Initial 2018 HGB Modeling Results

Dick Karp
Air Modeling Team
Air Modeling & Data Analysis Section

CAMx Ozone Modeling in SIP Development

The Big Picture

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

CAMx Ozone Modeling in SIP Development

Future Case – Future Baseline Emissions

Meteorological Modeling

Base Case Meteorological Modeling used

Emissions Modeling

VOC, CO & NO_X
Point, Area, On- & Non-Road & Biogenic
Growth + On-the-books Controls

CAMx Modeling

O_3, NO_X, VOC, CO, etc.

Run Model Sensitivities

(How does ozone respond to various emission changes?)

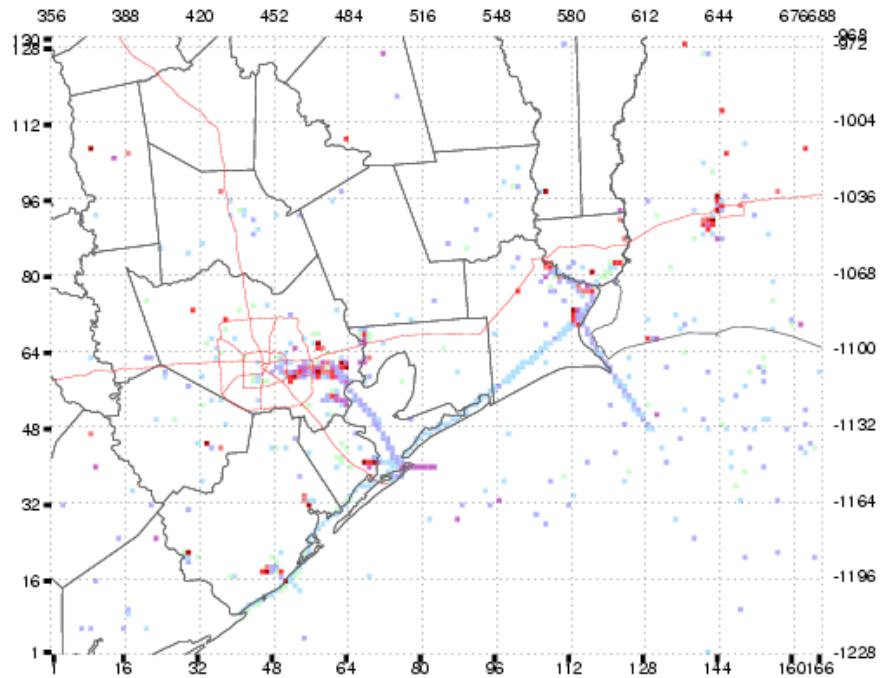
Matrix Runs, Control Measure Runs, etc.

Future Case Suitable for Control Strategy Modeling

2005 Baseline Modeling Emissions

- Point Sources
  - ARD sources (e.g., EGUs) used 2005 third quarter emissions
  - Non-ARD sources used 2005 STARS OSD emissions, except
    - Tank landing losses used average of 2005 episodic emissions
    - PSCFv2 EI-Reconciliation of HRVOC emissions
- On-Road Mobile Sources
  - All on-road used 2005 summer day-types
- Non-Road and Off-Road Sources
  - Non-Road used 2005 NMIM (same as base case emissions)
  - Off-Road used 2005 TexAER (same as base case emissions)
- Area sources used 2005 TexAER (same as base case emissions)
- Biogenic sources used episodic base case emissions

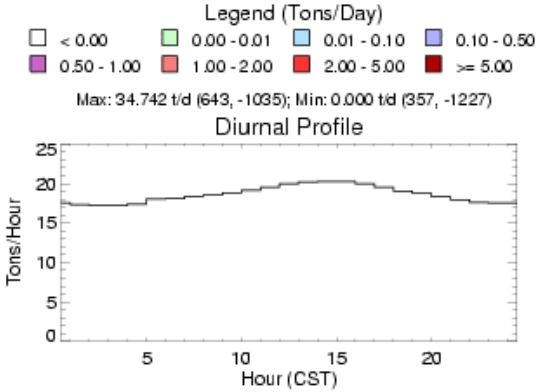
2005 Baseline Point Source Emissions Elevated

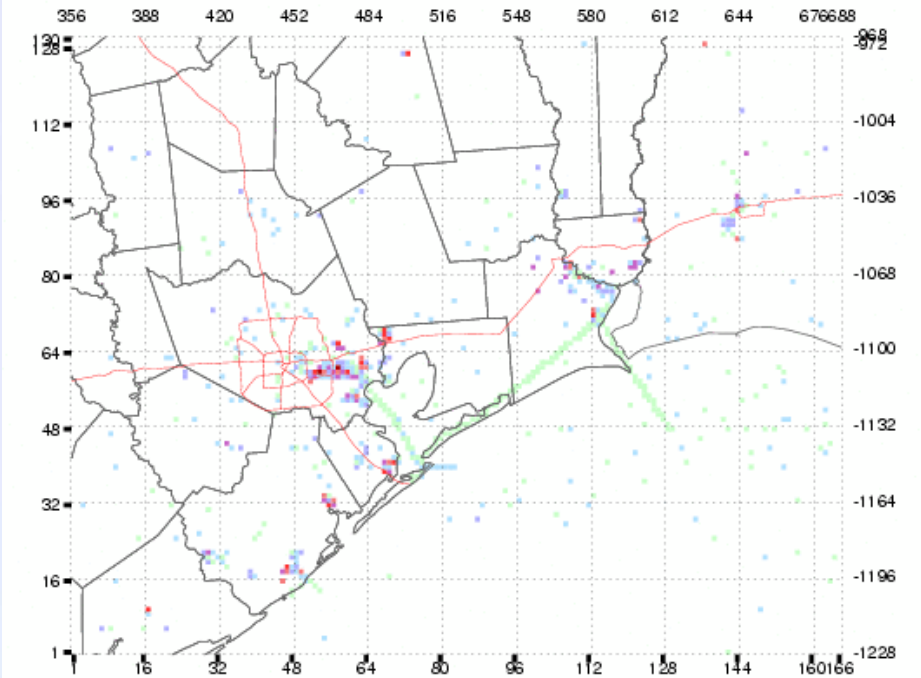


hgb8h2.bl05.reg1.hgbpa_02km All Elevated Emissions, 07/26/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	44.05
Chambers	11.69
Fort Bend	20.32
Galveston	28.75
Harris	103.97
Liberty	0.75
Montgomery	2.12
Waller	0.68
HGB SUBTOTAL:	212.31
Hardin	1.10
Jefferson	43.59
Orange	25.50
BPA SUBTOTAL:	70.19
MAP TOTAL:	446.89

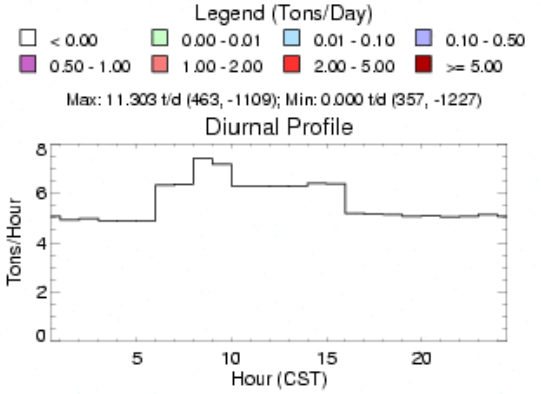




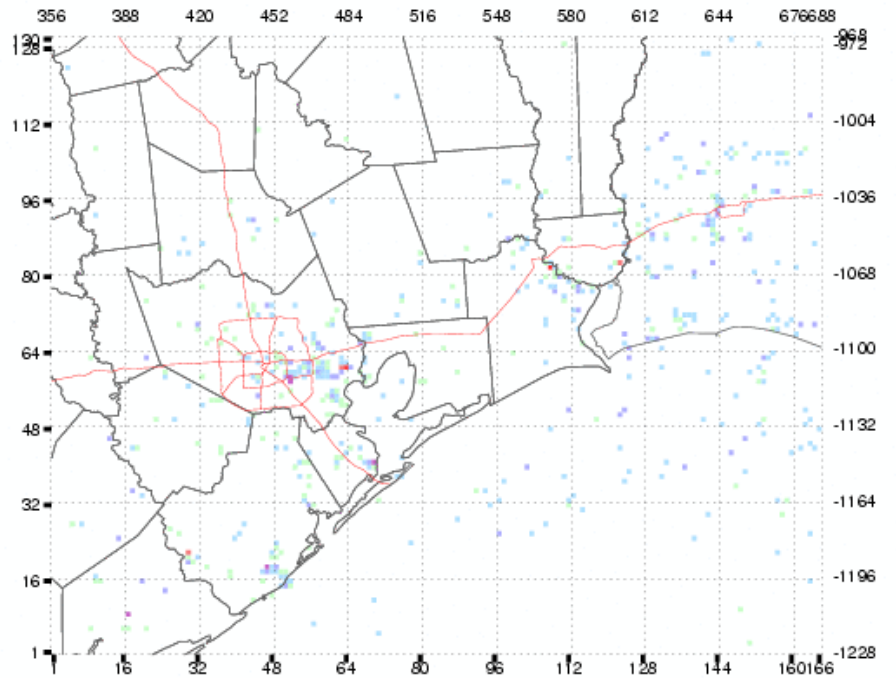
hgb8h2.bl05.reg1.hgbpa_02km All Elevated Emissions, 07/26/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	18.72
Chambers	10.61
Fort Bend	1.51
Galveston	10.13
Harris	58.46
Liberty	0.30
Montgomery	0.73
Waller	0.06
HGB SUBTOTAL:	100.52
Hardin	0.44
Jefferson	12.08
Orange	6.02
BPA SUBTOTAL:	18.54
MAP TOTAL:	135.88



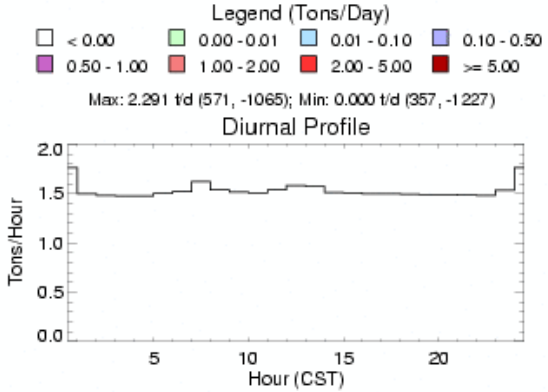
2005 Baseline Point Source Emissions
Low Level

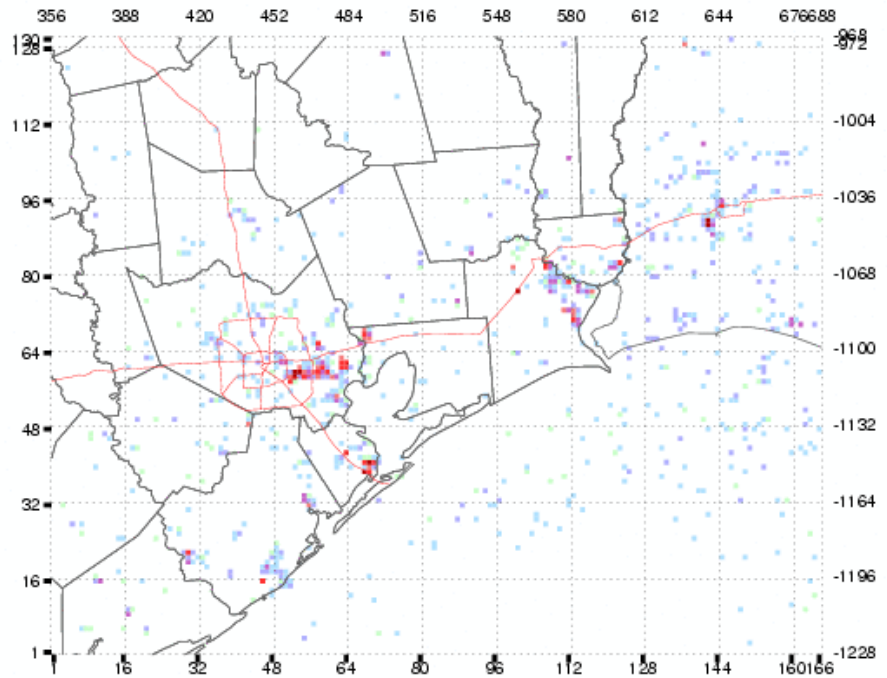


hgb8h2.bl05_reg1.regular.hgbpa_02km Low Level Point Emissions, 07/26/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	3.91
Chambers	0.31
Fort Bend	0.18
Galveston	1.47
Harris	9.19
Liberty	0.22
Montgomery	0.64
Waller	0.12
HGB SUBTOTAL:	16.04
Hardin	0.30
Jefferson	4.26
Orange	2.05
BPA SUBTOTAL:	6.61
MAP TOTAL:	36.55

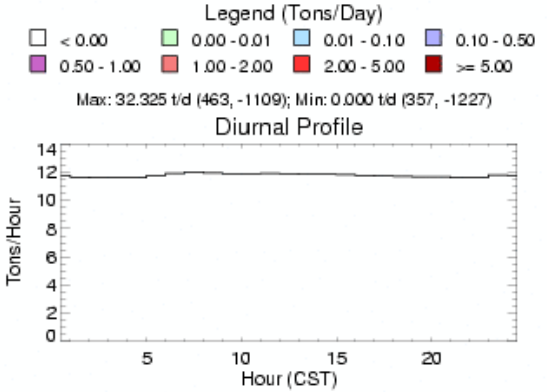




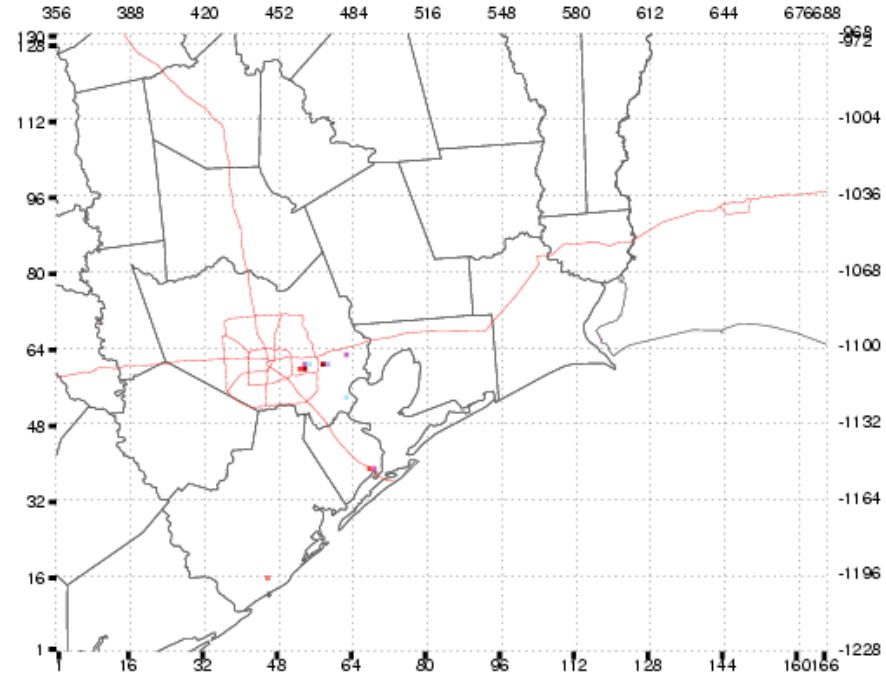
hgb8h2.bl05_reg1.regular.hgbpa_02km Low Level Point Emissions, 07/26/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	16.70
Chambers	10.76
Fort Bend	2.18
Galveston	33.62
Harris	115.20
Liberty	2.80
Montgomery	2.15
Waller	0.32
HGB SUBTOTAL:	183.73
Hardin	1.27
Jefferson	36.20
Orange	9.20
BPA SUBTOTAL:	46.67
MAP TOTAL:	282.88



