2012 TCEQ Modeling Platform Update

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Southeast Texas Photochemical Modeling Committee Meeting
July 26, 2016
HGB and the 2008 Standard

- Designated “Marginal” with Attainment Date of July 20, 2015

*Only monitors currently operating are shown on the graphic. Data from EPA’s AQS. 2015 data is current as of September 28, 2015.*

2014
Ozone Design Value Trends in HGB

- Eight-Hour Ozone Design Values
- One-Hour Ozone Design Values
- One-Hour Ozone NAAQS: 124 ppb
- 1997 Eight-Hour Ozone NAAQS: 84 ppb
- 2008 Eight-Hour Ozone NAAQS: 75 ppb
- 2015 Eight-Hour Ozone NAAQS: 70 ppb

*Design Values are from EPA’s AQS. 2015 design values as of October 1, 2015 and subject to change.
HGB Moderate SIP Preliminary Timeline

- **EPA**
  - Reviews final 2015 ozone data in mid-2016
  - Proposes failure-to-attain soon thereafter
  - Anticipated to Adopt the bump-up to Moderate classification in December 2016
    - July 2018 Attainment Date
    - 2017 Monitored Design Value

- **Unique timing**
  - 2017 Future Year Modeling for a SIP due to EPA in 2017
Ozone Modeling in SIP Development

One Year Typical Development

- **Base Case**: Day-specific emissions and meteorology; replicate what actually happened.
- **Baseline Case**: Typical emissions and day-specific met; used in RRF to predict future design values.
- **Future Case**: Apply future growth + on-the-books controls to estimate future ozone precursor emissions.
- **Control Strategy Testing**: Determine control strategies that will effectively reduce ozone.
- **SIP**: Document modeling results and procedures.
Modeling Episode and Configuration

- **Episode**
  - Base year: 2012
    - May – September
  - Future year: 2017

- **Domains:** 36, 12, 4km

- **29 Vertical Layers (+1)**
2012 Emission Inventory - Point Sources

- 2006 Environment Canada Annual and Oil and Gas Inventories
- Ozone Season Day: EPA 2011v6_v2 Modeling Platform
- EGUs: 2012 EPA Air Markets Program Data
- STARS 2012_v7a
- 2011 Gulf Wide EI
- 2012 Interpolation from EPA 2011 Platform v2 using 2008 EI

June 30, 2016 release1: bc12_12xxx.r5_r3g_ss.2012_wrf371_p2ma_i2m_e
2017 Emission Inventory - Point Sources

2006 Environment Canada Annual and Oil and Gas Inventories

Ozone Season Day: 2018 Projection from EPA 2011v6_v2 Modeling Platform

2017 Projections from STARS 2014_v2a with HECT and MECT caps

EGUs: 2017 Cross State Air Pollution Rule (CSAPR) Allocations

2018 Projection from EPA 2011v6_v2 Modeling Platform

2011 Gulf Wide EI
2012 & 2017 Emission Inventory - Area Sources

- 2006 Environment Canada Annual and Oil and Gas Inventories
- EPA 2011 NEI (projected to 2017)
- 2011 TexAER projected to 2012/2017
- 2012/2018 Interpolation from EPA 2011 Platform v2 using 2008 EI

June 30, 2016 release1: bc12_12xxx.r5_r3g_ss.2012_wrf371_p2ma_i2m_e; fy17.c0k_c0l_ss.2012_wrf371_p2ma_i2m_e
2012 & 2017 Emission Inventory
On-Road Sources

2006 Environment Canada
MOBILE6-Canada adjusted to
2012/2017

MOVES2014 Default Runs for 2012
and 2017

MOVES2014 links from TTI for
DFW and HGB;
MOVES2014 HPMS for rest of
Texas

1999 MOBILE6-MEXICO
adjusted to 2012/2017

June 30, 2016 release1: bc12_12xxx.r5_r3g_ss.2012_wrf371_p2ma_i2m_e; fy17.c0k_c0l_ss.2012_wrf371_p2ma_i2m_e
Emission Inventory – Expected Updates

- Updated 2017 Point Sources for cap-and-trade program allocations and base year projections
- MEGAN or BEIS biogenic EI choice
- 2017 Oil and Gas update (latest Railroad Commission of Texas data)
- 2017 link-based On-road Mobile (Texas Transportation Institute)
- Updated Fire EI (2015 AQRP project results)
**Meteorological Modeling**

**Current**

- WRF 3.7.1 w/ 45 vertical layers (+1 at the surface)
- Multi-Scale Kain-Fritsch cumulus parameterization
- Pleim-Xiu Land Surface Model (soil moisture initialized from analysis)
- YSU Planetary Boundary Layer scheme
- WSM5/WSM6 microphysics
- 3D-analysis nudging (all domains)
- Hourly 3D, surface analysis and profiler observational nudging (4km domain)

**Planned**

- University of Alabama-Huntsville (UAH) satellite-based cloud data assimilation
- Tests with other Planetary Boundary Layer and Land-Surface Model options
- WRF 3.8
Photochemical Model

**Current**

- CAMx 6.30 with 29 vertical layers (+1 at the top)
- CB6r2h with updated halogen chemistry
- Sea salt emissions
- GEOS-Chem v2.2 Boundary Conditions
- Wesely dry deposition (replaced Zhang)

**Planned**

- Updated boundary conditions (FY16 Project)
- Updated halogen chemistry (FY16 Project)
- CMAQ sensitivities
- CAMx Cloud-in-Grid (AQRP 14-025)
Model Performance Evaluation

