County compared to the 2017 emissions data EPA used for Guadalupe County could be a significant factor in explaining the relatively high O₃ ppb to 2017 EPA NO_x emissions estimates for this county relative to the other adjacent counties.

Table D-4. EPA 2017 Ozone Season Day NO_x Estimate for Guadalupe County (tpd)



Appendix E: QA Report

CAPCOG performed two different sets of QA checks for this project: 1) checks of AACOG's deliverables, and 2) internal checks of data transfers and calculations on new sheets created by CAPCOG staff.

CAPCOG checks of AACOG deliverables

CAPCOG performed a series of QA checks on deliverables submitted by AACOG in order to ensure accuracy and completeness of the data that were submitted. The files provided by AACOG included:

- *APCA_June_2006.xlsx*, which included the modeled 2017 hourly contributions of NO_x and VOC for each source type and region modeled for each receptor for each day using the June 2006 modeling platform;
- *APCA_June_2012.xlsx*, which included the modeled 2017 hourly contributions of NO_x and VOC for each source type and region modeled for each receptor for each day using the June 2012 modeling platform;
- *Max_o3.8hr.aacog.04km.summary_CAPCOG.xlsx*, which included 2006, 2012, and 2017 modeled MDA8 O₃ values used in design value projections and detailed descriptions of the model runs used in this analysis; and
- the modeled 2017 hourly contributions of NO_x and VOC for each source type and region modeled for each receptor for each day using the June 2012 modeling platform;

CAPCOG checked to make sure that each deliverable contained all of the data that was expected, and that data was properly labeled and characterized in order to ensure completeness and accuracy.

CAPCOG also checked the data to ensure that the June 2006 and June 2012 data were not duplicated in any places.

Internal checks of CAPCOG-developed spreadsheets for calculating RCFs

In order to calculate RCFs, CAPCOG first used the *APCA_June_2006.xlsx* and *APCA_June_2012.xlsx* spreadsheets to develop separate spreadsheets for each receptor for each modeling platform. These new files were labeled as follows:

- APCA2006_cams0003.xlsx
- APCA2006_cams0038.xlsx
- APCA2006_cams0614.xlsx
- APCA2006_cams0690.xlsx
- APCA2006_cams1603.xlsx
- APCA2006_cams1675.xlsx
- APCA2006_cams6602.xlsx
- APCA2012_cams0003.xlsx
- APCA2012_cams0038.xlsx

- APCA2012_cams0614.xlsx
- APCA2012_cams0690.xlsx
- APCA2012_cams1603.xlsx
- APCA2012_cams1675.xlsx
- APCA2012_cams6602.xlsx

Step 1 in preparing these spreadsheets was to transfer the data for each monitoring station for each day modeled onto a day-specific worksheet labeled “5-31,” “6-01,” etc. CAPCOG filtered each worksheet from the “APCA_June_2006.xlsx” and “APCA_June_2012.xlsx” spreadsheets in order to limit the data to just the receptor that was being transferred.

CAPCOG staff randomly selected three episode days (10% of the 30 days in the June episode) for the June 2006 episode to ensure that data had been properly transferred into CAPCOG’s new spreadsheets: 6/3, 6/12, and 6/30. CAPCOG verified that the data has been correctly transferred over for all three days for all seven monitoring stations for the June 2006 platform.

CAPCOG staff reviewed the 5/31, 6/1, and 6/2 data for the June 2012 episode in order to ensure that data had been properly transferred into CAPCOG’s new spreadsheets. CAPCOG staff verified that the data had been correctly transferred over for all three days for all seven monitoring stations for the June 2012 platform.

For each individual model day that CAPCOG had transferred into the new spreadsheets, CAPCOG added additional rows in order to sequentially separate out the NO_x impacts from the VOC impacts and create a combined impact estimate for each source. CAPCOG staff checked 6/3, 6/12, and 6/30 for the June 2006 platform and 5/31, 6/1, and 6/2 for the June 2012 platform in order to verify that the NO_x, VOC, and combined totals were being correctly identified and referenced.