2005 Baseline Point Source Emissions Tanks and PSCF



hgb8h2.bline05d.hgbpa_02km Tank Landing Loss Emissions, 07/20/2005: All VOC

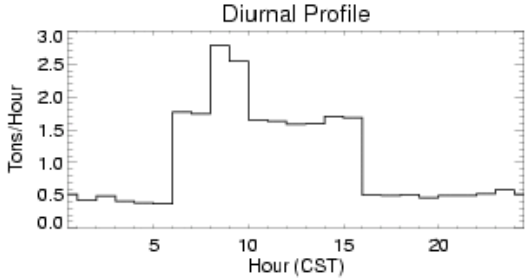
Emissions Plotted

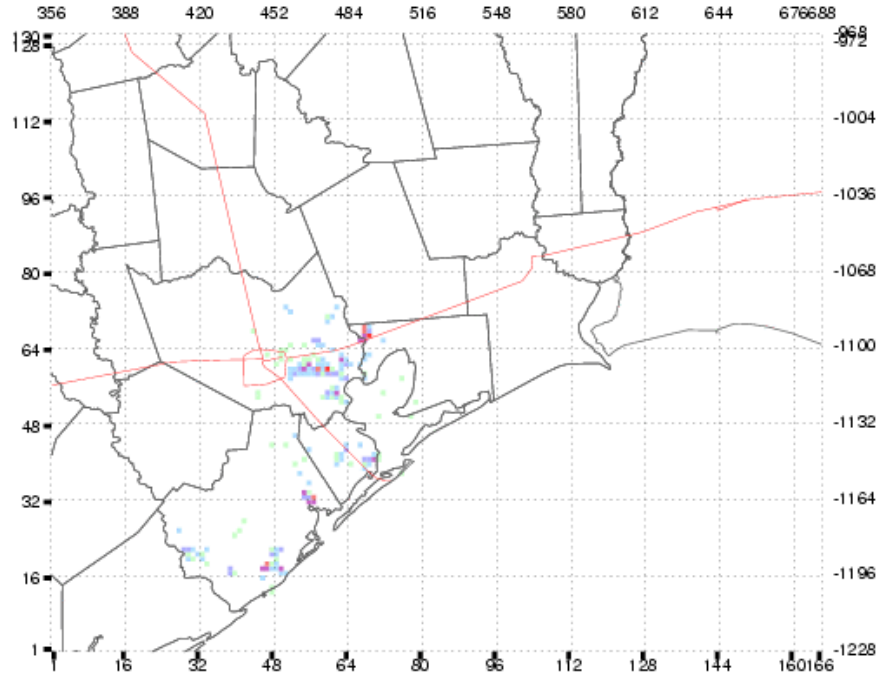
County	Tons/Day
Brazoria	1.29
Chambers	0.00
Fort Bend	0.00
Galveston	3.05
Harris	21.06
Liberty	0.00
Montgomery	0.00
Waller	0.00
HGB SUBTOTAL:	25.40
Hardin	0.00
Jefferson	0.00
Orange	0.00
BPA SUBTOTAL:	0.00
MAP TOTAL:	25.40

Legend (Tons/Day)

< 0.00 | 0.00 - 0.01 | 0.01 - 0.10 | 0.10 - 0.50 | 0.50 - 1.00 | 1.00 - 2.00 | 2.00 - 5.00 | >= 5.00

Max: 10.610 t/d (463, -1109); Min: 0.000 t/d (357, -1227)





pscfv2.hgbpa_02km PSCF Emissions, 06/22/2005: All VOC

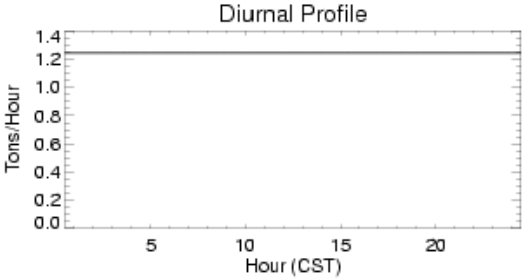
Emissions Plotted

County	Tons/Day
Brazoria	10.18
Chambers	6.98
Fort Bend	0.00
Galveston	1.91
Harris	10.84
Liberty	0.00
Montgomery	0.00
Waller	0.00
HGB SUBTOTAL:	29.92
Hardin	0.00
Jefferson	0.00
Orange	0.00
BPA SUBTOTAL:	0.00
MAP TOTAL:	29.92

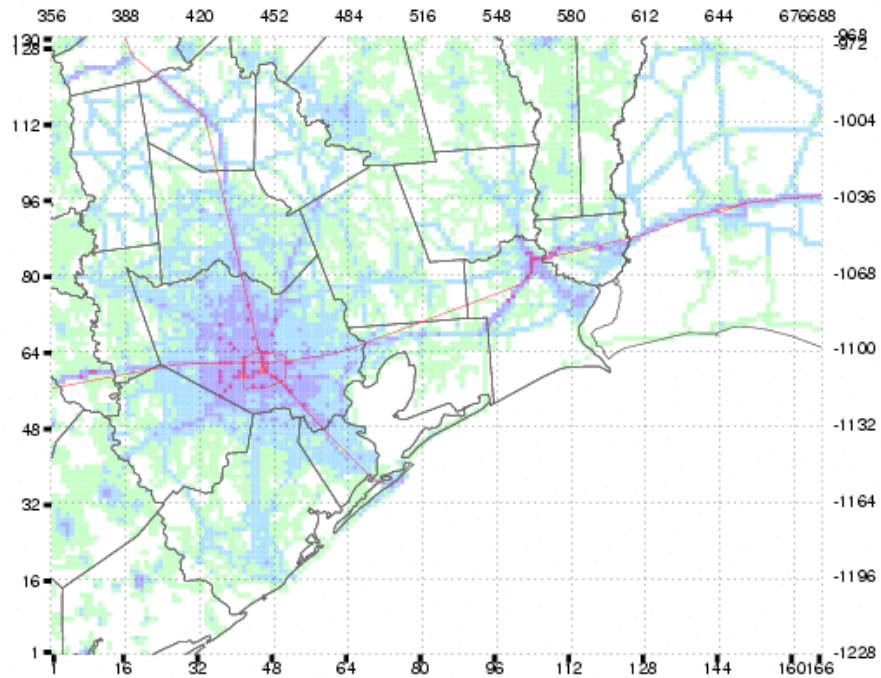
Legend (Tons/Day)

< 0.00 | 0.00 - 0.01 | 0.01 - 0.10 | 0.10 - 0.50 | 0.50 - 1.00 | 1.00 - 2.00 | 2.00 - 5.00 | >= 5.00

Max: 3.002 t/d (493, -1095); Min: 0.000 t/d (357, -1227)



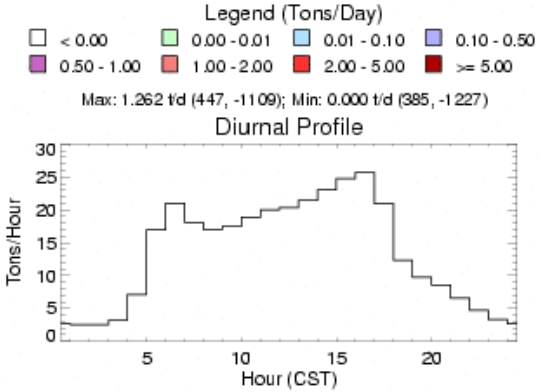
2005 Baseline On-Road Mobile Emissions

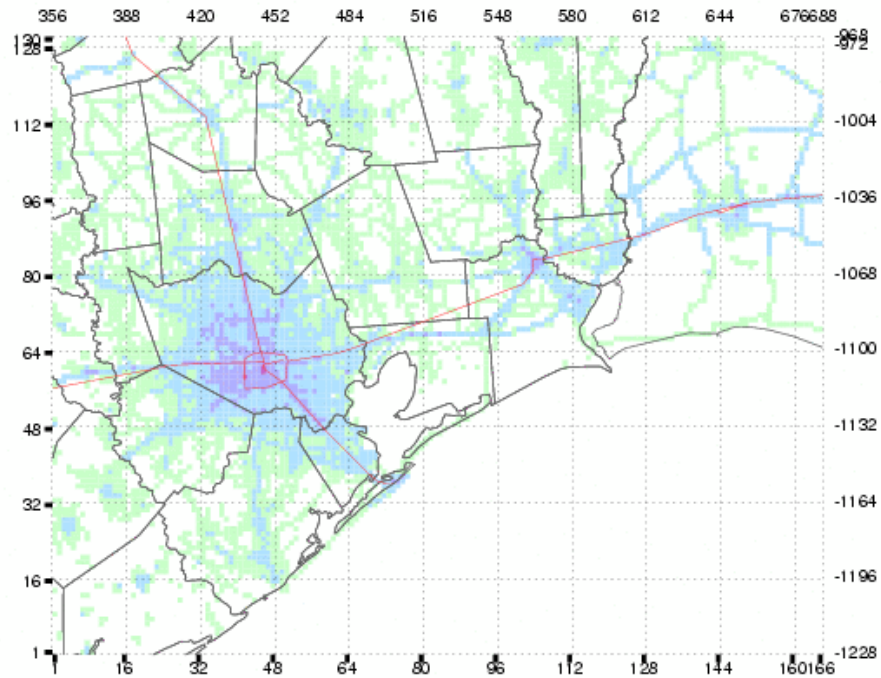


HGB8H2 On-road Mobile, m62.2005.summer.Texas_knox.07Nov08, weekday: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	9.93
Chambers	5.50
Fort Bend	12.91
Galveston	8.80
Harris	159.21
Liberty	4.60
Montgomery	17.17
Waller	3.96
HGB SUBTOTAL:	222.06
Hardin	4.06
Jefferson	25.59
Orange	12.67
BPA SUBTOTAL:	42.33
MAP TOTAL:	329.10

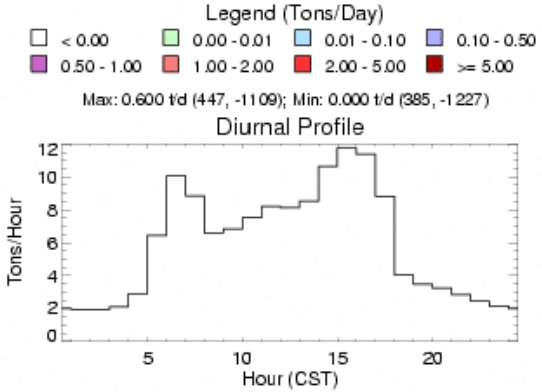




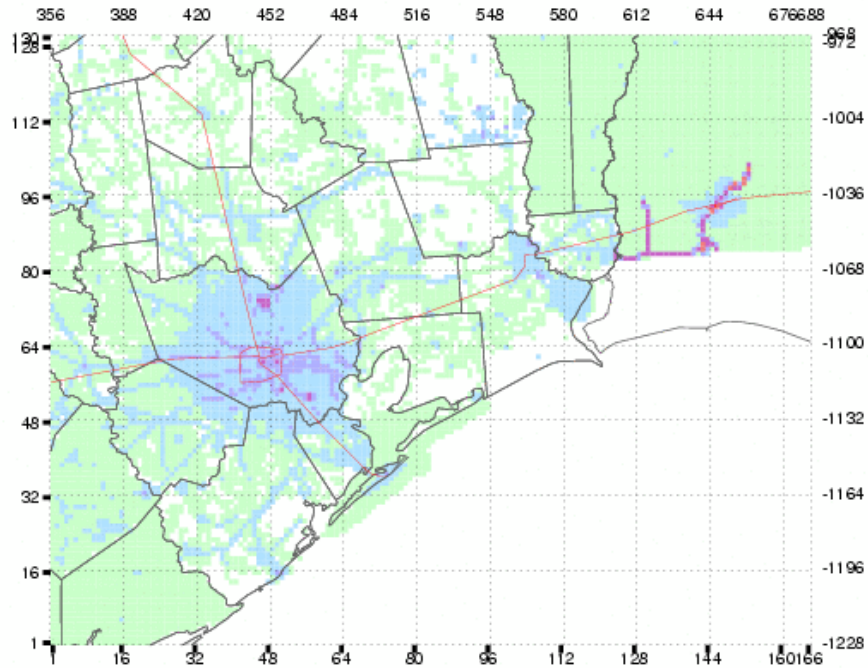
HGB8H2 On-road Mobile, m62.2005.summer.Texas_knox.07Nov08, weekday: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	4.64
Chambers	2.14
Fort Bend	5.49
Galveston	4.36
Harris	76.71
Liberty	2.51
Montgomery	6.88
Waller	1.80
HGB SUBTOTAL:	104.52
Hardin	1.84
Jefferson	7.53
Orange	3.32
BPA SUBTOTAL:	12.69
MAP TOTAL:	142.93



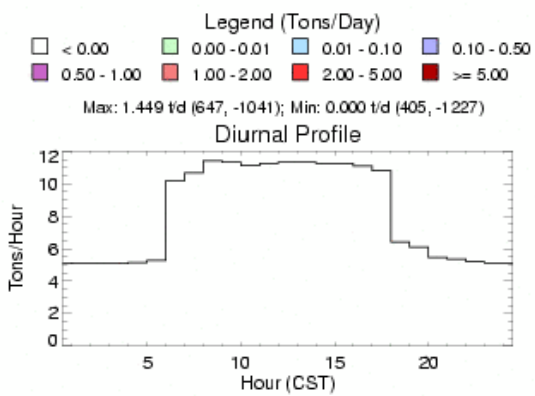
2005 Baseline Non-Road Mobile Emissions

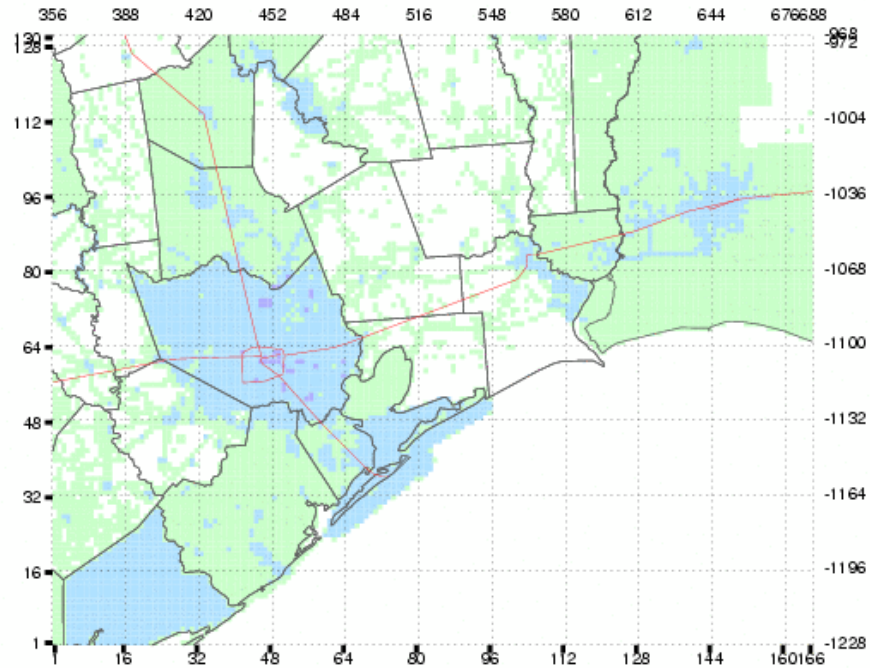


hgb8h2.bc05_b8.hgbpa_02km Non Road Mobile Emissions, 08/03/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	8.07
Chambers	1.50
Fort Bend	8.20
Galveston	5.07
Harris	78.80
Liberty	5.37
Montgomery	5.62
Waller	1.16
HGB SUBTOTAL:	113.78
Hardin	1.45
Jefferson	5.56
Orange	3.65
BPA SUBTOTAL:	10.65
MAP TOTAL:	197.54