**Planned**

- Model the 2013 DISCOVER-AQ study period to investigate model bias issues using the rich observational dataset
- 2006 retrospective modeling to evaluate the model’s response to emission changes
- Evaluate alternative model configurations
  - Multiple base/future runs with varying model configurations
2012 Model Performance

Model Performance Statistics of Hourly O3 Concentrations in tx_4km Domain
Mean Bias (MB) of All Data (2 x 2-cell bi-linear interpolated values)

Model Performance Statistics of Hourly O3 Concentrations in HGB (Houston-Galveston-Brazoria) Area
Mean Bias (MB) of All Data (2 x 2-cell bi-linear interpolated values)
2012 Model Performance

Hourly Concentration: O₃ (20120601-20120630 0:00-23:00)
BAP, 482010555, CS3, Houston Bayland Park CS3/A146, 6400 Bissonnet St., Houston, Harris Co., TX

Hourly Concentration: NOₓ (20120601-20120630 0:00-23:00)
BAP, 482010555, CS3, Houston Bayland Park CS3/A146, 6400 Bissonnet St., Houston, Harris Co., TX

Air Quality Division • 2012 TCEQ Modeling Platform Update • Doug Boyer • July 26, 2016 • Page 16
2012 Model Performance Maximum Daily Average Eight-Hour (MDA8) Ozone Relative Bias
2012 Model Performance - Isoprene

Hourly Concentration: ISOP (20120601–20120630 0:00–23:00)

- Current
- Previous
2012 Model Performance - May

**O3 Hourly Concentration (2x2 bi-linear interpolated value)**
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX

**NOx Hourly Concentration (2x2 bi-linear interpolated value)**
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX
2012 Model Performance - July

O3 Hourly Concentration (2x2 bi-linear interpolated value)
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX

NOx Hourly Concentration (2x2 bi-linear interpolated value)
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX
2012 Model Performance - August

**O3 Hourly Concentration (2x2 bi-linear interpolated value)**
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX

![Graph of O3 Hourly Concentration](image)

- Observed
- camx630_c6r2h tx bc12.12aug.r5.r3g ss 2012_wrf371_p2ma_i2m_e tx 4km
- camx630_c6r2h tx bc12.12aug.r5.r3g ss 2012_wrf371_p2ma_i2m_e tx 4km (3x3-cell max/min)

**NOx Hourly Concentration (2x2 bi-linear interpolated value)**
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX

![Graph of NOx Hourly Concentration](image)

- Observed
- camx630_c6r2h tx bc12.12aug.r5.r3g ss 2012_wrf371_p2ma_i2m_e tx 4km
- camx630_c6r2h tx bc12.12aug.r5.r3g ss 2012_wrf371_p2ma_i2m_e tx 4km (3x3-cell max/min)
2012 Model Performance - September

O3 Hourly Concentration (2x2 bi-linear interpolated value)
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX

- Observed
- camx630_cbi2h tx bc12_12sep r5 r3g ss 2012 wrf371 p2ma i2m etx 4km
- camx630_cbi2h tx bc12_12sep r5 r3g ss 2012 wrf371 p2ma i2m etx 4km (3x3-cell max/min)

NOx Hourly Concentration (2x2 bi-linear interpolated value)
MACP, 480391.004, C84, Manvel Croix Park C84, 4503 Croix Parkway, Manvel, Brazoria Co., TX

- Observed
- camx630_cbi2h tx bc12_12sep r5 r3g ss 2012 wrf371 p2ma i2m etx 4km
- camx630_cbi2h tx bc12_12sep r5 r3g ss 2012 wrf371 p2ma i2m etx 4km (3x3-cell max/min)
2012 Model Performance - Interactive Time Series

### Top Regulatory Monitors

<table>
<thead>
<tr>
<th>Name</th>
<th>2012</th>
<th>RRF</th>
<th>2017</th>
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<tbody>
<tr>
<td>Manvel Croix Park</td>
<td>85.00</td>
<td>0.93</td>
<td><strong>78.86</strong></td>
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<tr>
<td>Deer Park</td>
<td>78.33</td>
<td>0.96</td>
<td>75.24</td>
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<tr>
<td>Houston East</td>
<td>78.00</td>
<td>0.96</td>
<td>74.86</td>
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<td>Park Place</td>
<td>77.33</td>
<td>0.96</td>
<td>74.40</td>
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<td>Houston Northwest</td>
<td>80.00</td>
<td>0.93</td>
<td>74.16</td>
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<td>Bayland Park</td>
<td>78.67</td>
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<td>Croquet</td>
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<td>73.29</td>
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<td>Houston Monroe</td>
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<td>Seabrook Friendship Park</td>
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<td>72.70</td>
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<td>Houston Texas Ave</td>
<td>75.00</td>
<td>0.97</td>
<td>72.67</td>
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<td>Houston Aldine</td>
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<td>0.94</td>
<td>72.43</td>
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<tr>
<td>Conroe Relocated</td>
<td>78.00</td>
<td>0.92</td>
<td>71.92</td>
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<tr>
<td>Clinton Drive</td>
<td>74.67</td>
<td>0.96</td>
<td>71.91</td>
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</table>

Baseline: bl12.r5_r3g_ss ; Future: fy17.c0k_c0l_ss
Modeling Web Sites

- SET PMTC: Presentations and past meeting information

- Current Eight-Hour Ozone SIP Modeling Details
  https://www.tceq.texas.gov/airquality/airmod/data

- Interactive Modeling Map Results

- Interactive Modeling Time Series

- Current Modeling File FTP Site
  ftp://amdaftp.tceq.texas.gov/pub/TX/

- HGB: Latest Ozone Planning Activities
Questions?

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