Using the hourly data from each individual worksheet, CAPCOG then created three aggregated worksheets that combined the data from each day into a single, sequential data table of hourly contributions for all hours and all days of the episode. One worksheet was titled “NO_x sequential,” another was titled “VOC sequential,” and the last was titled “Combined sequential” in order to preserve the NO_x/VOC disaggregation prior to estimating impacts on each MDA8 value. CAPCOG then calculated the average 8-hour concentrations and contributions for each hour of the episode, identified the MDA8 O₃ value and start hour for each episode day, and the corresponding 8-hour contribution of each source to each MDA8 O₃ value. CAPCOG staff checked all of these data for CAMS 3 for both the 2006 and 2012 models by re-calculating 8-hour averages, re-identifying the maximum 8-hour averages, and ensuring that the NO_x and VOC data corresponded to the maximum 8-hour ozone average calculated for the combined spreadsheet. Staff found no issues.

Check of Data Analysis Spreadsheet

CAPCOG staff checked each of the data analysis sheets in the “CAPCOG APCA Data Analysis for Report.xlsx” spreadsheet created by CAPCOG for the following:

- Proper transcription or copy/pasting data from source data (either emissions inventory data, geographic cross-reference data, or the modeling data)
- Proper grouping/categorization of data
- Proper calculations
- Proper transcription and interpretation of data from spreadsheet into this report

The only errors found were interpretation of the county “airsheds” as described in section 3.3 of this report. CAPCOG staff corrected errors in the descriptions before finalizing this report.

Appendix F: Run Log

This appendix provides details of the model runs that were used for this project. A general description of each is shown below:

- Run 1: 2006 Baseline with June 2006 Base Case using CAMx 6.2, 8/31/2015
- Run 2: 2012 Baseline with June 2006 Base Case using CAMx 6.0, 5/28/2015
- Run 3: 2017 Future Year with June 2006 Base Case using CAMx 6.2, 9/3/2015
- Run 4: 2017 Future Year APCA with June 2006 Base Case using CAMx 6.2, 7/2/2016
- Run 5: 2017 Future Year APCA with June 2012 Base Case using CAMx 6.2, 7/12/2016
- Run 6: 2012 Baseline with June 2012 Base Case using CAMx 6.2, 5/13/2016

Since ultimately, CAPCOG found the design value projections using the modeled attainment test projection techniques to project unrealistically low projections, the most important of these for this project were runs 4 and 5. These runs used all of the same model configurations, chemistry parameters, anthropogenic emissions inputs and land use inputs, but had different boundary and initial conditions, meteorology, biogenic emissions, ozone columns, and photolysis rates. The details of each run are shown below. CAPCOG ultimately did not use the results from Run 2 for this project in any capacity.