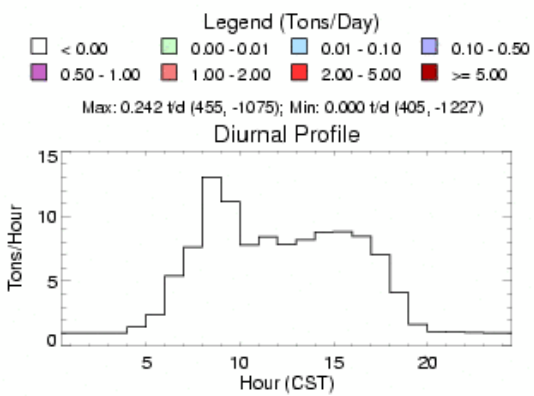




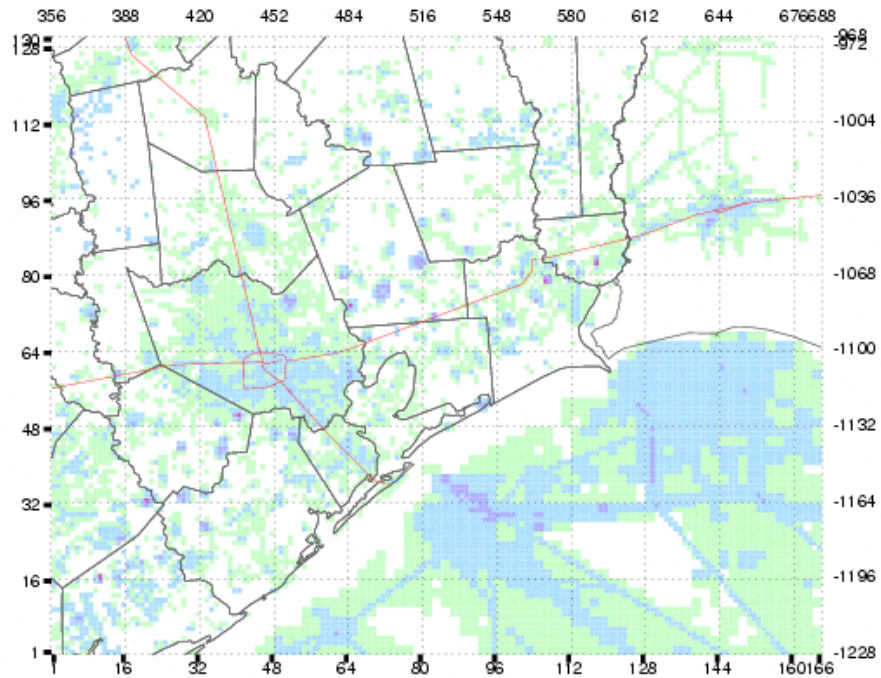
hgb8h2.bc05_b8.hgbpa_02km Non Road Mobile Emissions, 08/03/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	5.89
Chambers	2.02
Fort Bend	4.19
Galveston	15.66
Harris	43.56
Liberty	1.14
Montgomery	5.56
Waller	0.74
HGB SUBTOTAL:	78.77
Hardin	0.54
Jefferson	2.80
Orange	1.31
BPA SUBTOTAL:	4.64
MAP TOTAL:	120.39



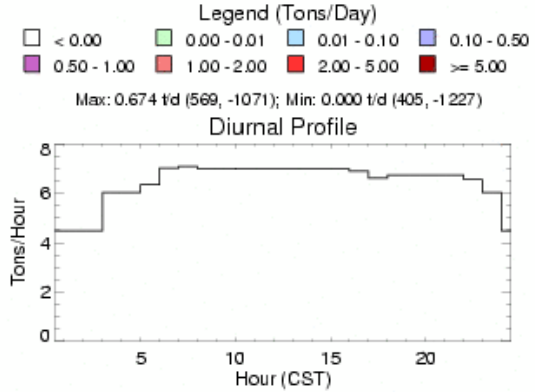
2005 Baseline Area Source Emissions

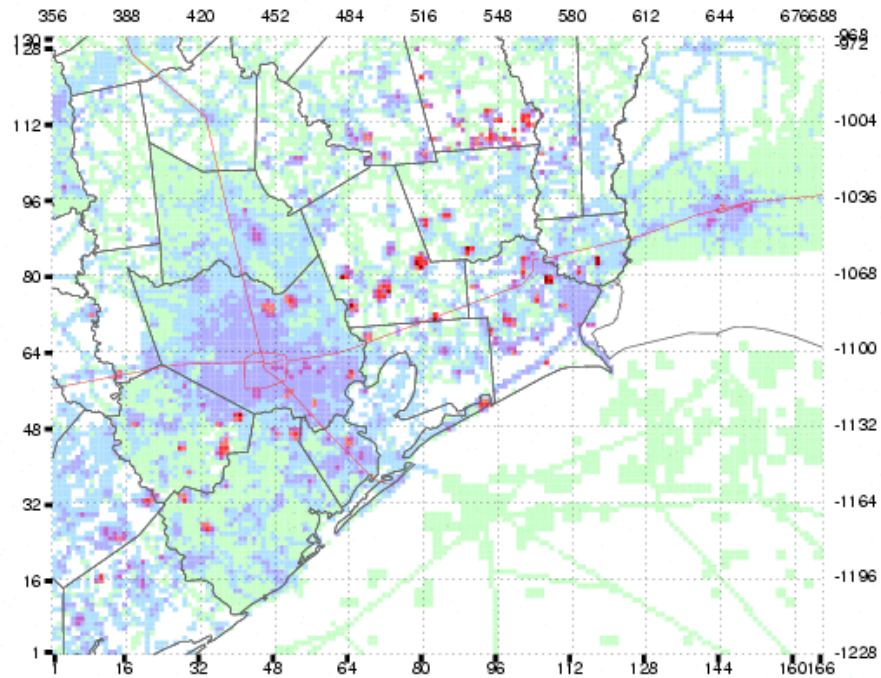


hgb8h2.bc05_b8.hgbpa_02km Area Source Emissions, 08/03/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	5.42
Chambers	2.12
Fort Bend	4.89
Galveston	2.25
Harris	12.40
Liberty	6.75
Montgomery	1.79
Waller	0.60
HGB SUBTOTAL:	36.22
Hardin	1.25
Jefferson	4.94
Orange	1.55
BPA SUBTOTAL:	7.74
MAP TOTAL:	155.09

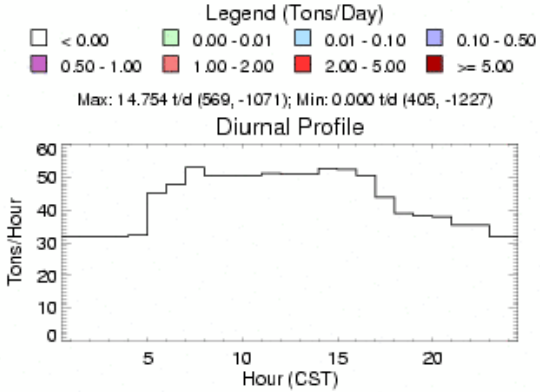




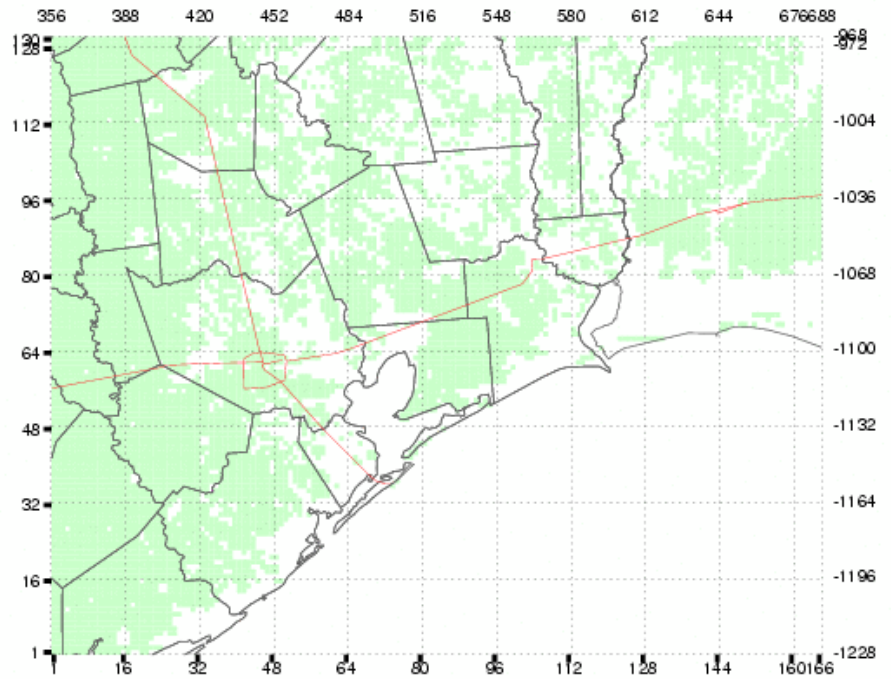
hgb8h2.bc05_b8.hgbpa_02km Area Source Emissions, 08/03/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	56.75
Chambers	26.53
Fort Bend	69.61
Galveston	46.29
Harris	183.52
Liberty	111.32
Montgomery	23.17
Waller	7.71
HGB SUBTOTAL:	524.92
Hardin	33.03
Jefferson	119.77
Orange	34.93
BPA SUBTOTAL:	187.74
MAP TOTAL:	1027.31



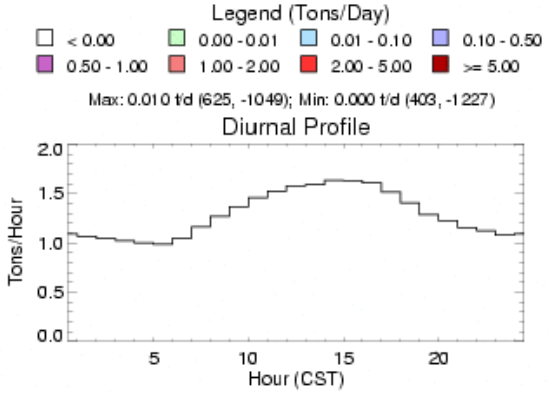
2005 Baseline Biogenic Emissions

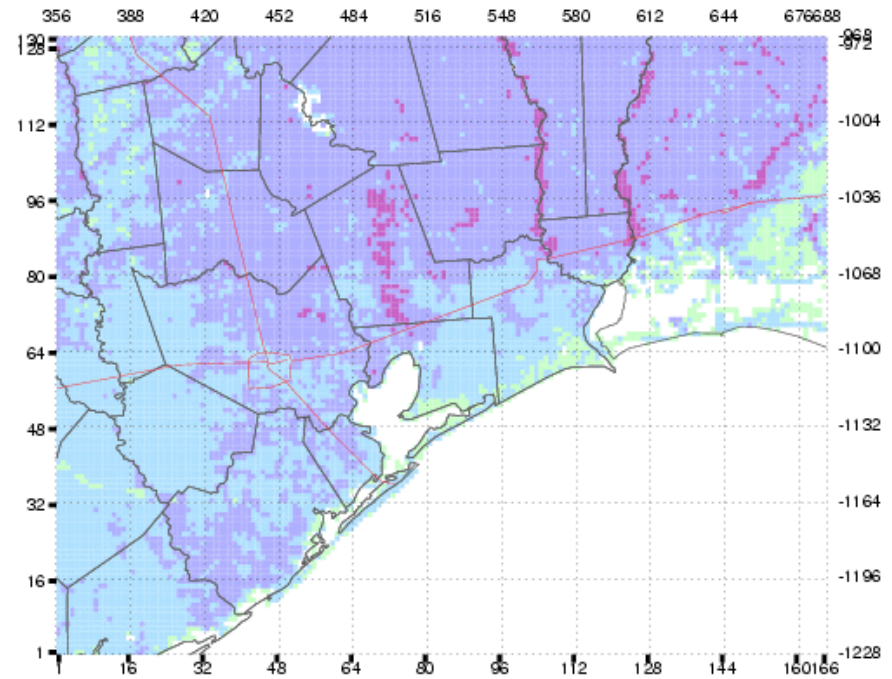


hgb8h2.bc05a.csr.hgbpa_02km Biogenic Emissions, 07/26/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	1.40
Chambers	0.58
Fort Bend	1.25
Galveston	0.22
Harris	1.22
Liberty	1.26
Montgomery	1.15
Waller	1.10
HGB SUBTOTAL:	8.18
Hardin	0.70
Jefferson	0.61
Orange	0.23
BPA SUBTOTAL:	1.53
MAP TOTAL:	30.84

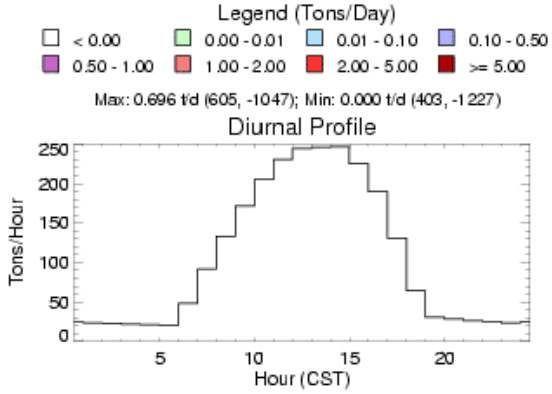




hgb8h2.bc05a.csr.hgbpa_02km Biogenic Emissions, 07/26/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	105.88
Chambers	38.44
Fort Bend	36.05
Galveston	22.52
Harris	151.54
Liberty	215.58
Montgomery	151.97
Waller	25.14
HGB SUBTOTAL:	747.12
Hardin	181.69
Jefferson	48.18
Orange	57.20
BPA SUBTOTAL:	287.07
MAP TOTAL:	2495.70



2018 Future Modeling Emissions

- Point Sources
- On-Road Mobile Sources
- Non-Road and Off-Road Sources
- Area Sources
- Biogenic Sources (used episodic base case emissions)

2018 Future Point Source Modeling Emissions

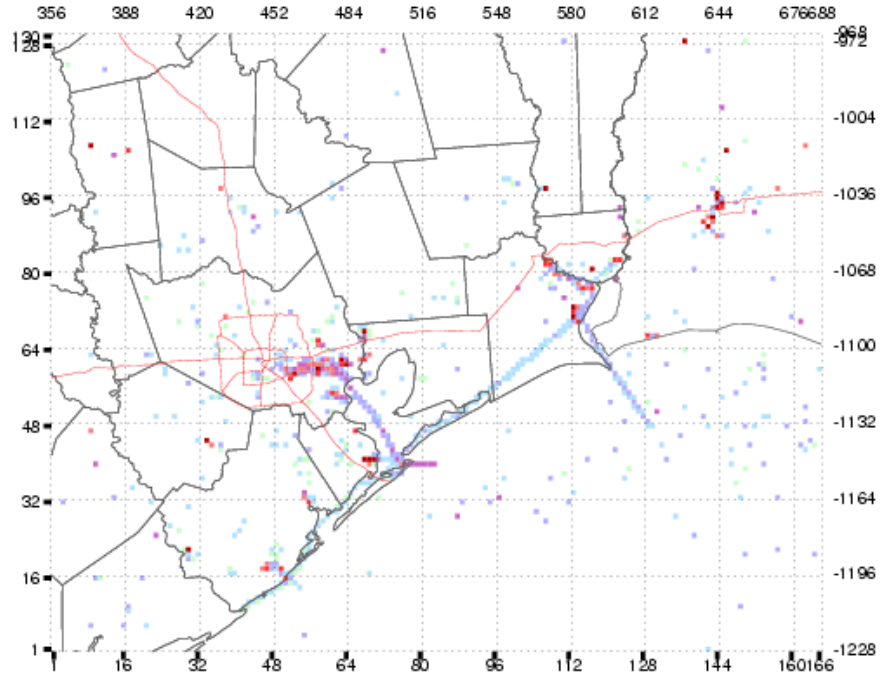
- For the region outside Texas, the CENRAP/RPO regional haze 2018 emission levels (e.g. IPM, CAIR2 trading, controls) were used

- For the attainment region of Texas,
  - CAIR Phase 2 allocations were used for existing EGUs, new EGUs were limited to the 9.5% set-aside
  - All controls included in the recent DFW and BPA SIPs (e.g., East Texas Engine Rule) were applied
  - Growth was projected to 2018 with Economy.com factors

- For the DFW and BPA nonattainment areas, CAIR Phase 2 and Chapter 117 ESAD were used

- For the HGB nonattainment area, MECT and HECT were used, as well as controls included in the recent HGB SIP (e.g., VOC from tanks and degassing)

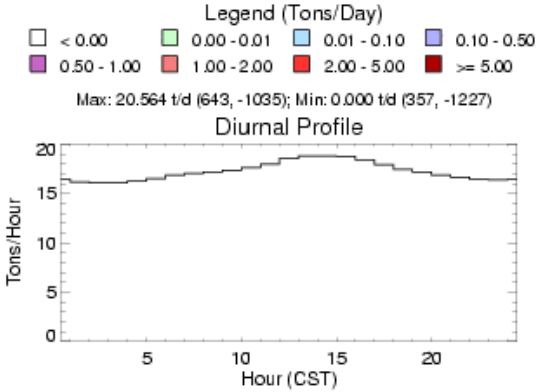
2018 Future Point Source Emissions Elevated

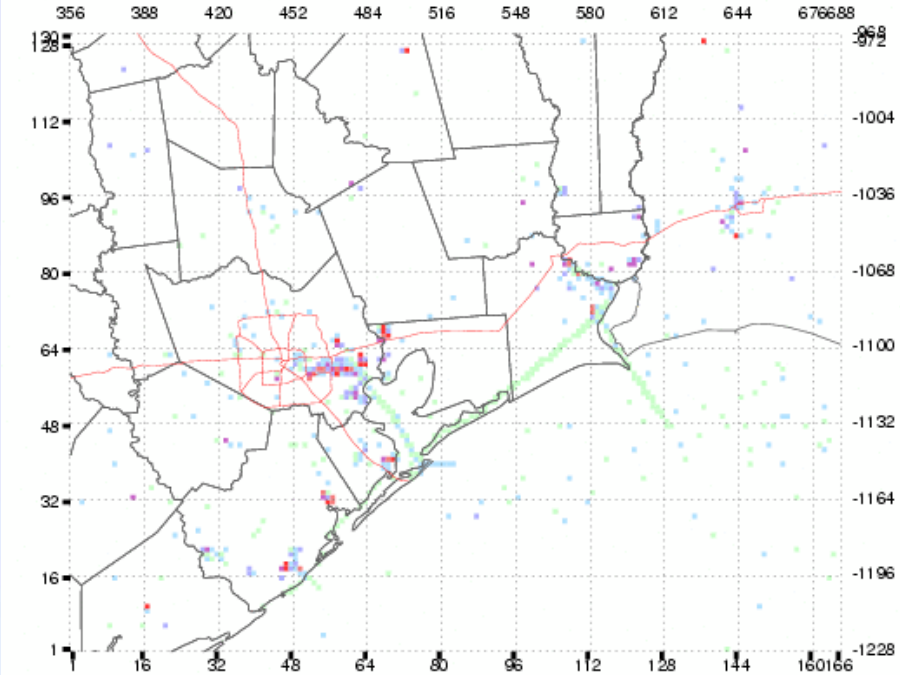


hgb8h2.fy18.cs02.hgbpa_02km All Elevated Emissions, 08/01/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	30.04
Chambers	15.72
Fort Bend	17.67
Galveston	39.76
Harris	86.51
Liberty	0.35
Montgomery	2.70
Waller	0.52
HGB SUBTOTAL:	193.26
Hardin	0.64
Jefferson	47.30
Orange	23.64
BPA SUBTOTAL:	71.58
MAP TOTAL:	413.65

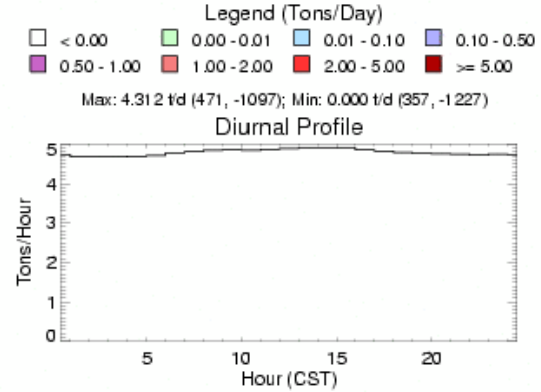




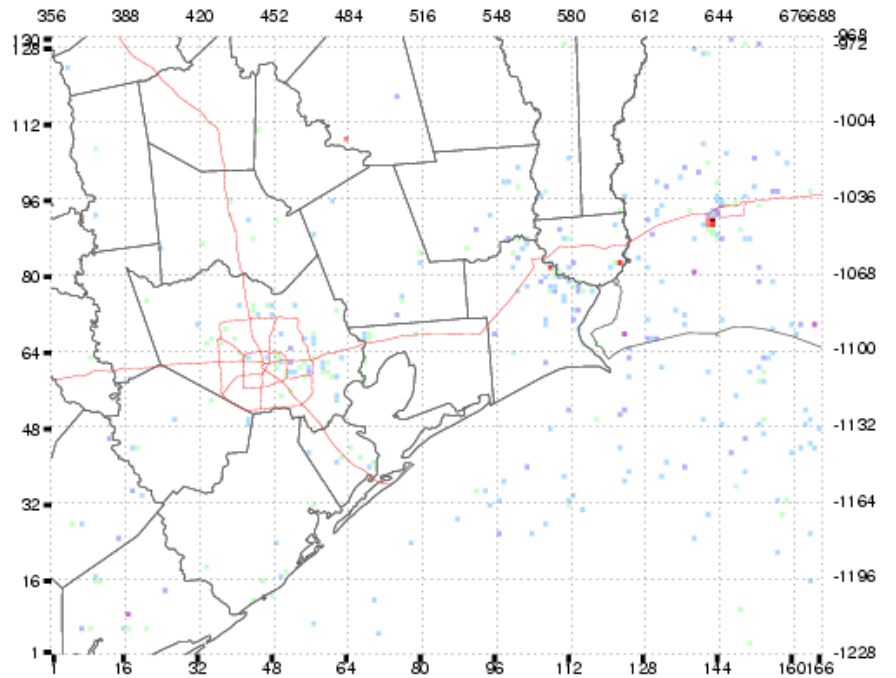
hgb8h2.fy18.cs02.hgbpa_02km All Elevated Emissions, 08/01/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	18.22
Chambers	10.11
Fort Bend	0.85
Galveston	6.68
Harris	41.52
Liberty	0.19
Montgomery	0.70
Waller	0.03
HGB SUBTOTAL:	78.29
Hardin	0.79
Jefferson	10.73
Orange	5.63
BPA SUBTOTAL:	17.15
MAP TOTAL:	115.02



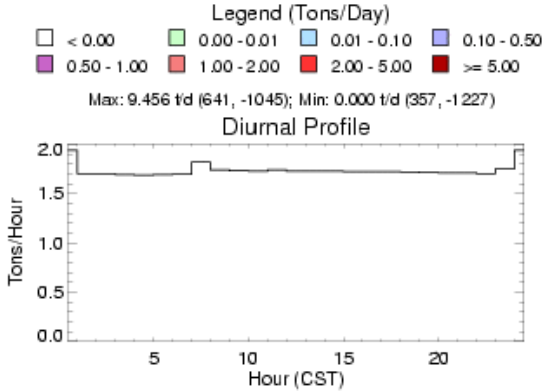
2018 Future Point Source Emissions Low Level

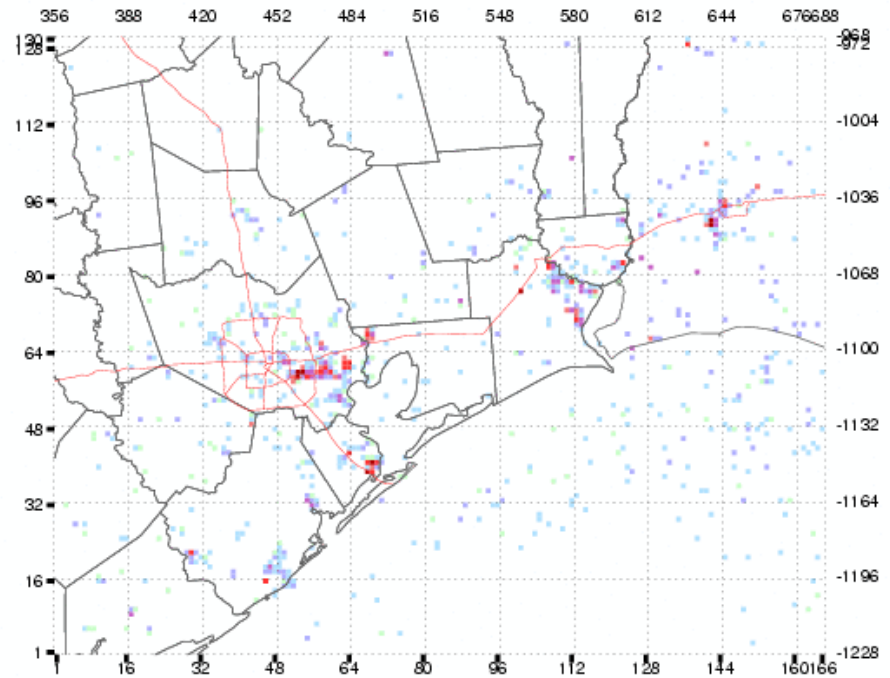


hgb8h2.fy18.cs02.hgbpa_02km Low Level Point Emissions, 08/01/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	0.08
Chambers	0.05
Fort Bend	0.10
Galveston	0.12
Harris	1.28
Liberty	0.17
Montgomery	0.07
Waller	0.01
HGB SUBTOTAL:	1.88
Hardin	0.58
Jefferson	4.66
Orange	2.71
BPA SUBTOTAL:	7.96
MAP TOTAL:	41.49

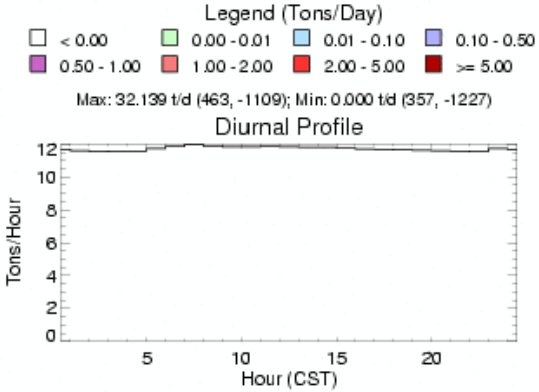




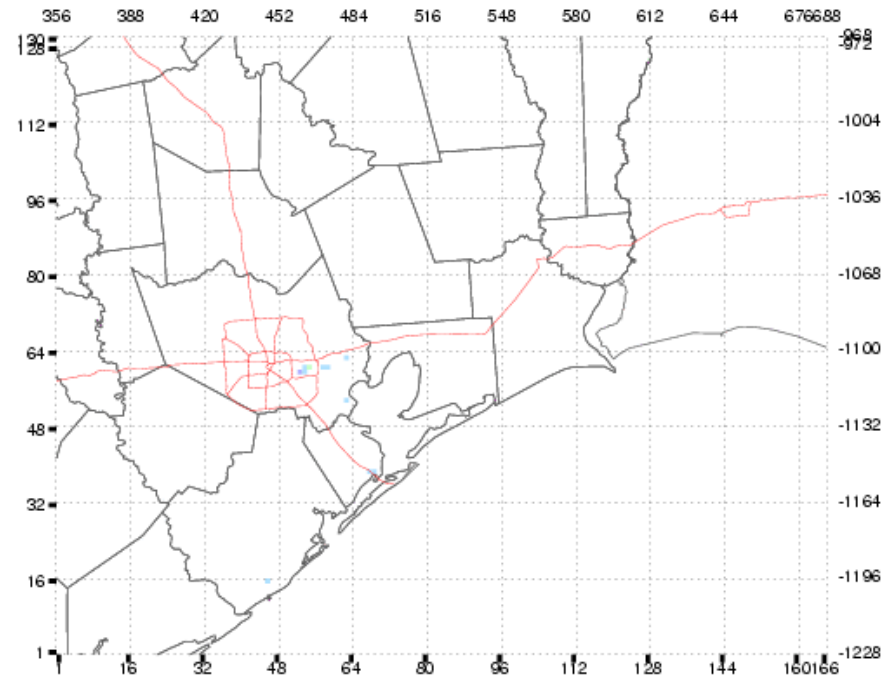
hgb8h2.fy18.cs02.hgbpa_02km Low Level Point Emissions, 08/01/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	14.98
Chambers	9.64
Fort Bend	2.33
Galveston	31.57
Harris	108.31
Liberty	2.68
Montgomery	1.96
Waller	0.27
HGB SUBTOTAL:	171.74
Hardin	1.29
Jefferson	35.26
Orange	7.59
BPA SUBTOTAL:	44.14
MAP TOTAL:	281.34