Source Apportionment Modeling Report, April 11, 2017

Table F-1. Modeling Run Log

Item	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
Run Label	camx620_cb6r2.tx.bl06_06jun.r3d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.control	Camx6.TCEQ.Eagle_Ford	camx620_cb6r2.tx.fy17_06jun.c0jCAIR.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.control	basecase.camx6.2.rpo.2017.APCA	baseline.camx6.2.june2012.APCA	Camx6.2Jun2012.12
Analysis Year	2006	2012	2017	2017	2017	2012
Date	8/31/2015	5/28/2015	9/3/2015	7/2/2016	7/12/2016	5/13/2016
Performing Party	TCEQ	AACOG	TCEQ	AACOG	AACOG	AACOG
Grid	RPO 36-km grid system, 12-km grid, and 4-km grid	RPO 36-km grid system, 12-km grid, and 4-km grid	RPO 36-km grid system, 1 2-km grid, and 4-km grid	RPO 36-km grid system, 12-km grid, and 4-km grid	RPO 36-km grid system, 12-km grid, and 4-km grid	RPO 36-km grid system, 12-km grid, and 4-km grid
Model	Camx6.2	Camx6.0	Camx6.2	Camx6.2	Camx6.2	Camx6.2
EPS3 version	EPS3 version 2	EPS3 version 2	EPS3 version 2	EPS3 version 2	EPS3 version 2	EPS3 version 2
dvection_Solver	PPM	PPM	PPM	PPM	PPM	PPM
Chemistry_Solver	EBI	EBI	EBI	EBI	EBI	EBI
PiG_Submodel	GREASD	GREASD	GREASD	GREASD	GREASD	GREASD
Probing_Tool	None	None	None	APCA	APCA	None
Drydep_Model	ZHANG03	ZHANG03	ZHANG03	ZHANG03	ZHANG03	ZHANG03
Wet_Deposition	true	true	true	true	true	true
ACM2_Diffusion	false	false	false	false	false	true
Meteorology Release Date	6/22/2015	2/4/2015	9/3/2015	5/3/2016	5/3/2016	5/3/2016
TCEQ Emission Inventory Release Date	6/22/2015	2/4/2015	9/3/2015	5/3/2016	5/3/2016	5/3/2016
Chemistry Parameters	CAMx6.2.chemparam.2_NO NE	CAMx6.0.chemparam.7	CAMx6.2.chemparam.2_NO NE'	CAMx6.2.chemparam.2_NO NE	CAMx6.2.chemparam.2_NO NE	CAMx6.2.chemparam.2_NO NE
Photolysis Rates	camx620_cb6_tuv.rpo_36km .2015AUG31.tuv48	camx6_cb6_tuv.rpo_36km.2 013MAY08.tuv48	camx6_cb6_tuv.rpo_36km .2015AUG31.tuv48	camx6_cb6_tuv.rpo_36km.2 013MAY08.tuv48	camx6_cb6_tuv.rpo_36km.2 013MAY24.tuv48	camx6_cb6_tuv.rpo_36km.2 013MAY24.tuv48
Boundary Conditions	camx_cb6_bc.geoschem.rpo _36km	camx_cb05_bc.geoschem.rp o_36km	camx_cb6_bc.geoschem201 3.rpo_36km.2018	camx_cb6_bc.geoschem201 3.rpo_36km.2018	camx_cb6_bc.geoschem201 3a0.rpo_36km.2012	camx_cb6_bc.geoschem201 3.rpo_36km.2018
Ozone Column	camx_o3c.rpo_36km.2013 MAY08	camx_o3c.rpo_36km.2013 MAY08	camx_o3c.rpo_36km.2013 MAY08	camx_o3c.rpo_36km.2013 MAY08	camx_o3c.rpo_36km.2013 MAY24	camx_o3c.rpo_36km.2013 MAY08
Emiss Grid(1)	camx_cb6_ei_lo.tx.bl06_06j un.r3d.rpo_36km	lo_emiss.bio.tx_36km.cb6.bl 06jun.reg1.tx_36km	camx_cb6_ei_lo.tx.fy17_06j un.c0j.rpo_36km	bio.tx_36km.cb6.TCEQ.fy17.r eg1.tx_36km	bio.tx_36km.cb6.20xxxxxx.ju ne12.TCEQ.fy17.reg1.tx_36k m	camx_cb6p_ei_lo.tx.bl12_12 jun.reg3.rpo_36km