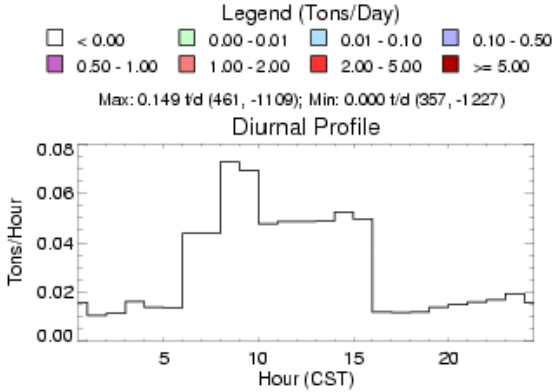
2018 Future Point Source Emissions Tanks and PSCF

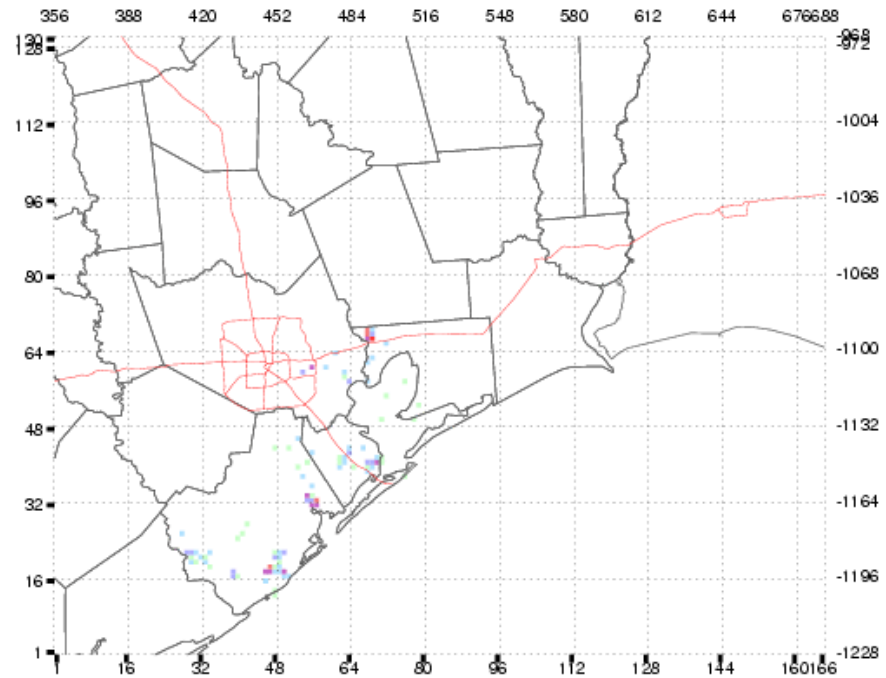


hgb8h2.fy18a.hgbpa_02km Tank Landing Loss Emissions, 07/20/2005: All VOC

Emissions Plotted

County	Tons/Day
Brazoria	0.08
Chambers	0.00
Fort Bend	0.00
Galveston	0.08
Harris	0.57
Liberty	0.00
Montgomery	0.00
Waller	0.00
HGB SUBTOTAL:	0.72
Hardin	0.00
Jefferson	0.00
Orange	0.00
BPA SUBTOTAL:	0.00
MAP TOTAL:	0.72

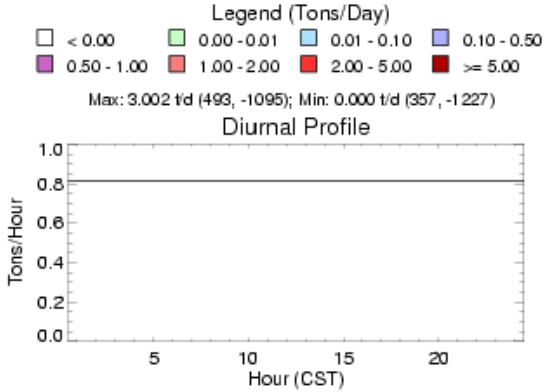




pscfv2_noharris.hgbpa_02km PSCF Emissions, 06/22/2005: All VOC

Emissions Plotted

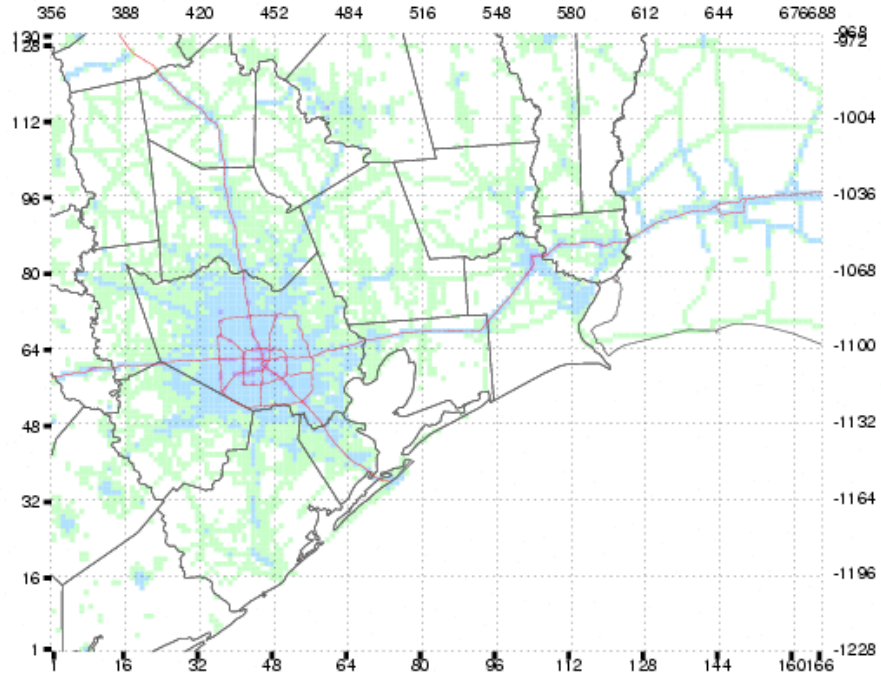
County	Tons/Day
Brazoria	10.18
Chambers	6.49
Fort Bend	0.00
Galveston	1.91
Harris	0.89
Liberty	0.00
Montgomery	0.00
Waller	0.00
HGB SUBTOTAL:	19.48
Hardin	0.00
Jefferson	0.00
Orange	0.00
BPA SUBTOTAL:	0.00
MAP TOTAL:	19.48



2018 Future On-Road Modeling Emissions

- For areas outside of Texas, county-level emissions derived from NMIM were used and projected to 2018
- For Texas counties outside of BPA and HGB, county-level hourly emissions by summer day-type from TTI based on 2018 projected traffic count data from TxDOT were used
- For both HGB and BPA, link-based hourly emissions by summer day-type from TTI based on projected travel demand modeling were used

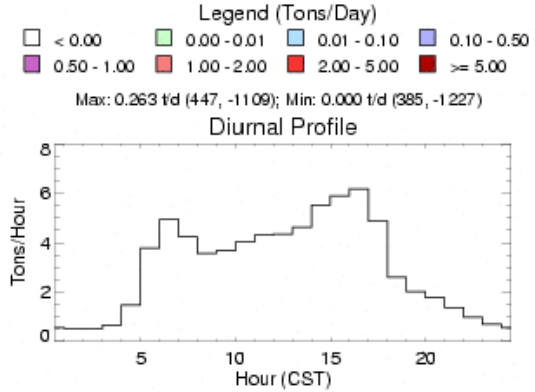
2018 Future On-Road Mobile Emissions

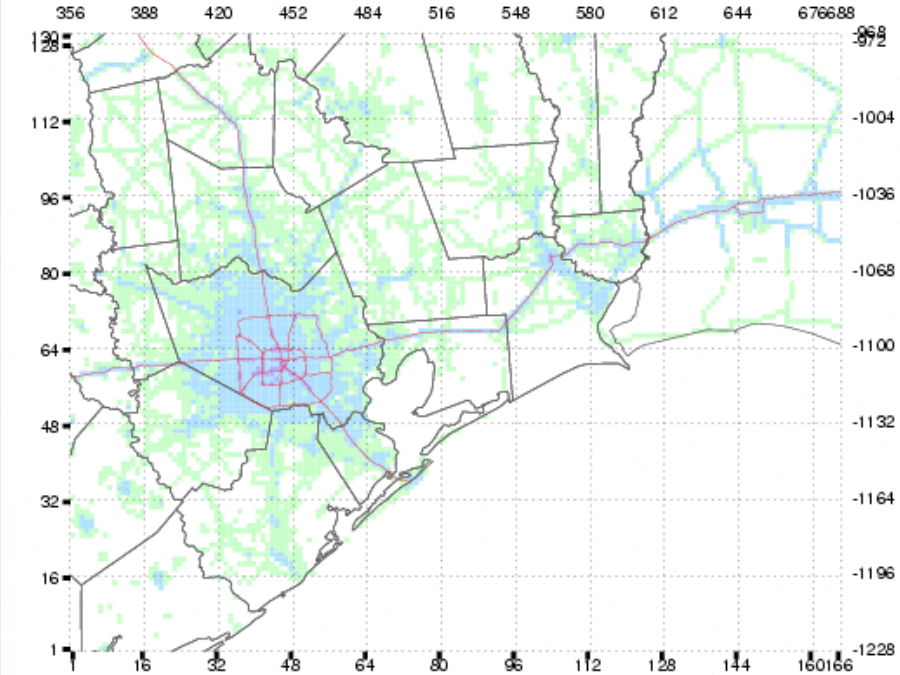


HGB8H2 On-road Mobile, m62.2018.noschool.Texas_knox.07Nov08, weekday: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	2.45
Chambers	1.70
Fort Bend	3.51
Galveston	1.72
Harris	33.71
Liberty	1.62
Montgomery	4.00
Waller	1.17
HGB SUBTOTAL:	49.88
Hardin	0.95
Jefferson	4.67
Orange	2.37
BPA SUBTOTAL:	7.98
MAP TOTAL:	73.19

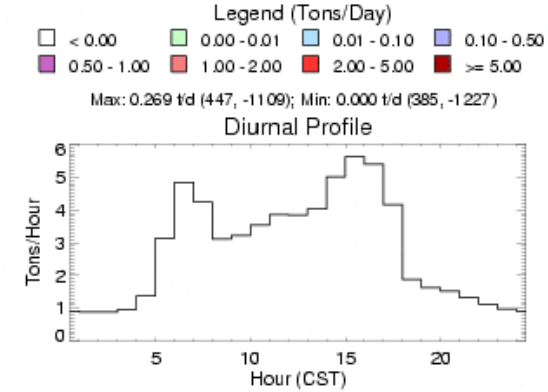




HGB8H2 On-road Mobile, m62.2018.noschool.Texas_knox.07Nov08, weekday: All VOC

Emissions Plotted

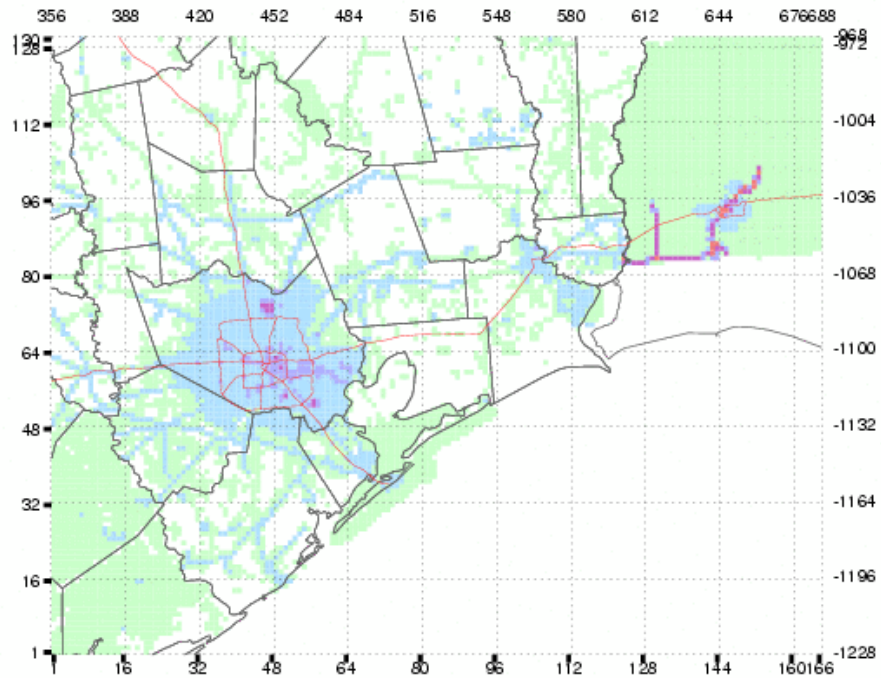
County	Tons/Day
Brazoria	2.34
Chambers	1.36
Fort Bend	3.35
Galveston	1.77
Harris	34.05
Liberty	1.51
Montgomery	3.66
Waller	1.01
HGB SUBTOTAL:	49.05
Hardin	0.86
Jefferson	3.48
Orange	1.62
BPA SUBTOTAL:	5.96
MAP TOTAL:	67.53



2018 Future Non and Off-Road Modeling Emissions

- For the region outside Texas, EPA's NMIM was used for non-road categories, and 2002 NEI with EGAS growth was used for all off-road categories with national controls on locomotives and marine vessels
- For the non-road categories within Texas, the Tex-N model was used
- For the off-road categories within Texas
  - 2005 TexAER was used with REMI-EGAS growth and national controls for locomotives and marine vessels, except locomotives in HGB and DFW, and marine vessels in HGB and BPA
    - 2018 emissions for locomotives in HGB and DFW were provided from a contract with ERG (now in TexAER)
    - 2018 emissions for marine vessels in HGB and BPA were developed using emission trends provided by the HGB and BPA Port Authorities and 2007 and 2000 emission projections, respectively, provided from a contract with Starcrest
  - For aircraft within Texas
    - 2002 TexAER was used with REMI-EGAS growth, except for HGB and DFW
    - For HGB and DFW, 2005 emission estimates from AQP were used with REMI-EGAS growth.

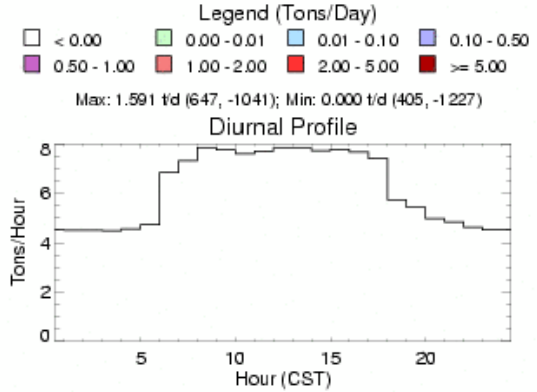
2018 Future Non-Road Mobile Emissions

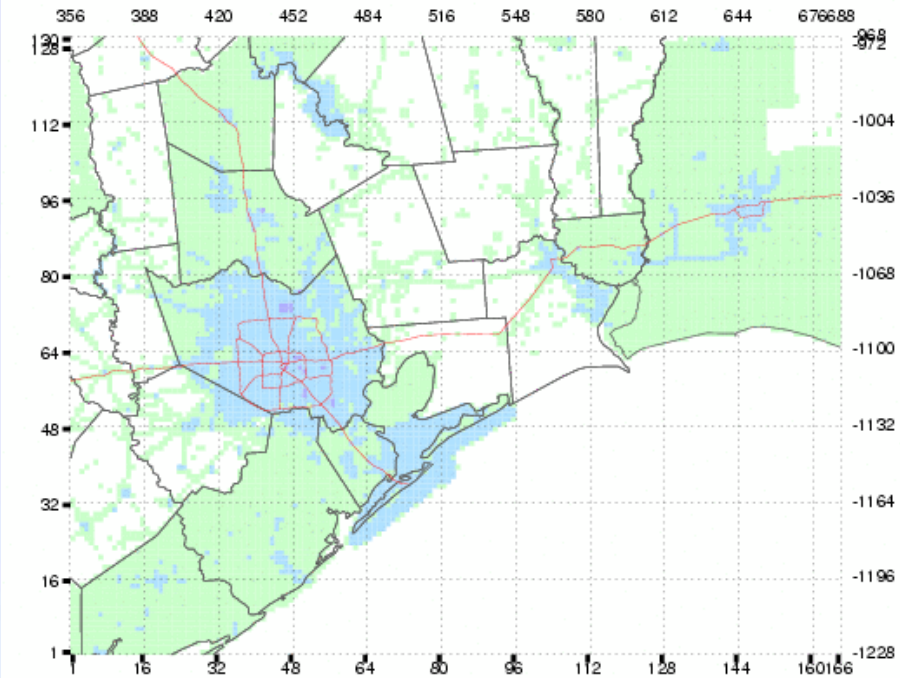


hgb8h2.fy18_b9.hgbpa_02km Non Road Mobile Emissions, 08/03/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	4.30
Chambers	0.72
Fort Bend	4.71
Galveston	3.04
Harris	56.51
Liberty	3.31
Montgomery	3.39
Waller	0.60
HGB SUBTOTAL:	76.57
Hardin	0.63
Jefferson	2.85
Orange	2.89
BPA SUBTOTAL:	6.37
MAP TOTAL:	148.98

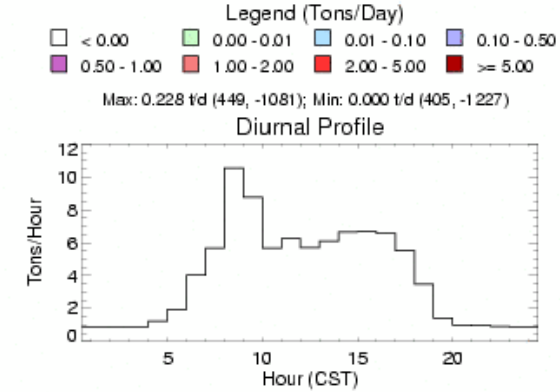




hgb8h2.fy18_b9.hgbpa_02km Non Road Mobile Emissions, 08/03/2005: All VOC

Emissions Plotted

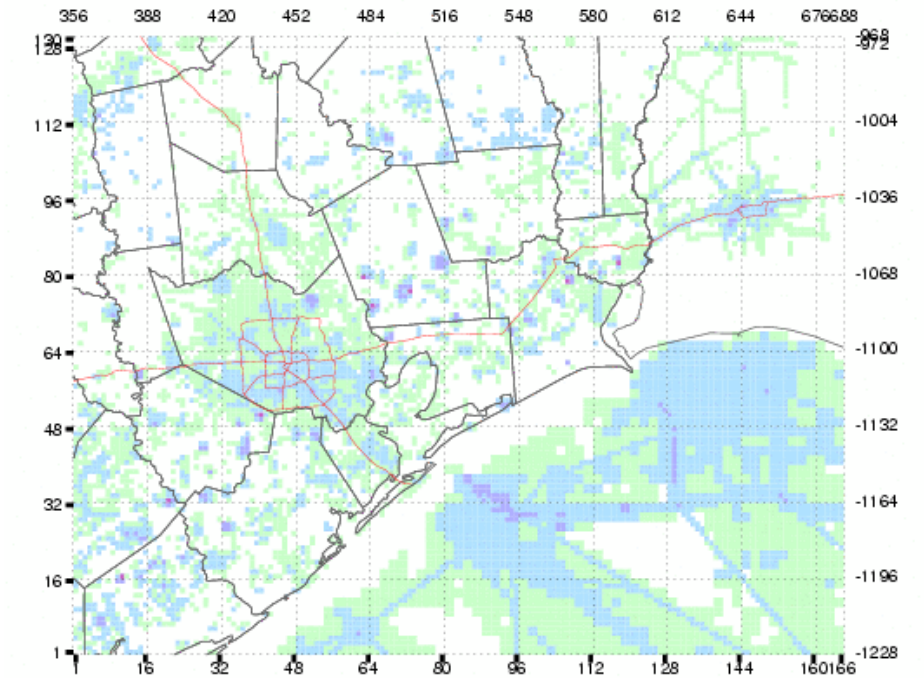
County	Tons/Day
Brazoria	4.52
Chambers	1.48
Fort Bend	3.32
Galveston	12.18
Harris	34.87
Liberty	0.87
Montgomery	4.36
Waller	0.56
HGB SUBTOTAL:	62.15
Hardin	0.42
Jefferson	2.17
Orange	1.00
BPA SUBTOTAL:	3.59
MAP TOTAL:	93.50



2018 Future Area Source Modeling Emissions

- For the region outside Texas, 2002 NEI with EGAS growth was used
- For the region within Texas, 2005 TexAER with REMI-EGAS growth was used

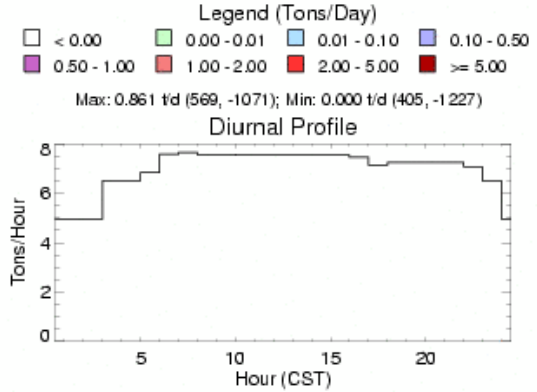
2018 Future Area Source Emissions

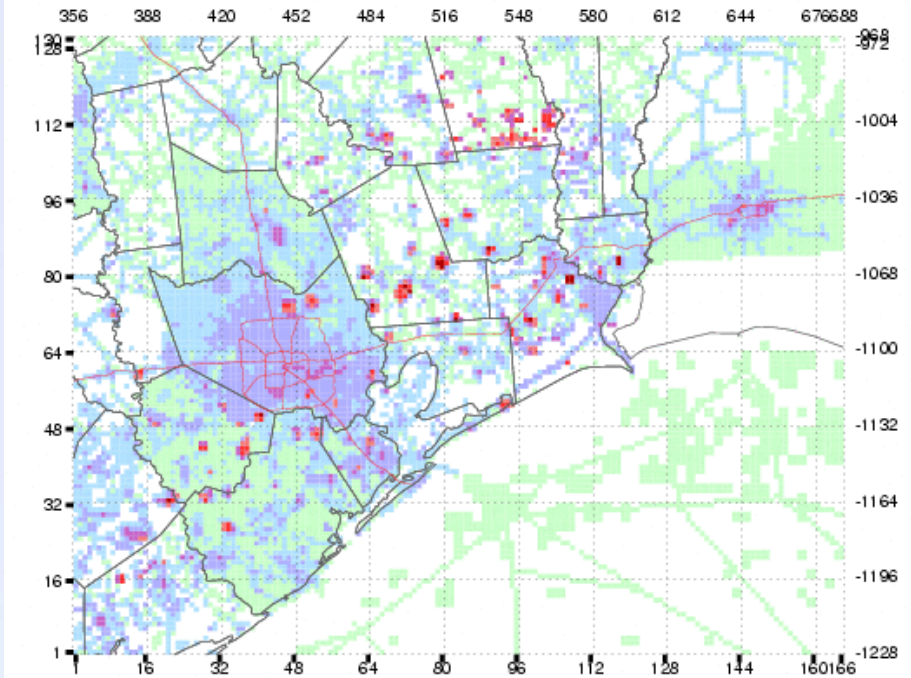


hgb8h2.fy18_b8.hgbpa_02km Area Source Emissions, 08/03/2005: NO_x

Emissions Plotted

County	Tons/Day
Brazoria	7.00
Chambers	2.42
Fort Bend	5.70
Galveston	2.50
Harris	12.83
Liberty	8.63
Montgomery	2.05
Waller	0.91
HGB SUBTOTAL:	42.04
Hardin	1.53
Jefferson	6.13
Orange	1.90
BPA SUBTOTAL:	9.55
MAP TOTAL:	167.86

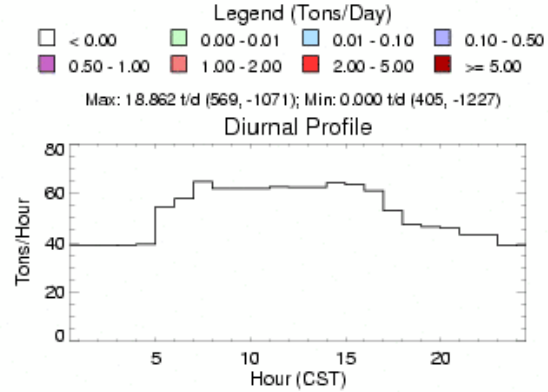




hgb8h2.fy18_b8.hgbpa_02km Area Source Emissions, 08/03/2005: All VOC

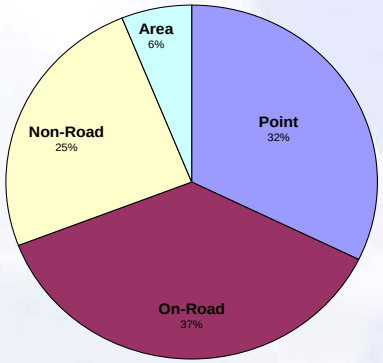
Emissions Plotted

County	Tons/Day
Brazoria	74.36
Chambers	30.53
Fort Bend	84.88
Galveston	52.37
Harris	223.20
Liberty	142.75
Montgomery	30.19
Waller	12.20
HGB SUBTOTAL:	650.47
Hardin	40.59
Jefferson	147.00
Orange	42.94
BPA SUBTOTAL:	230.54
MAP TOTAL:	1254.08

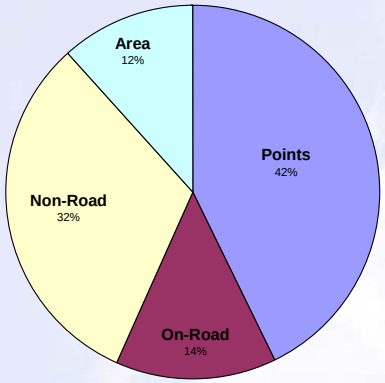


2005 Baseline and 2018 Future Modeling Emissions

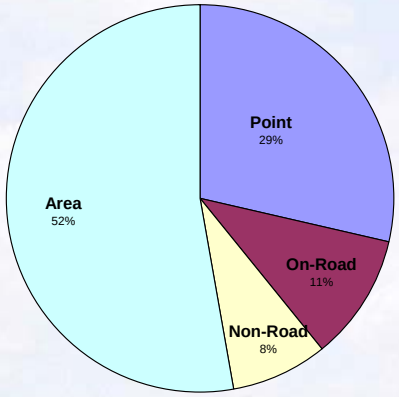
2005 Baseline Modeling Emissions
HGB Eight-County NOx - 600 tpd



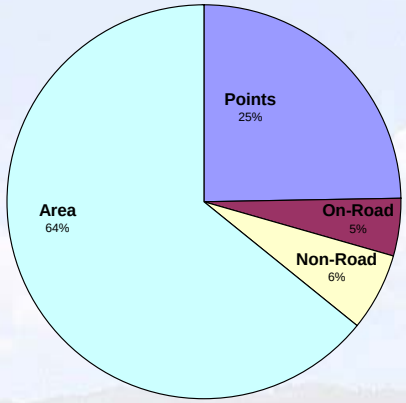
2018 Future Modeling Emissions
HGB Eight-County NOx =364 tpd



2005 Baseline Modeling Emissions
HGB Eight-County VOC = 992



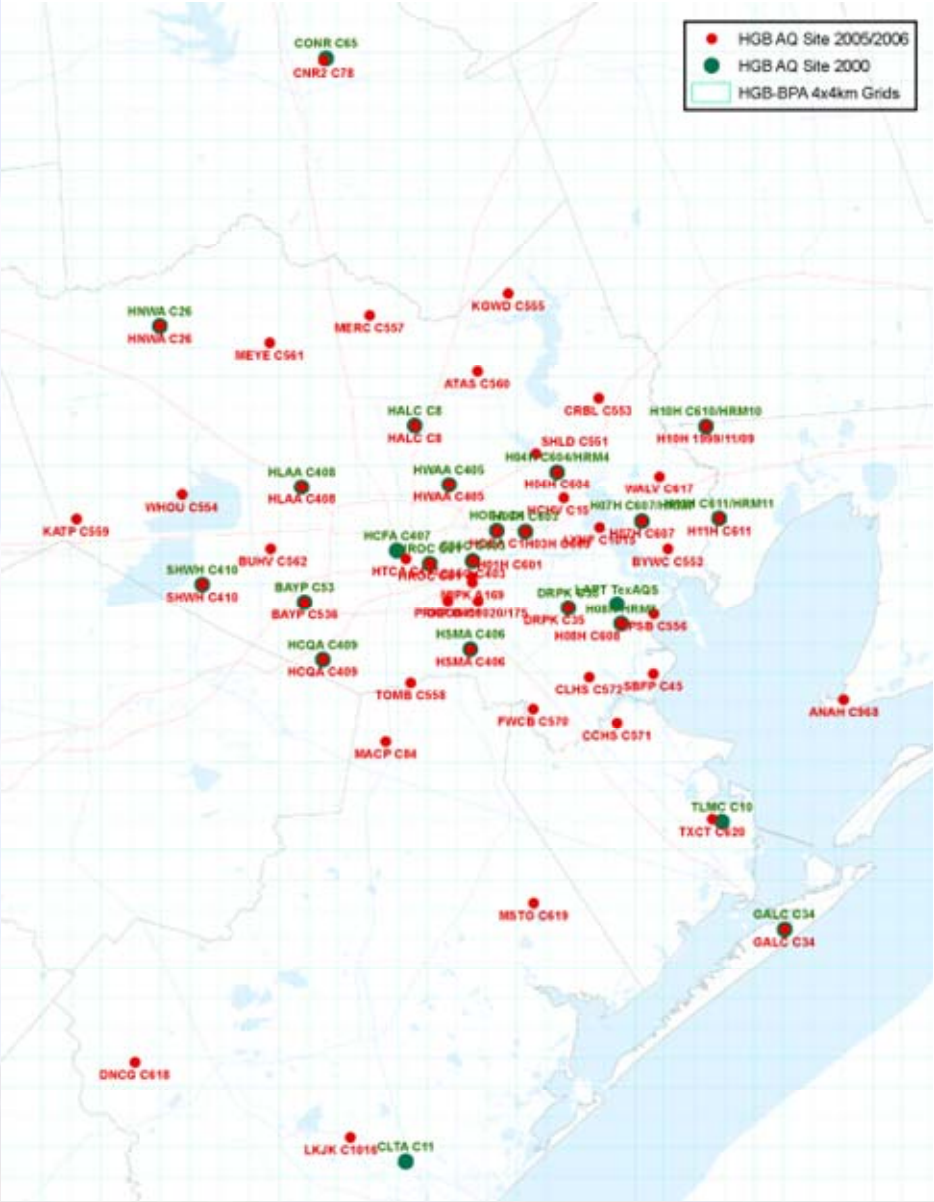
2018 Future Modeling Emissions
HGB Eight-Colunty VOC = 1011 tpd