Source Apportionment Modeling Report, April 11, 2017

Item	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
Emiss Grid(2)	camx_cb6_ei_lo.tx.bl06_06j un.r3d.tx_12km	lo_emiss.bio.tx_12km.cb6.bl. 06jun.reg1.tx_12km	camx_cb6_ei_lo.tx.fy17_06j un.c0j.tx_12km	bio.tx_12km.cb6.TCEQ.fy17.r eg1.tx_12km	bio.tx_12km.cb6.20xxxxxx.ju ne12.TCEQ.fy17.reg1.tx_12k m	camx_cb6p_ei_lo.tx.bl12_12ju n.reg3.tx_12km
Emiss Grid(3)	camx_cb6_ei_lo.tx.bl06_06j un.r3d.tx_4km	lo_emiss.bio.tx_4km.cb6.TCE Q.2012.EPS3_v2.reg1.tx_4k m	camx_cb6_ei_lo1.tx.fy17_06 jun.c0j.tx_4km	bio.tx_4km.cb6.20xxxxxx.TC EQ.fy17.reg1.tx_4km	bio.tx_4km.cb6.20xxxxxx.jun e12.TCEQ.fy17.reg1.tx_4km	camx_cb6p_ei_lo.tx.bl12_12ju n.reg3.tx_4km
Point Sources	camx_cb6_ei_el.jjas.tx.bl06.r eg2i	ptsrce.PIG.cb6.TCEQ.osd_20 12	camx_cb6_ei_el.jjas.tx.fy17. c0jCAIR	camx_cb6_ei_el.jjas.tx.fy17. c0jCAIR	camx_cb6_ei_el.jjas.tx.fy17. c0jCAIR	camx_cb6p_ei_el.tx.bc12_12j un.reg3
Local Emissions	No Updated Local Emission Updates					
Landuse Grid(1)	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606qc10 8ufun	camx_landuse.rpo_36km.tce q2zhang26a.lai2006jun	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606qc10 8ufun	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606qc10 8ufun	camx6_landuse.rpo_36km.tc eq2zhang26a.lai201206qc10 8ufun	camx6_landuse.rpo_36km.tce q2zhang26a.lai201206qc108ufu n
Landuse Grid(2)	camx6_landuse.tx_12km.tce q2zhang26a.lai200606qc108 ufun	camx_landuse.tx_12km.tceq 2zhang26a.lai2006jun	camx6_landuse.tx_12km.tce q2zhang26a.lai200606qc108 ufun	camx6_landuse.tx_12km.tce q2zhang26a.lai200606qc108 ufun	camx6_landuse.tx_12km.tce q2zhang26a.lai201206qc108 ufun	camx6_landuse.tx_12km.tceq 2zhang26a.lai201206qc108ufu n
Landuse Grid(3)	camx6_landuse.tx_4km.tceq 2zhang26a.lai200606qc108u fun	camx_landuse.tx_4km.tceq2 zhang26a.lai2006jun	camx6_landuse.tx_4km.tceq 2zhang26a.lai200606qc108u fun	camx6_landuse.tx_4km.tceq 2zhang26a.lai200606qc108u fun	camx6_landuse.tx_4km.tceq 2zhang26a.lai201206qc108u fun	camx6_landuse.tx_4km.tceq2z hang26a.lai201206qc108ufun
Surface Grid(1)	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606qc10 8ufun	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606	camx6_landuse.rpo_36km.tce q2zhang26a.lai200606
Met3D Grid(1)	camx6_met3d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met3d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met3d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met3d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met3d.2012_wrf361 _p2a.rpo_36km.v42	camx6_met3d.2012_wrf361_p 2a.rpo_36km.v42
Met2D Grid(1)	camx6_met2d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met2d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met2d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met2d.2006_5layer_ YSU_KF_WSM5.rpo_36km.v 33	camx6_met2d.2012_wrf361 _p2a.rpo_36km.v42	camx6_met2d.2012_wrf361_p 2a.rpo_36km.v42
Vdiff Grid(1)	camx6_kv.2006_5layer_YSU _KF_WSM5.rpo_36km.v33.Y SU.kv100	camx6_kv.2006_5layer_YSU _KF_WSM5.rpo_36km.v33.Y SU.kv100	camx6_kv.2006_5layer_YSU _KF_WSM5.rpo_36km.v33.Y SU.kv100	camx6_kv.2006_5layer_YSU _KF_WSM5.rpo_36km.v33.Y SU.kv100	camx6_kv.2012_wrf361_p2a .rpo_36km.v42.CMAQ.kv100	camx6_kv.2012_wrf361_p2a.r po_36km.v42.CMAQ.kv100
Cloud Grid(1)	camx6_cr.2006_5layer_YSU_ KF_WSM5.rpo_36km.v33	camx6_cr.2006_5layer_YSU_ KF_WSM5.rpo_36km.v33	camx6_cr.2006_5layer_YSU_ KF_WSM5.rpo_36km.v33	camx6_cr.2006_5layer_YSU_ KF_WSM5.rpo_36km.v33	camx6_cr.2012_wrf361_p2a. rpo_36km.v42	camx6_cr.2012_wrf361_p2a.r po_36km.v42
Surface Grid(2)	camx6_landuse.tx_12km.tce q2zhang26a.lai200606	camx6_landuse.tx_12km.tce q2zhang26a.lai200606	camx6_landuse.tx_12km.tce q2zhang26a.lai200606	camx6_landuse.rpo_36km.tc eq2zhang26a.lai200606qc10 8ufun	camx6_landuse.tx_12km.tce q2zhang26a.lai201206qc108 ufun	camx6_landuse.tx_12km.tceq 2zhang26a.lai201206qc108ufu n
Met3D Grid(2)	camx6_met3d.2006_5layer_ YSU_KF_WSM5.tx_12km.v33	camx6_met3d.2006_5layer_ YSU_KF_WSM5.tx_12km.v33	camx6_met3d.2006_5layer_ YSU_KF_WSM5.tx_12km.v33	camx6_met3d.2006_5layer_ YSU_KF_WSM5.tx_12km.v33	camx6_met3d.2012_wrf361 _p2a.tx_12km.v42	camx6_met3d.2012_wrf361_p 2a.tx_12km.v42