Met Modeling for 2005 Baseline and 2018 Future

Met modeling, same as for base case, includes:

- New UT-CSR land use/land cover (LU/LC) data for surface characteristics
- Observational nudging using radar profiler data
- Hourly temporally and spatially varying sea surface temperatures (U of H algorithm)



Site Code	Site Info
BAYP	Bayland Park, Harris Co., TX
C35C	Clinton, Harris Co., TX
CNR2	Conroe Relocated, Montgomery Co., TX
DRPK	Deer Park, Harris Co., TX
GALC	Galveston, Galveston Co., TX
H03H	HRM-3, Haden Road, Harris Co., TX
H08H	HRM Site 8, La Porte, Harris Co., TX
H10H	HRM-10, Mt Belvieu, Chambers Co., TX
H11H	HRM-11, , Chambers Co., TX
HALC	Aldine, Houston, Harris Co., TX
HCHV	Channelview, Houston, Harris Co., TX
HCQA	Croquet, Houston, Harris Co., TX
HNWA	NW Harris, Tomball, Harris Co., TX
HOEA	Houston East, Houston, Harris Co., TX
HROC	Houston Regional Office, Harris Co., TX
HSMA	Swiss and Monroe,, Harris Co., TX
HTCA	Texas Avenue, Houston, Harris Co., TX
HWAA	North Wayside, Houston, Harris Co., TX
LYNF	Lynchburg Ferry, Harris Co., TX
MACP	Manvel Croix Park, Brazoria Co., TX
MSTG	Mustang Bayou, Brazoria Co., TX
SBFP	Seabrook Friendship Park, Harris Co., TX
SHWH	Westhollow, Houston, Harris Co., TX
TXCT	Texas City, Galveston Co., TX
WALV	Wallisville Road, Harris Co., TX

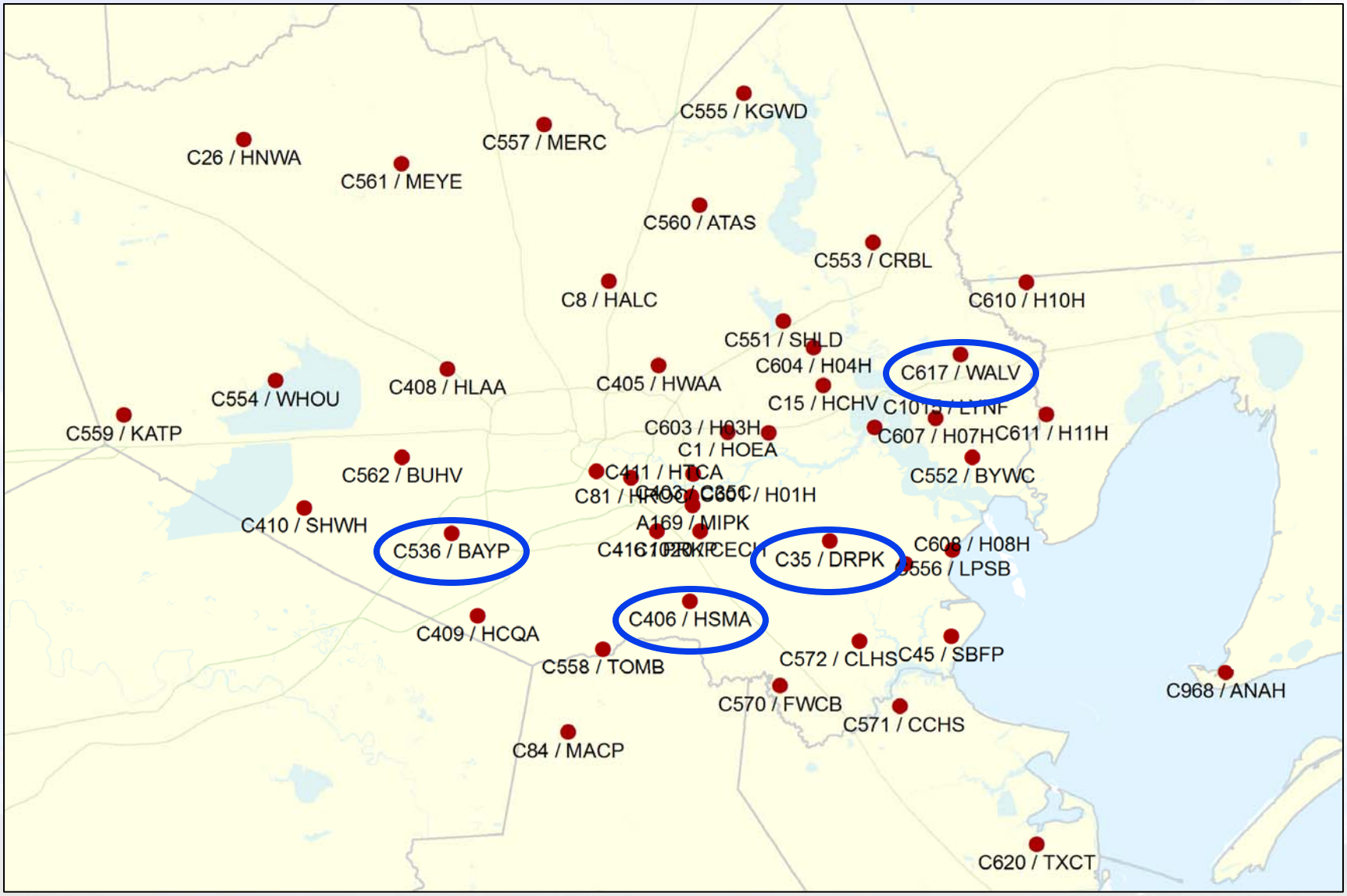
2005 Baseline Modeling

Site Code	2005 Baseline Design Value (ppb)	Number Days 8-Hr O_3 > 80.0 ppb	Number Days 8-Hr O_3 > 84.9 ppb	Average 8-Hr O_3 > 80.0 ppb	Average 8-Hr O_3 > 84.9 ppb
BAYP	100.67	27	18	90.67	93.77
C35C	86.33	16	11	89.52	91.94
CNR2	85.00	7	5	91.05	97.56
DNCG	81.50	9	6	91.02	91.22
DRPK	96.33	14	6	86.97	94.10
GALC	85.00	10	5	85.05	90.30
H03H	88.00	15	8	89.44	92.53
HALC	88.00	15	10	90.13	93.26
HCHV	85.67	15	9	89.41	91.14
HCQA	93.00	27	19	90.93	92.51
HLAA	78.67	22	12	89.28	94.81
HNWA	91.67	17	9	88.48	88.53
HOEA	82.67	17	9	90.65	93.17
HROC	84.33	18	13	90.37	93.17
HSMA	95.33	28	13	88.76	90.72
HTCA	83.33	20	13	90.92	93.09
HWAA	78.67	17	13	91.86	91.18
LKJK	77.50	9	4	85.18	89.38
LYNF	89.00	11	6	89.36	93.37
MACP	94.67	28	18	88.71	90.25
MSTG	88.67	10	7	89.42	91.23
SBFP	89.33	16	4	86.79	93.00
SHWH	92.33	25	18	92.22	95.79
TXCT	87.67	11	3	84.91	87.07
WALV	94.00	10	7	90.24	93.94

Initial 2018 Future Modeling Results

Site Code	2005 Baseline Design Value (ppb)	2005 Baseline Average 8-Hr O_3 > 80.0 ppb	2018 Future Average 8-Hr O_3 (ppb)	Relative Response Factor (RRF)	2018 Future Design Value (ppb)
BAYP	100.67	90.67	78.16	0.862	**86.8**
C35C	86.33	89.52	82.80	0.925	79.9
CNR2	85.00	91.05	77.85	0.855	72.7
DNCG	81.50	91.02	77.37	0.85	69.3
DRPK	96.33	86.97	80.10	0.921	**88.7**
GALC	85.00	85.05	78.59	0.924	78.5
H03H	88.00	89.44	83.45	0.933	82.1
HALC	88.00	90.13	79.67	0.884	77.8
HCHV	85.67	89.41	83.78	0.937	80.3
HCQA	93.00	90.93	77.84	0.856	79.6
HLAA	78.67	89.28	76.60	0.858	67.5
HNWA	91.67	88.48	74.85	0.846	77.6
HOEA	82.67	90.65	83.58	0.922	76.2
HROC	84.33	90.37	83.05	0.919	77.5
HSMA	95.33	88.76	79.52	0.896	**85.4**
HTCA	83.33	90.92	82.74	0.91	75.8
HWAA	78.67	91.86	82.95	0.903	71.0
LKJK	77.50	85.18	74.02	0.869	67.3
LYNF	89.00	89.36	84.45	0.945	84.1
MACP	94.67	88.71	76.64	0.864	81.8
MSTG	88.67	89.42	78.24	0.875	77.6
SBFP	89.33	86.79	80.02	0.922	82.3
SHWH	92.33	92.22	77.74	0.843	77.9
TXCT	87.67	84.91	77.77	0.916	80.3
WALV	94.00	90.24	83.38	0.924	**86.8**

Regulatory Monitoring Sites with DV_{18}s $\geq$ 85 ppb



Caveats to the 2018 Modeling

- CAIR phase 2 allocations were used in estimating 2018 future emissions; the CAIR program has been vacated
- Emission adjustments for the Motiva, Valero and TOTAL refinery expansions have not been included
- There are a number of improvements to the 2005 and 2006 base case modeling that are in progress, which may affect the 2005 baseline, including:
  - Reconciling HRVOC emissions with the TexAQS II monitored data
  - Changing the toluene chemistry in the photochemical model chemical mechanism
  - Episode-specific boundary conditions
  - Cloud assimilation
  - Results of TexAQS II studies are still forthcoming and may impact other modeling assumptions
- Some of these can be expected to increase the DV_{18}'s, while others may result in a decrease

2018 Matrix Modeling

- Matrix modeling consists of CAMx runs using various NO_X and VOC "across-the-board" anthropogenic emission reduction scenarios (e.g., 25%, 50%, etc.)
- Matrix modeling results are used to develop ozone DV_{18}s versus emission reduction response curves
- The response curves are used to estimate the amount of emissions reduction needed for attainment

NO_X and VOC Emissions by Source Category

Reduction Percent (%)	Source Category	NO_X (tpd) Modeled (reduced)	VOC (tpd) Modeled (reduced)
0.0%	Point Sources	156 (0.0)	249 (0.0)
	AR/NR Sources	158 (0.0)	713 (0.0)
	On-Rd sources	49.8 (0.0)	48.9 (0.0)
	Total Emissions	**364 (0.0)**	**1011 (0.0)**
25.0%	Point Sources	117 (39.0)	186.8 (62.2)
	AR/NR Sources	118.5 (39.5)	534.8 (178.2)
	On-Rd Sources	37.4 (12.4)	36.7 (12.2)
	Total Emissions	**273 (91)**	**758.3 (252.6)**
50.0%	Point Sources	78.0 (78.0)	124.5 (124.5)
	AR/NR Sources	79.0 (79.0)	356.5 (356.5)
	On-Rd Sources	24.9 (24.9)	24.5 (24.4)
	Total Emissions	**182 (182)**	**505.5 (505.4)**

Matrix Modeling:
2018 Future Projected Ozone Design Values

Monitoring Sites with 2018 Future Baseline DV_{18}s $\geq$ 85 ppb
Sorted by VOC Reductions

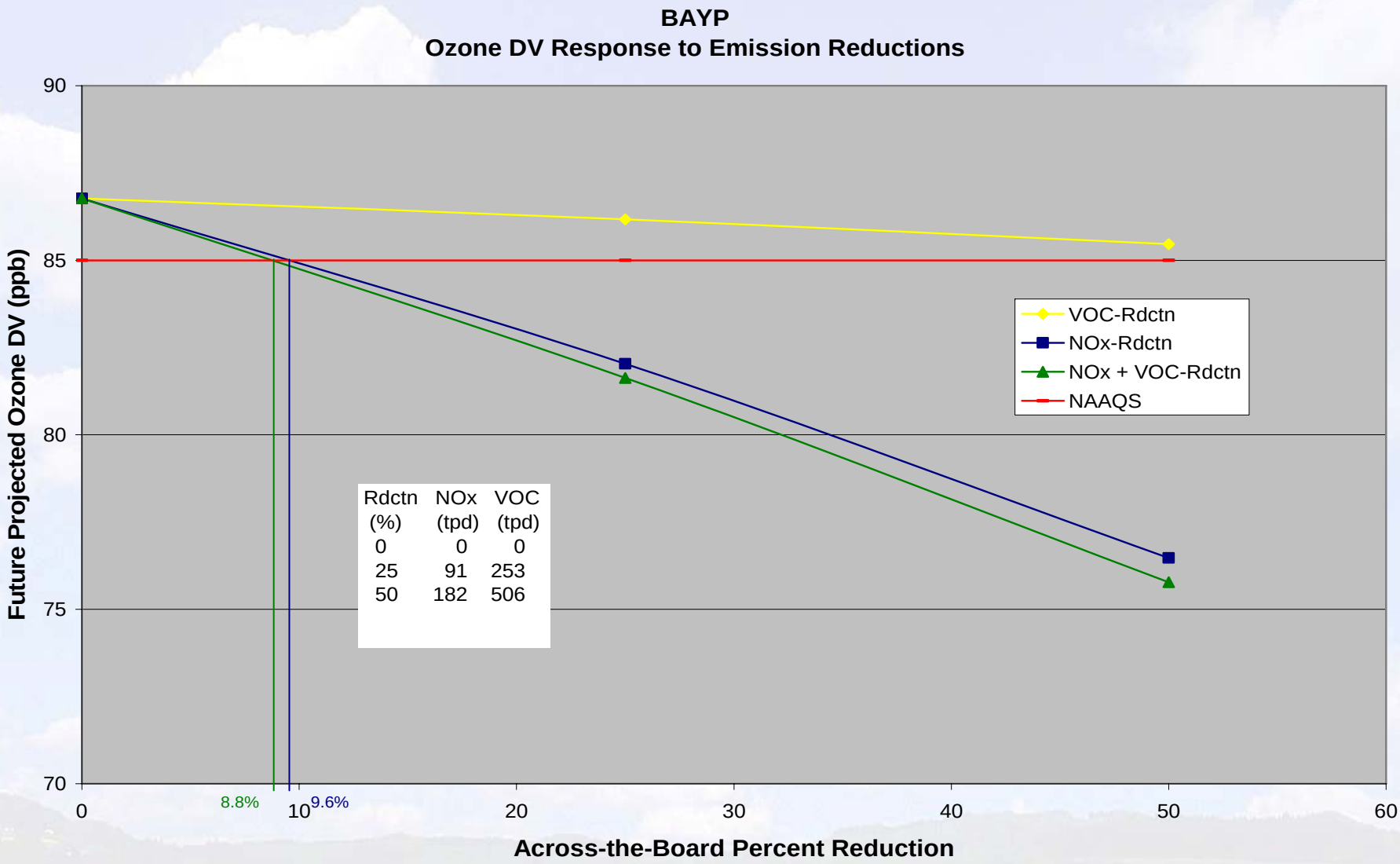
Matrix Scenario	Projected DV_{18}s (ppb) by Monitoring Site			
	BAYP	DRPK	HSMA	WALV
100n100v	86.8	88.7	85.4	86.8
100n075v	86.2	87.9	84.7	85.8
100n050v	85.5	86.9	83.9	84.7
075n100v	82.0	85.6	81.2	82.8
075n075v	81.6	84.9	80.6	82.1
050n100v	76.5	80.9	75.8	77.0
050n050v	75.8	80.0	75.1	76.2