Source Apportionment Modeling Report, April 11, 2017

Item	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
Met2D Grid(2)	camx6_met2d.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_met2d.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_met2d.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_met2d.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_met2d.2012_wrf361_p2a.tx_12km.v42	camx6_met2d.2012_wrf361_p2a.tx_12km.v42
Vdiff Grid(2)	camx6_kv.2006_5layer_YSU_KF_WSM5.tx_12km.v33.YSU_kv100	camx6_kv.2006_5layer_YSU_KF_WSM5.tx_12km.v33.YSU_kv100	camx6_kv.2006_5layer_YSU_KF_WSM5.tx_12km.v33.YSU_kv100	camx6_kv.2006_5layer_YSU_KF_WSM5.tx_12km.v33.YSU_kv100	camx6_kv.2012_wrf361_p2a.tx_12km.v42.CMAQ_kv100	camx6_kv.2012_wrf361_p2a.tx_12km.v42.CMAQ_kv100
Cloud Grid(2)	camx6_cr.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_cr.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_cr.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_cr.2006_5layer_YSU_KF_WSM5.tx_12km.v33	camx6_cr.2012_wrf361_p2a.tx_12km.v42	camx6_cr.2012_wrf361_p2a.tx_12km.v42
Surface Grid(3)	camx6_landuse.tx_4km.tceq 2zhang26a.lai200606	camx6_landuse.tx_4km.tceq 2zhang26a.lai200606	camx6_landuse.tx_4km.tceq 2zhang26a.lai200606	camx6_landuse.tx_4km.tceq 2zhang26a.lai200606qc108ufun	camx6_landuse.tx_4km.tceq 2zhang26a.lai20120606qc108ufun	camx6_landuse.tx_4km.tceq2zhang26a.lai20120606qc108ufun
Met3D Grid(3)	camx6_met3d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met3d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met3d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met3d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met3d.2012_wrf361_i2.tx_4km.v42	camx6_met3d.2012_wrf361_i2.tx_4km.v42
Met2D Grid(3)	camx6_met2d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met2d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met2d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met2d.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_met2d.2012_wrf361_i2.tx_4km.v42	camx6_met2d.2012_wrf361_i2.tx_4km.v42
Vdiff Grid(3)	camx6_kv.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33.YSU_kv100	camx6_kv.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33.YSU_kv100	camx6_kv.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33.YSU_kv100	camx6_kv.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33.YSU_kv100	camx6_kv.2012_wrf361_i2.tx_4km.v42.CMAQ_kv100	camx6_kv.2012_wrf361_i2.tx_4km.v42.CMAQ_kv100
Cloud Grid(3)	camx6_cr.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_cr.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_cr.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_cr.2006_5layer_YSU_WSM6_3dsfc1h_fddats_gq_sfc_0.tx_4km.v33	camx6_cr.2012_wrf361_i2.tx_4km.v42	camx6_cr.2012_wrf361_i2.tx_4km.v42