Matrix Modeling:
2018 Future Projected Ozone Design Values

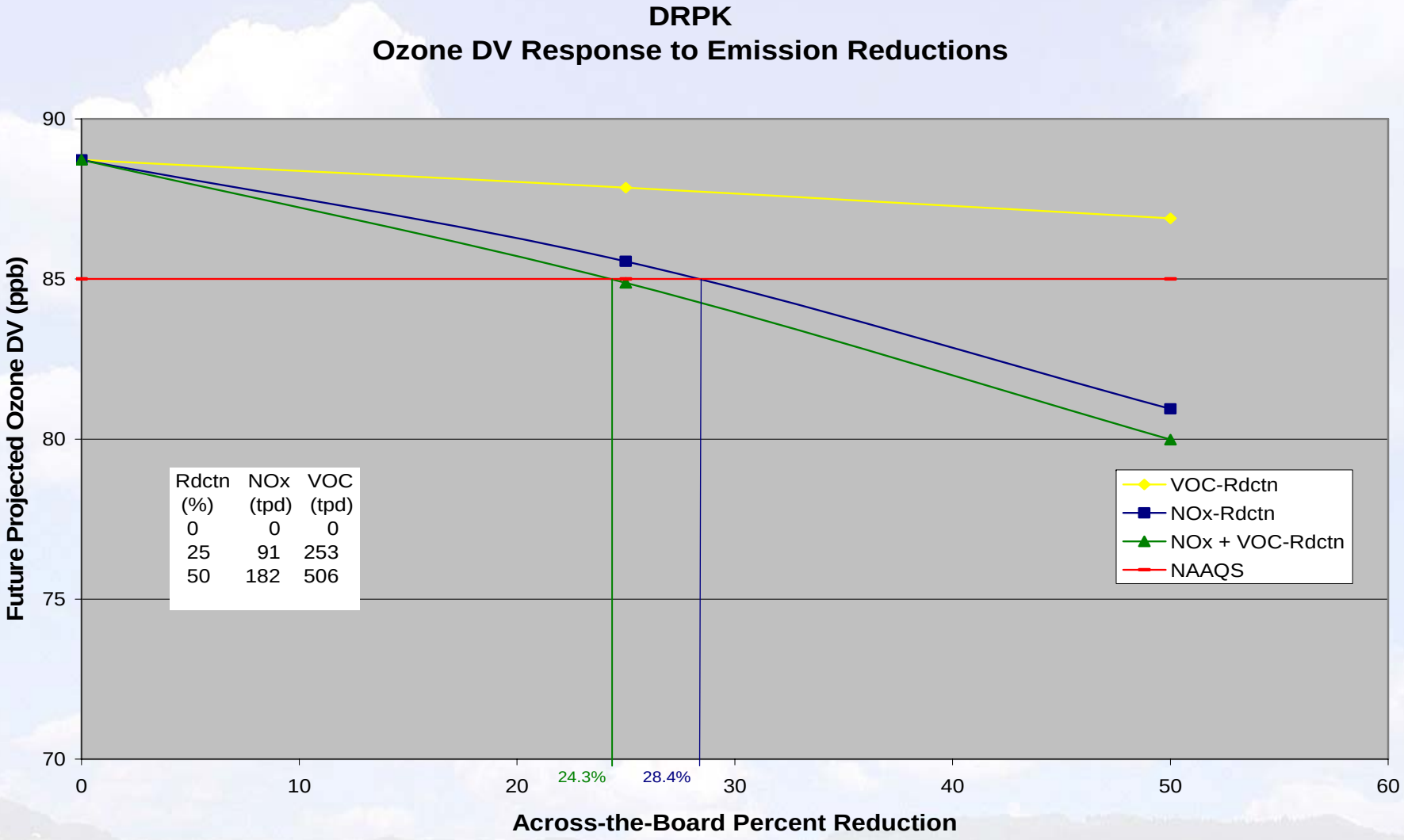
Monitoring Sites with 2018 Future Baseline DV_{18}s $\geq$ 85 ppb
Sorted by NO_X Reductions

Matrix Scenario	Projected DV_{18}s (ppb) by Monitoring Site			
	BAYP	DRPK	HSMA	WALV
100n100v	86.8	88.7	85.4	86.8
075n100v	82.0	85.6	81.2	82.8
050n100v	76.5	80.9	75.8	77.0
100n075v	86.2	87.9	84.7	85.8
075n075v	81.6	84.9	80.6	82.1
100n050v	85.5	86.9	83.9	84.7
050n050v	75.8	80.0	75.1	76.2

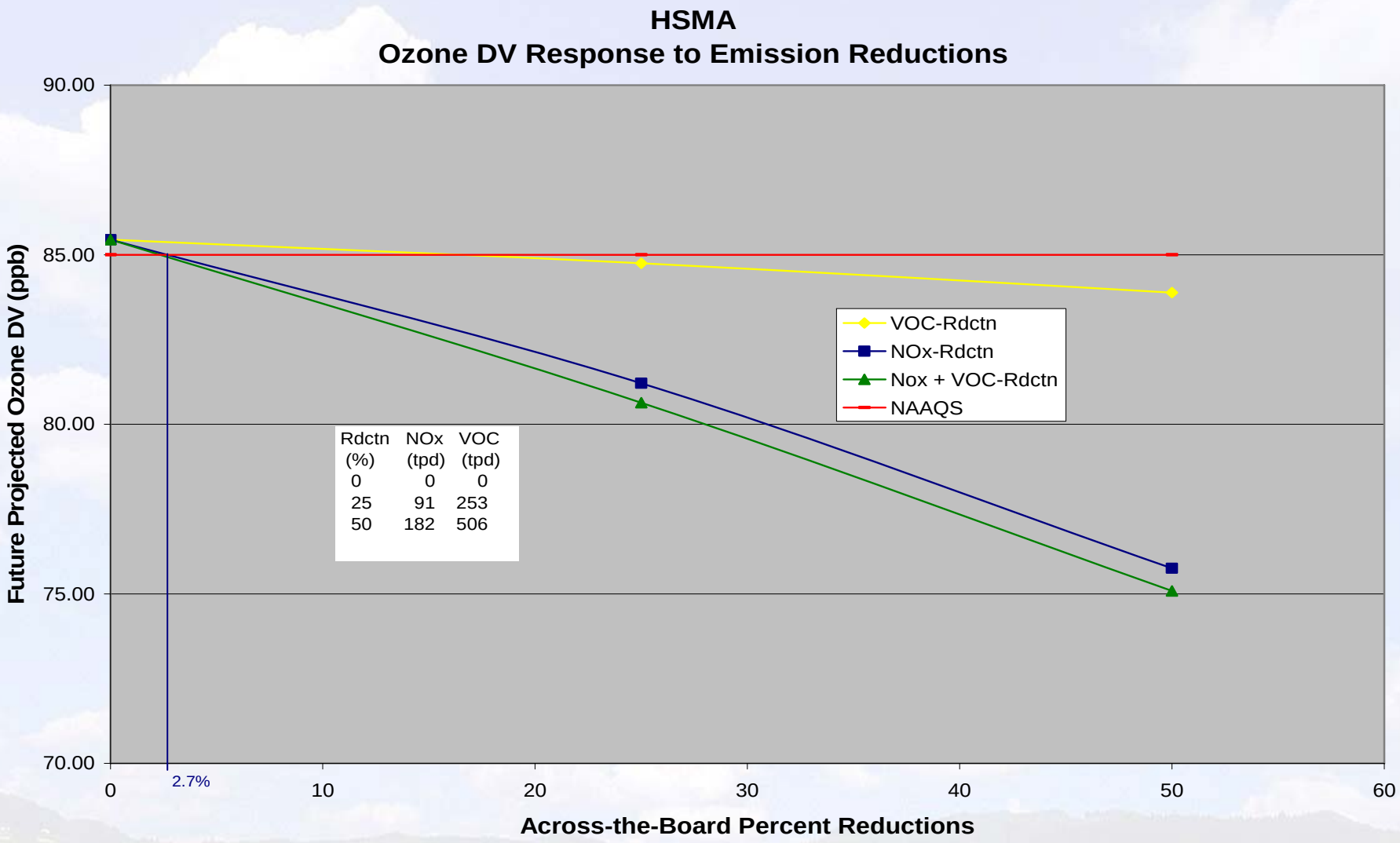
Eight-Hour Ozone Response Curves



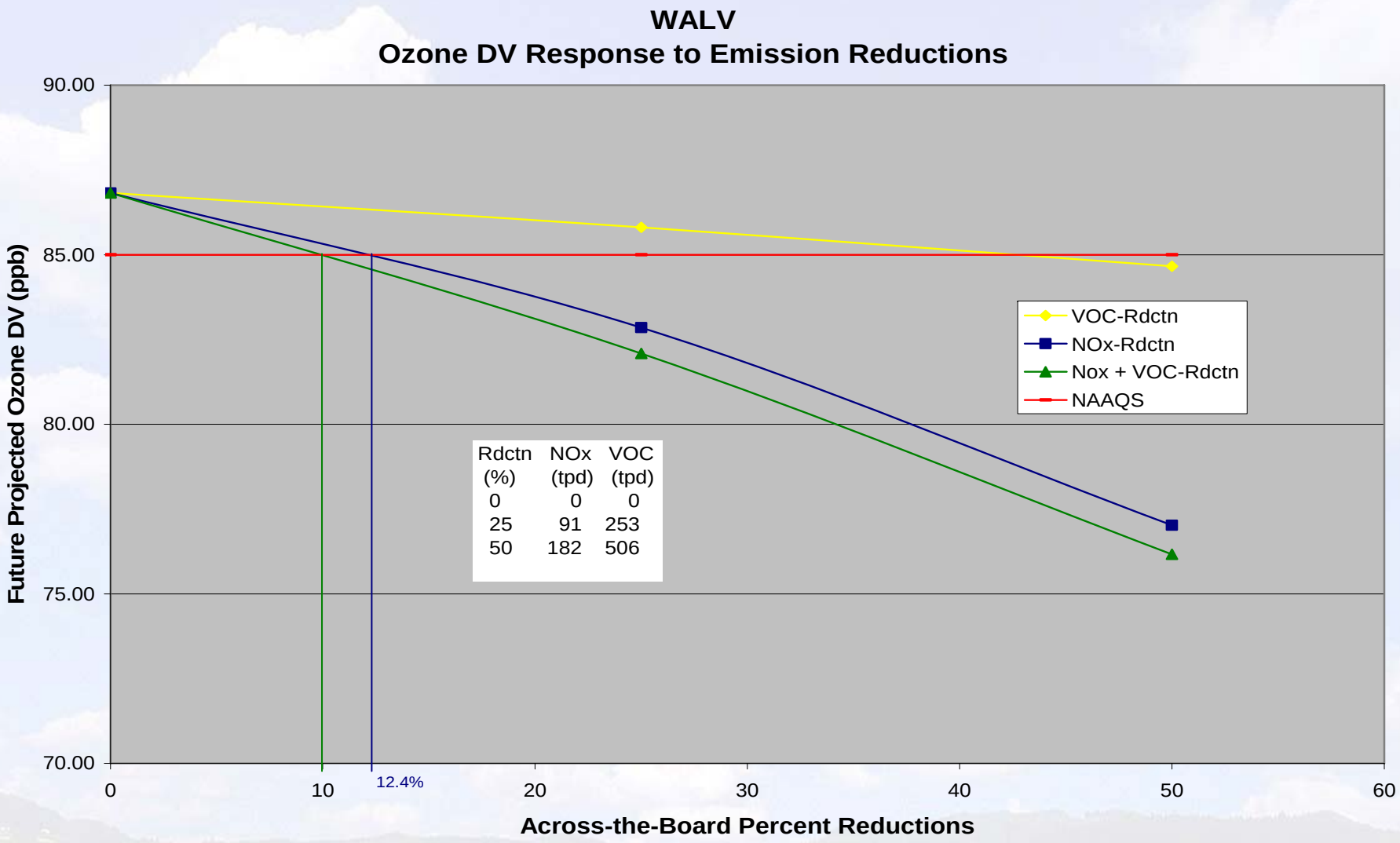
Eight-Hour Ozone Response Curves



Eight-Hour Ozone Response Curves



Eight-Hour Ozone Response Curves



Summary

- The matrix modeling of emission reductions resulted in decreases in the projected DV_{18}s at all four monitors
- The response of the DV_{18}s was greatest for the NO_X + VOC reduction and least for the VOC-only reduction
- The response of the DV_{18}s for NO_X-only was almost as much as the response for NO_X + VOC emission reductions
- With less than a 25 percent reduction of NO_X emissions (approximately 90 tpd), three of the four monitors are projected to be in attainment
- A 28 percent reduction in NO_X (approximately 100 tpd) would be needed for DRPK to reach a DV_{18} of 85 ppb
- A 24 percent combined reduction in NO_X (approximately 87 tpd) and VOC (approximately 243 tpd) would be needed for DRPK to reach a DV_{18} of 85 ppb

Summary

Monitoring Site Code	2005 8-Hour Design Value (ppb)	RRFs	2018 8-Hour Design Value (ppb)	Estimated NO_X Reduction (tpd)
DRPK – C35	96.3	0.921	88.7	103
BAYP – C53	100.7	0.862	86.8	35
HSMA –C406	95.3	0.896	85.4	9.8
WALV – C617	94.0	0.924	86.8	45